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Smart Markets Integrated with RFID, Computer Vision, Sensor Data Fusion

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Abstract: ***In India, the retail industry is growing at a rapid pace, and it is at present one of the top 5 destinations for retail investments worldwide. The retail industry accounts for about 10% of India's GDP. By the introduction of Radio frequency identification (RFID), computer vision, and sensor fusion technologies in the retail industry helps to increase their empire rapidly. The objective of this paper is to understand the role of smart technologies like AI and IoT which are introduced in "Just walk out" or Amazon Go stores which increases the customer experience and saves time.***
Index Terms: Amazon Go, RFID, sensor fusion

I. INTRODUCTION

It is envisaged that the Internet of Things (IoT) will bring new business opportunities into different business domains. IoT is also expected to transform the way business is done and how products and services are designed and developed. IoT, computer vision, sensor fusion is interesting technology that is gaining momentum and in the near future, the reality is, a technology revolution is occurring around us. Artificial intelligence is growing, driverless cars are increasing, new mobile OS, smartphones are demanding RTOS, RFID, IoT devices are developing rapidly and the cloud is emerging. These changes are all because of technical innovations. But the new technologies are forcing us to re-think how technology will transform services and how the businesses will be created. A tendency is developing in which the business of the future is a service business. Therefore, services technology is becoming more and more popular and it's a leading focus area in all industries. In this paper, this technology and new technologies will be discussed and the importance of new technology will be analyzed.

II. LITERATURE SURVEY

A. The Research Of Iot Based On Rfid Technology

Information technology and its application in business have gained a lot of popularity. Business is changing because of the Internet of Things. In the future, all businesses will rely on the Internet of Things. The Internet of Things is providing us with more comfort. The International Telecommunication Union proposes four key application advances of IoT: RFID innovation, sensor innovation, and shrewd innovation and Nano innovation

B. "Preview on Structures and Algorithms of Deep Learning"

Profound learning proposed by Hinton etal is another learning calculation of multi-layer neural system it takes the recently advanced innovation ideas of stacking and mix, proceeds the investigations in different themes, for example, the deep unsupervised learning is improved on, the deep learning frameworks are analyzed, the neural network units, including the activation functions and structural units, are examined and diversified, and the learning models are also described. Finally, some learning experiments are conducted to analyze the models' effects.

C. Sensor Fusion

Sensor combination is a method to merge tactile data from various sources so the resultant data has less weakness than when the sources are used independently. The term Sensor Fusion refers to the combination of information from various sources. Sensor combination is a procedure used to join information from numerous sources to make a more precise picture. It is used in a variety of fields including, but not limited to, robotics, computer vision, and air traffic control. Sensor combination is merging tactile information or data got from various sources with the ultimate objective that the resulting information has less weakness than would be possible when these sources were used independently. The term vulnerability diminishment for this situation can mean more exact, more total, or more trustworthy, or allude to the aftereffect of a rising perspective, for example, stereoscopic vision (calculation of depth information by combining two-dimensional images from two cameras at slightly different viewpoints.

D. Advantage Of Sensor Fusion

Following are the advantages of Data Fusion:

1) Different sensor based information combination Makes data more unequivocal, insightful, reasonable and exact than single sensor based information combination.
2) Information combination helps in factual examination of "N" free perceptions.
3) As information combination helps in the production of profoundly exact data, low power sensors with minimal low exactness can likewise be utilized in IoT-based organizations rather than high precision power-hungry sensors.
4) It helps in dealing with issues confronted identified with large information created by IoT-based frameworks.
5) It helps seclude from everything basic data.

E. Disadvantage Of Sensor Fusion

Following are the downsides or inconveniences of Data Fusion. These difficulties are needed to be addressed to have a fruitful information combination framework.

1) IoT networks involving a couple hundred and thousands of sensors make irrelevant and nontrivial data. Handling of insignificant information might influence the exactness of information combination calculations. Thus, most significant highlights and most significant information are arranged for information combination calculations.
2) Information combination isn't a static cycle in nature.
3) The clashing nature of information gives strange outcomes. Thus, information combination calculations should take utmost care while dealing with clashing information.
4) Information relationships and arrangements ought to be taken care of before the information combination process. This is more normal in WSNs (Wireless Sensor Networks).
5) Information blemish and information irregularities should be managed successfully while utilizing information combination calculations.

III. AMAZON GO CONCEPT

For better understanding and to point out the different customer experiences, I like to highlight some features along with differences to conventional retail stores. Examination dependent on YouTube video (Silicon valley girl) it is feasible to perceive how the Amazon Go store resembles, the undertaking of another shopping experience is called Amazon Go. The shop sells food and other products. There are no cashiers in the shop. The customers are monitored by cameras and AI algorithms, which are constantly watching the shop and customers. The clients are recognized by their face and their garments. The customer is not required to show a card or register the product, but he/she can check-in via the Amazon Go App. The Amazon Go application is needed for the shop to work. The client can get the merchandise in the shop. The goods are identified by a special sticker on the top side. The customer compares the receipt with the online invoice and knows that the AI algorithms are correct. The customer is happy with the shopping experience. It is important to note based on this overview that the change and implementation of this technology are to increase the customer experience and to save the worth making time to a little extinct. Along with all these advancements they have to face some of the challenges like whether customer like and accept the new way of shopping, with the cameras, sensors, and AI algorithms work up to the mark, also in these stores, there is no need of cashiers and automation will eliminate these existing job profiles (there are around 3.67 million cashiers in US (zippia.com).

A. Difference in the Concept of Shopping

Based on the lower number of steps, the Amazon Go store can build the shopping comfort for around 33%.There are no check-out lines and repacking procedures.

AMAZON GO	OTHER SIMPLE STORES
Easily access to groceries and every other day to day products	Easily access to same groceries and every other day to day products
Turn style entry ; customers are required to enter through Amazon app on phone	Enter in shop and start shopping
Customers simply picks up the goods add to bag and shop like normal	Pick up the items
Customer leaves	Wait in the line for cashier
	Take items out of bag scan them and put back in the bag
	Customer leaves

Table 1: Simple comparison of number of steps in Amazon Go stores and in simple stores.

SWOT analysis

STRENGTH	WEAKNESS
Convenience factor	Possible loss of jobs
Learning	Costly tech maintenance
No checkouts	Supplying and weighing fresh produce and meats
Grab and go	
Customer loyalty	
Brand name	
Innovative culture	

Table 2: Swot analysis 2021

B. Amazon go Retail Expansion

Amazon is known to upset ventures, beginning with books back in 1994. The most recent vertical is retail, furthermore explicitly the staple business. Amazon reported designing 3,000 new Amazon Go stores by 2021(Walton 2018). By the start of 2019 Amazon previously opened 10 stores in Seattle, Chicago and SanFrancisco (Amazon 2019). It is a multi-channel portion where generally enormous players are contributing immense aggregates to further develop client experience, using computerized stages, better conveyance choices, or the expanded joining of innovation into the shopping experience. The ordinary American is visiting the supermarket 1.6 times every week generally. Later Amazon purchased Whole Foods for $13.7 billion in August 2017; it has become clear that the fate of the staple industry will change (Ladd 2018). Basic food item retailers can close the innovation hole with Amazon, by transforming their current stores into shrewd "Amazon Go" stores.

C. E-Commerce Keeps Growing

Customers have become used to quick home conveyances and snap and gather choices. The issue isn't that numerous retailers have not figured out how to meet client assumptions, it is that many have not had the option to do it in a productive manner. A contributor to the issue is that picking and last-mile costs have would in general eat intensely into benefits. An ever-increasing number of retailers are looking to automatize their picking and delivery processes.

D. Impact On Workforce

As indicated by the Bureau of Labor Statistics, in 2016, there were 2.7 million individuals distinguished as being utilized by retail supermarkets, 856,850 of whom are utilized as clerks (Bureau of Labor Statistics, 2017). This number doesn't even mirror the 3.5 million clerks that are utilized across all enterprises, in addition to the retail basic food item industry (Bureau of Labor Statistics, 2016). With such countless individuals being utilized in this industry, and in positions that this problematic innovation might make outdated, it follows that one might be interested in how these people will be impacted by Amazon Go and its clerk less functional model. While there could be an undeniable unfriendly effect on clerks, there could likewise be an expanded interest for technical individuals to configure, carry out, and keep up with this innovation. Administrators and client support staff would be expected to answer questions, handle returns, and handle quality-related issues. Security and anti-theft representatives would likewise be expected to forestall shoplifters (Rash, 2016). It shows up that individuals will in any case be required in retail, maybe in various limits.

IV. AMAZON BUSINESS MODEL

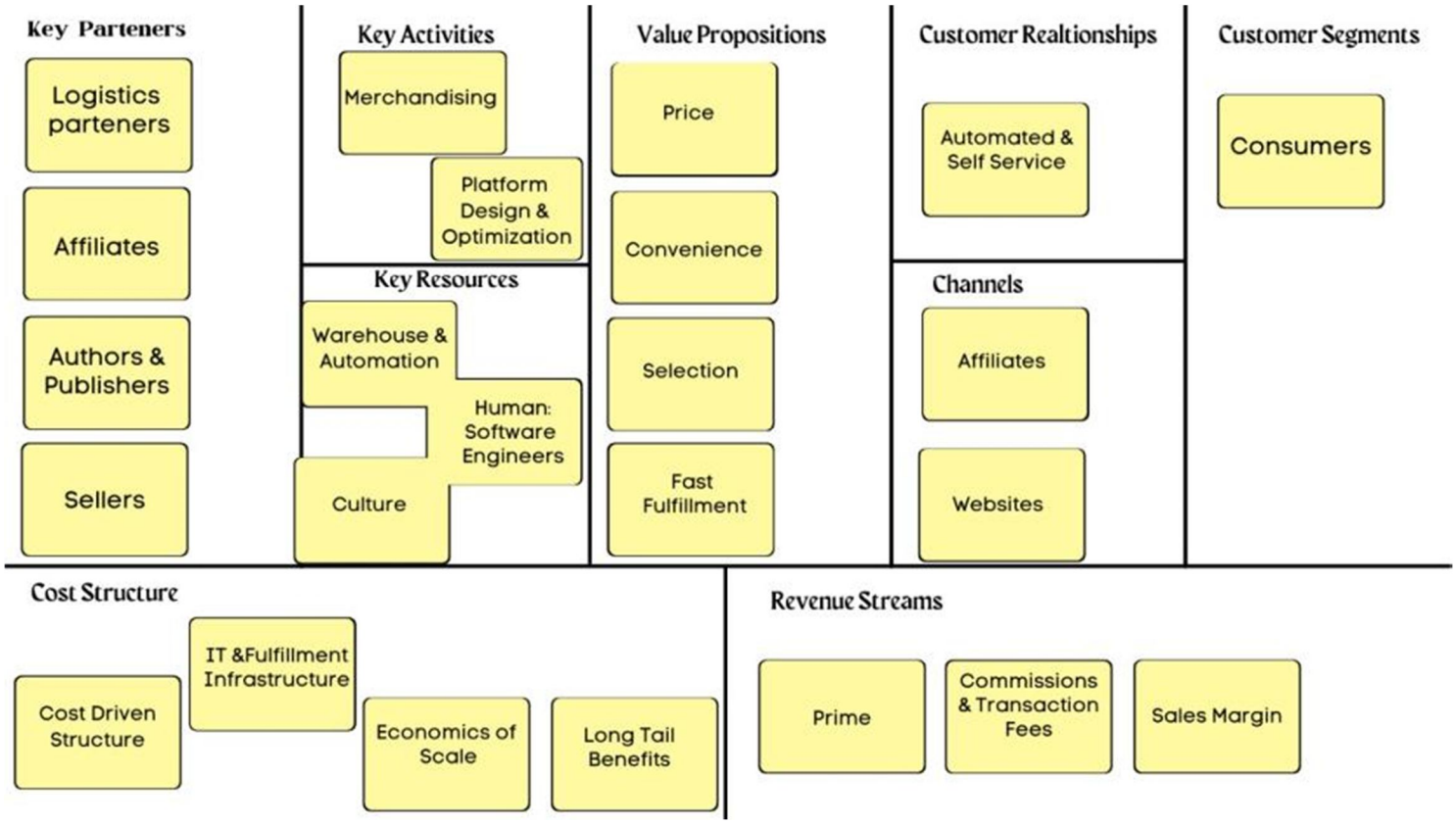


Fig: Business Model Canvas Amazon adapted from Business Model

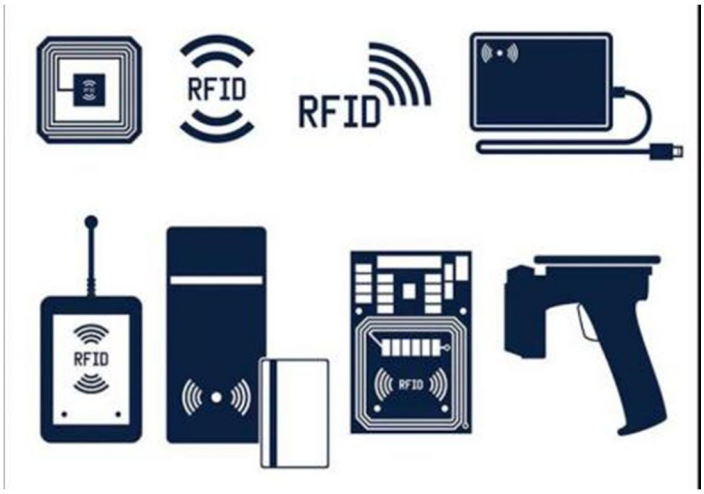
In recent years, Amazon has focused on Payments, Logistics, Pharmaceuticals, Media and Consumer Brands, among others. Behind this is, of course, its continued commitment to investing in technology through both R&D and acquisitions. Marketplaces and customers are still the heartbeat of Amazon's business. Amazon generates most of its revenue (over 50%) from its marketplace.

Amazon takes care of issues for shoppers and organizations. The Amazon retail plan of action is serving.
Customers who need the best arrangements conveyed to them in the most helpful manner. The Amazon administrations plan of action is giving organizations from one side of the planet to the other, a method for arriving at a large number of clients, making showcasing and selling simpler. The offer for purchasers is an immense assortment of everything: hardware, PCs, books and that's just the beginning. All they offer is at the least cost and shopping besides conveyance is helpful. The offer for organizations is an entire scope of answers for develops a business, from selling on the Amazon Marketplace, through Fulfillment, to promoting and brand building.

V. TECHNOLOGY USED

A. About RFID Tags And How It Works

RFID technology automates the identification and tracking of objects and information using electromagnetic waves. The waves are unique to each object and can be read by a scanner from a few feet away. The information is then stored in an electronic format, allowing for easy tracking and retrieval. RFID tags are most often found on products to allow for easy identification and tracking.



RFID technology has the potential to streamline many business processes, helping companies save time and money. For example, it could be used to automatically track items as they move through a supply chain, reducing the need for paperwork. This would allow companies to better monitor their inventory, which in turn would increase efficiency. RFID tags are also embedded in business cards and other small cards to help keep track of them.
The RFID computer program can then access information on the tag through an online database. Every RFID tag is individually programmed with the EPC or GS1 Electronic Product Code™, which can be applied to pallets, boxes, products, and equipment. From a management perspective, tags can be programmed with a large number of different characteristics that can tell you what the item is, when it was manufactured, and how well it has served you over time. The more information you have, the better your inventory management. [1]

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If you want to get the easiest explanation on RFID labels, the best way to do this is to compare them with barcodes. Similar to the barcodes, RFID tags are used to immediately get the information that you want to retrieve, such as a product's price. Like a barcode, an RFID tag can contain a few different types of information, but it is most often used for the following three types of data:

RFID labels utilize a microchip and an antenna to get and communicate data. Individuals now and then allude to this as a coordinated circuit or IC. The label comes in two fundamental sorts:Active and Passive.
RFID tags of the first kind are active RFID tags. They are the most common type of tag. This type of tag needs a source of power to function, which is usually supplied by a small battery.
The second type of RFID tag is passive. This kind of label utilizes a microchip and a receiving antenna to get and send the data.. The microchip is often referred to as the “integrated circuit” or the “IC”, as it is the main component of the tag. Tags use their antennas to transmit and receive signals between the tag and the reader.

B. Disadvantages of RFID

Everything has a dark side, this has to a dark side, there are still many security issues that it can still cause. One of these is the ability to read the information that RFID tags contain. This is very useful for scammers as they can gather sensitive information without the knowledge of the individual who issued the RFID tag. The main issue with RFID systems is that they tend to get jammed or disrupted when they operate on the radio frequency that's what they're supposed to use. This can result in lower productivity and longer waiting times in retail stores and warehouses. In addition to being a labour-intensive process, getting an RFID system is also quite time-consuming. Doing so often requires companies to test different systems and hardware to find the best fit. Aside from these, implementing RFID tags also comes with various other expenses. That is why many businesses still consider inventory and data collection as key components of their operations.[2] [3]

C. Vision Sensing

Many considerations go into the design of retail cameras. One of them is the camera specification. As technology improves, it can be eased up a bit. For now, we consider the following factors when it comes to camera performance: frame rate, resolution, and lighting. Many considerations go into the design of retail cameras, such as camera placement, the number of cameras to deploy, and camera specifications. As technology improves, camera specifications can be relaxed. For optimal frame rate, we suggest around 25–30 fps[9]. Likewise, lighting conditions should assist with getting the most ideal picture quality. The concept of multiple cameras spreading across various viewing angles is a good one, but it can also cause issues due to the added hardware and computational cost. In addition, the human eye can still detect objects in the same location.

VI. CUSTOMER TRACKING SYSTEM

Customers Tracking System (CTS) consists of 2 sub-components: Customer Location Tracking System (CTS-L) and Customer Action Tracking System (CATS). The Customer Location Tracking System (CTS-L) was designed to meet the following objectives:

A. Customer Identification

This framework uses a customer's physical presence to identify and collect relevant information from their database. This system does so by extracting data from the customer database and associating the relevant information with the customer's unique key.

B. Customer Location Tracking

Upon entering the store, the customer will first explore the various shelves. It is important to keep track of the exact location of the customer throughout the visit as well as the items that the customer has picked up. Once the customer leaves the store, this system will then log the end of the visit and send a message to the email address that the customer provided.

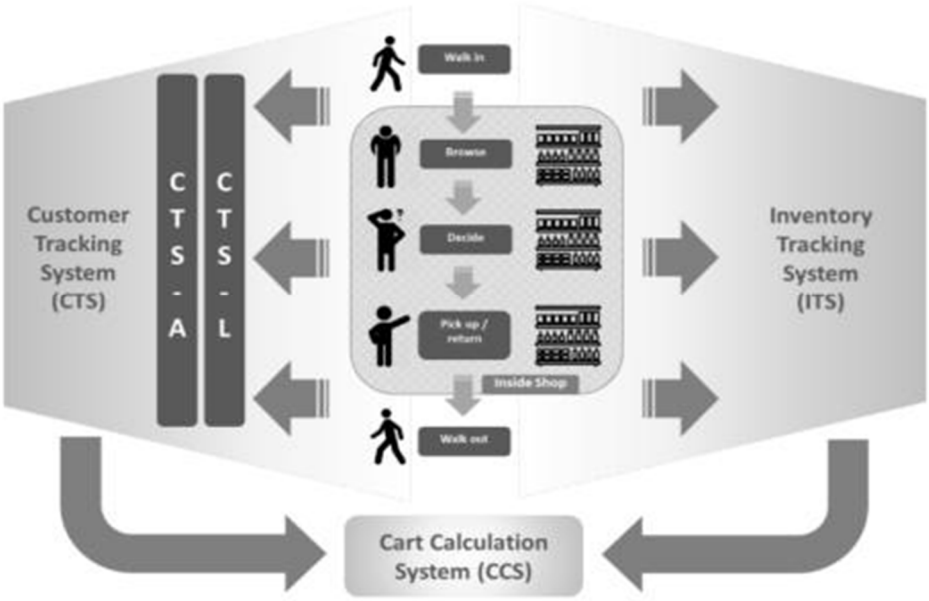


Fig: The proposed framework

Time Stamp	Customer ID	Raw Location		Shelf Vicinity Flags				
		X_Co-ord	Y_Co-ord	Item_1	Item_2	Item_3	.....	Item_n
15-01-2018 09:31:10	956431	574	733	1	1	0	....	0
15-01-2018 09:31:10	245786	769	112	0	0	1	....	0
15-01-2018 09:31:10	359563	920	636	0	0	0	....	0
15-01-2018 09:31:10	315635	29	101	0	0	0	....	1

Fig: Sample CTS-L output data

Concerning the Customer Action Tracking System (CTS-A) then again, it tracks what the client does in the store once. From an actual viewpoint, everything client activities can be arranged into three classes:

1) Moving
2) Standing
3) Taking or returning items

As a result, this subsystem tracks these actions and records the respective timestamps of actions taken. The last action described above is of greatest importance, so ideally, the system should be activated only after an item is taken or returned, at the point when it will likewise record the subtleties of activities taken by the client.

VII. INVENTORY TRACKING SYSTEM

The inventory tracking system or the ITS is an automated system that will keep track of the quantity of each item in a shop and will maintain a log file for each of the items. Ideally, it should be able to detect a change in the inventory and automatically trigger a monitoring mechanism.One more innovation that can be fused into the arrangement is picture acknowledgement. Using a rudimentary Python program, we were able to achieve greater than 90% accuracy in predicting the number of items on a virtual shelf image generated and randomly populated with items.

Time Stamp	Customer ID	Customer Actions		
		Move	Stand	Take/Return
15-01-2018 09:31:05	956431	1	0	0
15-01-2018 09:31:05	245786	0	1	0
15-01-2018 09:31:05	359563	0	1	0
15-01-2018 09:31:05	315635	1	0	0
15-01-2018 09:31:10	956431	1	0	0
15-01-2018 09:31:10	245786	1	0	1
15-01-2018 09:31:10	359563	0	1	0
15-01-2018 09:31:10	315635	0	0	0
15-01-2018 09:31:15	956431	1	0	0
15-01-2018 09:31:15	245786	0	1	0
15-01-2018 09:31:15	359563	0	1	0
15-01-2018 09:31:15	315635	1	0	0

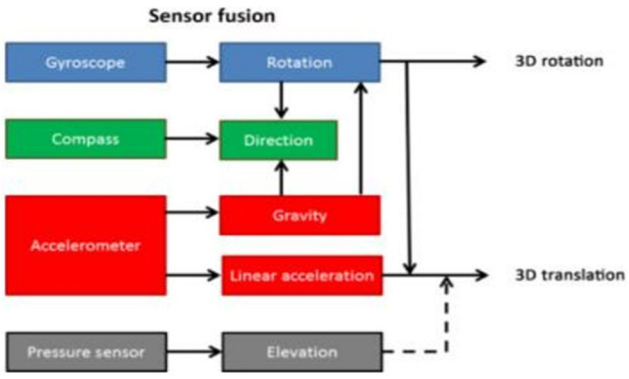
Fig: Sample CTS-A output data

Time Stamp	Inventory				
	Item_1	Item_2	Item_3	.....	Item_n
15-01-2018 09:31:03	124	56	73		0
15-01-2018 09:31:05	124	56	73		0
15-01-2018 09:31:07	124	56	73		0
15-01-2018 09:31:09	124	56	73		0
15-01-2018 09:31:11	124	56	72		0

Fig: Sample ITS Output data

VIII. SENSOR FUSION AND INTEGRATION

The idea of sensor combination endeavors to recreate the capacity of the focal sensory system to handle tangible contributions from different sensors all the while. For mechanical gadgets, criticism from one sensor is regularly sufficiently not, especially for the execution of control algorithms. Sensor combination can be utilized to make up for inadequacies in data by using criticism from numerous sensors. The inadequacies related to individual sensors to ascertain specific sorts of data can be made up for by consolidating the information from different sensors. The net impact of sensor combination is that the subsequent data ought to have less vulnerability than would have happened assuming the sensors were utilized separately. Sensor combination can likewise assist with making up for sensor commotion, restricted exactness, disappointment, or an absence of data about a specific part of the climate. Also, sensor combination can be utilized when the ideal sensor of decision is cost restrictive. Sensor combinations can use data straightforwardly from sensors or noteworthy sensor information or can utilize roundabout data from earlier information about the framework inputs. Delineate the idea of sensor combination. Data is procured from various sensor types and consolidated to get data around 3D turns and interpretations.[4]



Sensor coordination alludes to cleverly consolidating information from different sources to determine integrated data for ensuing handling. An assortment of calculations has been produced for coordinating information from various sources and representing vulnerabilities related to the information sources. Models incorporate discrete Bayesian techniques, Kalman shifting, or neural organizations

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IX. DISCUSSION

Similar technology is implemented in other countries also.

Various reforms and major steps have been taken in this direction to increase the customer experience. By the introduction of IoT, helps to increase sales and make business much profitable. Similar to the concept of Amazon Go convenience stores, the Korean market is also stepping up by using IoT whose consequence can easily be seen in their increasing sales and profitability.

Before introduction (Average sales per store within brand)	After introduction (Average sales per store within brand)	Increase/decrease width	Fluctuation rate	Installation time
108.90%	141.30%	32.40%	29.76%	July, 2015
45.98%	61.56%	15.58%	33.87%	December, 2015
26.19%	34.13%	7.94%	30.33%	December, 2015

Fig: Comparison of sales before and after installation of smart store.

A. Financial Analysis

Financial analysis is the method of reviewing companies, programs, expenditures, and other activities relevant to finance to assess their performance and appropriateness. Financial analysis is usually used to determine whether an enterprise is sufficiently stable, solvent, liquid, or competitive to warrant a monetary investment.

B. Amazon go Business Operators

1) *Data Analysis For Better Services:* Place to gather data with the aim to increase the Customer Satisfaction and Retention
2) *Synergy with other Amazon Services:* The strategy of Amazon is providing Amazon Go as a complement to AWS for and marketplace platform analytics.
3) *Customer Healthiness and Wellness:* The Amazon Go store provides only healthy fresh food in kits and ready to eat snacks mainly provided by Whole Food
4) *Increase the Profit Margin of the grocEry Sector:* The Grocery Market has a unique financial characteristic to be not strongly profitable with an average of 1.7% of profit. Amazon Go technology will impact directly and indirectly the operating costs of a store for a better Profitability.

C. Amazon Go Business Ceiling

1) *Cost/Benefit of the Project:* Amazon Go is a costly project estimated at $1.69 Billion for the company that it will takes years to be profitable with the adequate strategy
2) *Competitor's Reaction:* The actual competitors such as Microsoft and Alibaba are developing a similar technology by using the Radio Frequency Identification (RFID) technology for payments that could help Walmart to compete with Amazon
3) *Workforce and Regulation:* Amazon Go is targeting principally the 23 Million cashier jobs in the United States estimated to be $37 Billion in potentially lost income nationwide. Amazon should anticipate any law suit from Unions such as United Food and Commercial Workers (UFCW)

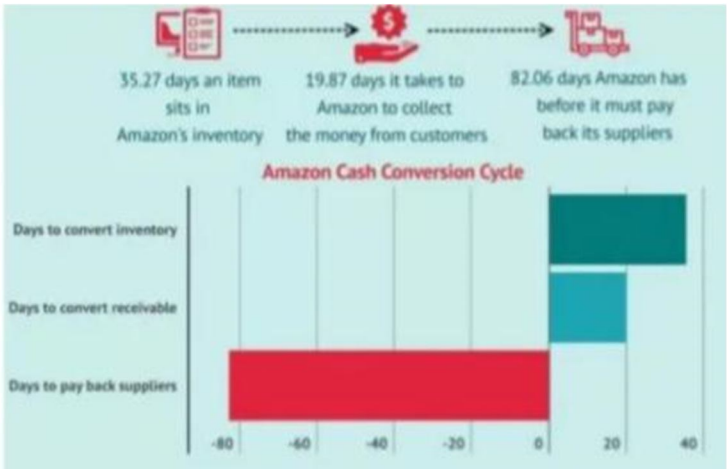
D. Financial Feasibility of Amazon Go

1) *Financial Strategy:* Financial Ability of Amazon to develop technology and making them ready to use.
2) *Forecasting Analysis:* Forecasting the financial contribution of Amazon go with the actual strategy of the group.
3) *Alternative Financial Stream:* Suggesting a new stream of revenue that will position Amazon at a safer place.

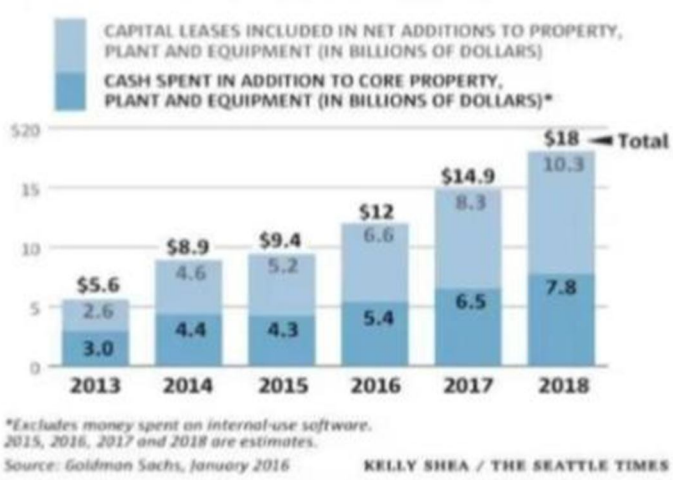
a) Financial Strategy

- *Amazon Financial Investment*

Cash Conversion Cycle



Capital Budget for CAPEX and R&D



- *Financial Benchmark of the Grocery Market.*

√ The potential size of sector:

This sector considered one of the safest areas to invest due to its estimated size in 2016 of $1.4 Trillion in the United States which 1% of this sector represents 10% of Amazon revenue.

√ financial indicators:

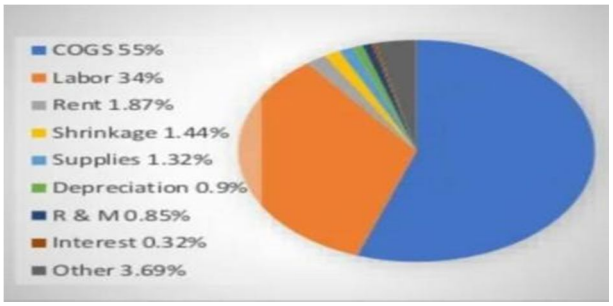
Weekly Sales per store: Average $305,105 and Ranges from $30,600 to $1,541,000

Average annual sales per square foot: $1,725 per sq. ft. weekly sales Weekly Transaction per store: Average 11,211 and Ranges from 2,147 to 29,477 Sales and transaction by checkout: Weekly store sales by checkout $29,194 and Weekly transaction by checkout 1,241 The gross margin: it is virtually flat at 56.48%

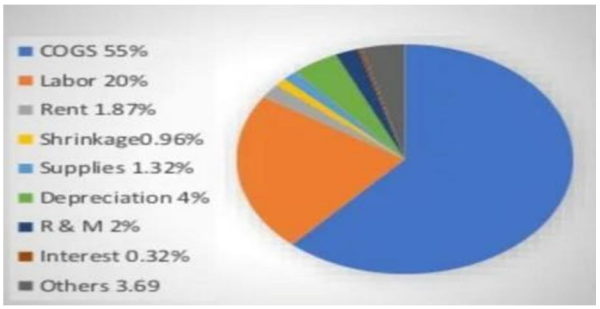
The net profit: 1.65% for Publicly Traded companies and 4.01% for Profit leaders

Components of total cost in percentage

Current Market Total Cost in Percentage



Impact of Amazon Go on the Total Cost in Percentage



Comments:
Net profit: Increase from 1.69% to 12%

Positive impact:
- Labour costs: decrease from 34% to 20%
- Shrinkage: decrease from 1.44% to 0.96%

Negative impact:
-Depreciation: Increase from 0.9% to 4%
-R & M: increase from 0.85% to 2%

b) Forecasting Analysis

Annual Cash Flow

Financial Elements	%	Seattle	Strategy
Average Sales	**100%**	**$ 3,142,500**	**$ 6,285,000,000**
Cost Of Good Sold	**55%**	**$(1,728,375)**	**$(3,456,750,000)**
Gross Margin	***45%***	***$ 1,414,125***	***$ 2,828,250,000***
Labor and Benefits	20%	$ (628,500)	$ 1,257,000,000
Rent	2%	$(58,765)	$ 117,529,500
Utilities	1.48%	$(46,509)	$ 93,018,000
Inventory Shrinkage	0.48%	$(15,084)	$ 30,168,000
Supplies	1.32%	$(41,481)	$ 82,962,000
Advertising	1.24%	$(38,967)	$ 77,934,000
Depreciation	4.00%	$ (125,700)	$ 251,400,000
Repair and maintenan	2.00%	$(62,850)	$ 125,700,000
Interest	0.32%	$(10,056)	$ 20,112,000
Total Operating Costs	33%	$(1,027,912)	$ 2,055,823,500
Net Profit	***12%***	***$ 386,213***	***$ 4,884,073,500***

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Net Present Value (NPV)

	Prior 2018	2018	2019	2020	2021	2022	2023	2024	2025
Number of stores		1	8	50	150	280	380	480	651
Cumulative # of stores		1	9	59	209	489	869	1349	2000
Discount	12.34%								
Cash-Flow		$ 511,913	$ 4,095,306	$ 25,595,663	$ 76,786,988	$ 143,335,710	$ 194,527,035	$ 245,718,360	$ 333,255,526
Cumulative CF		$ 511,913	$ 4,607,219	$ 30,202,882	$ 106,989,869	$ 250,325,579	$ 444,852,614	$ 690,570,974	$ 1,023,826,500
Discounted CF	$ 2,271,575,175	$ 455,682	$ 4,101,139	$ 26,885,243	$ 95,217,535	$ 222,828,538	$ 395,987,729	$ 614,715,128	$ 911,364,162
Investment									
Technology		$ (50,000)	$ (400,000)	$ (2,500,000)	$ (7,500,000)	$ (14,000,000)	$ (19,000,000)	$ (24,000,000)	$ (32,550,000)
Store equipment		$ (320,000.00)	$ (2,560,000.00)	$ (16,000,000)	$ (48,000,000)	$ (89,600,000)	$ (121,600,000)	$ (153,600,000)	$ (208,320,000)
Total additional investment		$ (370,000)	$ (2,960,000)	$ (18,500,000)	$ (55,500,000)	$ (103,600,000)	$ (140,600,000)	$ (177,600,000)	$ (240,870,000)
Discounted Additional Investment	$ (858,714,616)	$ (329,357)	$ (2,634,858)	$ (16,467,865)	$ (49,403,596)	$ (92,220,046)	$ (125,155,777)	$ (158,091,508)	$ (214,411,608)
R&D + CAPEX	$ (1,620,000,000.00)								
Total investment	$ (2,278,714,616)								
Net Present Value	$ (7,139,442)								

	Prior 2018	2018	2019	2020	2021	2022	2023	2024	2025
Number of stores		1	8	50	150	280	380	480	651
Cumulative # of stores		1	9	59	209	489	869	1349	2000
Discount	8.74%								
Cash-Flow		$ 511,913	$ 4,095,306	$ 25,595,663	$ 76,786,988	$ 143,335,710	$ 194,527,035	$ 245,718,360	$ 333,255,526
Cumulative CF		$ 511,913	$ 4,607,219	$ 30,202,882	$ 106,989,869	$ 250,325,579	$ 444,852,614	$ 690,570,974	$ 1,023,826,500
Discounted CF	$ 2,346,779,061	$ 470,768	$ 4,236,913	$ 27,775,319	$ 98,390,536	$ 230,205,609	$ 409,097,493	$ 635,066,189	$ 941,556,233
Investment									
Technology		$ (50,000)	$ (400,000)	$ (2,500,000)	$ (7,500,000)	$ (14,000,000)	$ (19,000,000)	$ (24,000,000)	$ (32,550,000)
Store equipment		$ (320,000.00)	$ (2,560,000.00)	$ (16,000,000)	$ (48,000,000)	$ (89,600,000)	$ (121,600,000)	$ (153,600,000)	$ (208,320,000)
Total additional investment		$ (370,000)	$ (2,960,000)	$ (18,500,000)	$ (55,500,000)	$ (103,600,000)	$ (140,600,000)	$ (177,600,000)	$ (240,870,000)
Discounted Additional Investment	$ (680,522,347)	$ (340,261)	$ (2,722,089)	$ (17,013,059)	$ (51,039,176)	$ (95,273,129)	$ (129,299,246)	$ (163,325,363)	$ (221,510,024)
R&D + CAPEX	$ (1,620,000,000.00)								
Total investment	$ (2,300,522,347)								
Net Present Value	$ 46,256,714								

Conclusion after taking both Negative and Positive scenario into consideration:

•The grocery retailing market is risky for the company due to the following elements:

•The market has a small average net profit

•Difficulties to switch costs from a traditional grocery retail benchmark

•Sensitivity of the project regarding the discount

•The obligation of the company to open 2.000 stores within 7 years

•Therefore, Amazon needs for an Alterative Financial Stream to reduce the financial risk

c) Alternative Financial Stream

•Amazon should sell the technology to other retail stores

• Market size of 38,441 groceries stores in the US worth $50 billion according to Loup Ventures

• With 5% of shares, Amazon can make an annual sales of $240 Million and an annual profit of $60M

•This will reduce the financial risk of the actual corporate strategy of Amazon

➢ *Technical Considerations*

• Hold two patents to protect their innovations & licensing possibility

• Error rate of technology, missed items, lost sales

• Competing technology being developed by Microsoft, Wal-Mart, Costco, Alibaba

• Technology creates “exclusive” access environment

• Customer information could be used to enhance experience on other platforms

➢ *Operational Considerations*

• Savings from less staff, allows focus on merchandising & customer services

• Continuing fresh product creation on site verses centralizing production

• Partnering Whole Foods to take advantage of systems and expertise

• Stocking Amazon Go with items produced or stocked by Whole Foods

• Customers purchasing age restricted products

➢ *Economic Considerations*

• Technology and operations costs verses revenue generated by store

• Estimating 900k per store in annual sales • Choosing high volume locations with appeal to key demographics

• Retail network role out cost verses licencing technology to others • Competing against retailers already operating in retail store space

• Retail Industry profit margin of 1-2%

X. MARKET FIT ANALYSIS

A. *Income Statement*

Countries	Market Fit (1-3)	Lifestyle	Value per Store (Higher = customers likely to spend more)
Canada	3	Likes physical store more than online retail experience	0.53
UK	3	Young generation shop weekly at grocery stores	0.88
Japan	3	Fast-paced, usually shop at convenient stores	1.30
China	3	Fast-paced lifestyle, highly value convenience, use product from local giants	0.12
India	1	Prefer local mom and pop shops and street food	0.71
Germany	2	German pay less on their food than other Europen countries, likes to eat homecooked food, tech-savvy	0.84
Spain	2	Likes small independent shops more, health conscious, growth in online retail	0.84
Italy	2	Likes delivery, like local stores more then chains	0.82
Brazil	3	Fast-paced lifestyle, often live alone	0.25
Australia	3	Time-pressed, want convenience	0.36
France	2	95% prefer physical stores	0.94

Periods	2019	2020	2021	2022
Income Statement				
Revenue from operation	-	1,862,812	7,746,702	17,330,440
Profit sharing	-	11,177	277,145	766,948
Net Revenue	-	**1,851,636**	**7,469,558**	**16,563,492**
Cost of good sold	-	1,456,311	5,874,807	13,027,187
Gross Profit	-	**395,324**	**1,594,751**	**3,536,306**
Sale and Marketing expense	96,000	111,000	126,000	141,000
Selling and administrative expense	-	81,900	313,560	797,160
Rental expense	-	57,900	144,600	293,800
Utilities expense	-	22,964	110,565	302,778
Operating Income	**96,000**	**121,561**	**900,026**	**2,001,568**
Financing cost	-	19,495	41,379	80,704
Earning before tax	**96,000**	**102,066**	**858,647**	**1,920,864**
Tax expense (income)	20,160	25,528	189,005	420,329
Net profit (loss)	**75,840**	**76,538**	**669,641**	**1,500,535**
Finance Costs	17.0%	17.0%	17.0%	17.0%
Tax Rate	21.0%	21.0%	21.0%	21.0%
Depreciation	-	295,162	1,227,461	2,745,999
EBITDA	96,000	416,722	2,127,487	4,747,567

Earnings before interest, taxes, depreciation, and amortization
Is low in 2021 but at the end of 2022 it is high.[16]

B. Expenses Statement

Periods	2016	2017	2018	2019	2020	2021	2022
Expense summary							
Train station store CAPEX				-	2,863,500	2,863,500	3,818,000
% of total CAPEX				0%	100%	47%	32%
Office store CAPEX				-	-	3,214,500	8,036,250
% of total CAPEX				0%	0%	53%	68%
CAPEX				-	**2,863,500.00**	**6,078,000.00**	**11,854,250.00**
% of total expense				0%	91%	90%	89%
Rental expense				-	57,900	144,600	293,800
% of total OPEX				0%	21%	21%	19%
Sale and Marketing expense				96,000	111,000	126,000	141,000
% of total OPEX				100%	41%	18%	9%
Selling and administrative expense				-	81,900	313,560	797,160
% of total OPEX				0%	30%	45%	52%
Utilities expense				-	22,963.50	110,565.00	302,778.00
% of total OPEX				0%	8%	16%	20%
OPEX				**96,000.00**	**273,763.50**	**694,725.00**	**1,534,738.00**
% of total expense				100%	9%	10%	11%
Total expense				***96,000.00***	***3,137,263.50***	***6,772,725.00***	***13,388,988.00***

C. Revenue Statement

Periods	2016	2017	2018	2019	2020	2021	2022
Revenue summary							
Tokyo train station store revenue				-	1,862,812	4,568,182	8,321,851
%					100%	91%	87%
Revenue from Tokyo Station				-	1,186,182	1,645,472	2,139,936
Revenue from Shimbashi Station				-	565,528	1,008,643	1,311,741
Revenue from Yurakucho Station				-	111,102	693,546	901,956
Revenue from other Tokyo train station				-	-	1,220,521	3,968,218
Osaka train station store revenue				-	-	464,820	1,208,997
%					0%	9%	13%
Revenue from other Osaka train station				-	-	464,820	1,208,997
Total train station store revenue				-	***1,862,812.50***	***5,033,001.72***	***9,530,847.55***
%					100%	65%	55%
Tokyo Office store revenue				-	-	2,713,701	7,494,292
%						100%	96%
Osaka Office store revenue				-	-	-	305,301
%						0%	4%
Total office store revenue				-	-	***2,713,700.71***	***7,799,592.09***
%					0%	35%	45%
Total revenue				-	***1,862,812.50***	***7,746,702.43***	***17,330,440.04***
# of store				-	3	8	17
Revenue per store				-	620,937.50	968,337.80	1,019,437.65

D. Partnership Profit Sharing

Periods	2016	2017	2018	2019	2020	2021	2022
Partnership Profit Sharing							
Partnership Profit Sharing for Subway Station							
Total sales from train station				-	1,862,812	5,033,002	9,530,848
proportion of subway card payment				30%	30%	30%	30%
Sale of subway card in subway station				-	558,844	1,509,901	2,859,254
% of revenue sharing for subway card partner				2%	2%	2%	2%
Subway store partnership revenue sharing				-	**11,177**	**30,198**	**57,185**
Partnership Profit Sharing for Subway Station							
Total sales from office store				-	-	2,713,701	7,799,592
average proportion of restaurant partner food sale				30%	30%	30%	30%
Sale of restaurant partner food				-	-	814,110	2,339,878
% of revenue sharing for restaurant partner				30%	30%	30%	30%
Office store revenue sharing for restaurant partner				-	-	**244,233**	**701,963**
Total sales from office store				-	-	2,713,701	7,799,592
proportion of subway card payment				5%	5%	5%	5%
Sale of subway card in office store				-	-	135,685	389,980
% of revenue sharing for subway card partner				2%	2%	2%	2%
Office store revenue sharing for subway card partner				-	-	**2,714**	**7,800**
Office store partnership revenue sharing				-	-	**246,947**	**709,763**
Total partnership revenue sharing				-	**11,177**	**277,145**	**766,948**
Total revenue				-	1,862,812.50	7,746,702.43	17,330,440.04
% of revenue					1%	4%	4%

Partnership profit sharing ratio of both the Subway stores partnership revenue sharing and office stores partnership revenue sharing ratio is same in 2021 and 2022 which is 4%.
It shows constant flow of revenue for contribution in partnership profit sharing

E. Consolidated Statement

Periods	2016	2017	2018	2019	2020	2021	2022
Executive summary							
Revenue							
Total train station store revenue				-	1,862,812	5,033,002	9,530,848
% of total revenue					100%	65%	55%
Total office store revenue				-	-	2,713,701	7,799,592
% of total revenue					-	35%	45%
Total revenue				-	**1,862,812.50**	**7,746,702.43**	**17,330,440.04**
Total partnership revenue sharing				-	11,177	277,145	766,948
% of total revenue					1%	4%	4%
Net revenue				-	**1,851,635.62**	**7,469,557.66**	**16,563,492.07**
Expense							
Train station store CAPEX				-	2,863,500	2,863,500	3,818,000
% of total CAPEX					100%	47%	32%
Office store CAPEX				-	-	3,214,500	8,036,250
% of CAPEX					-	53%	68%
CAPEX				-	2,863,500	6,078,000	11,854,250
% of total expense				0%	91%	90%	89%
Rental expense				-	57,900	144,600	293,800
% of total OPEX				-	21%	21%	19%
Sale and Marketing expense				96,000	111,000	126,000	141,000
% of total OPEX				100%	41%	18%	9%
Selling and administrative expense				-	81,500	313,560	797,160
% of total OPEX				-	30%	45%	52%
Utilities expense				-	22,964	110,565	302,778
% of total OPEX				-	8%	16%	20%
OPEX				96,000	273,764	694,725	1,534,738
% of total expense				100%	9%	10%	11%
Net expense				96,000	3,137,264	6,772,725	13,388,988

Consolidated statement shows hike in the net revenue in year 2022 as compared to 2021 with signifies good feasibility of the project.[16]

XI. CONCLUSION

In this paper, we examined convincing advertising and Vivid client experience dependent on different Internet of
Things innovations through a contextual investigation on brilliant stores and also about the financials of such giant companies affected by the introduction of new technology. Retail settings will change client practices through client experience enhancement from the advertising point of view. Also, different IoT Innovations like indoor positioning, increased reality, facial acknowledgement, and intelligent presentation make it conceivable to make arrangements and parts for brilliant store implementations from the registering point of view. Albeit this paper completely overviews the cutting edge advertising rehearses also specialized applications in the brilliant store, we trust that there ought to be a further commonsense and hypothetical exploration on a brilliant store to carry out it effectively in different circumstances.

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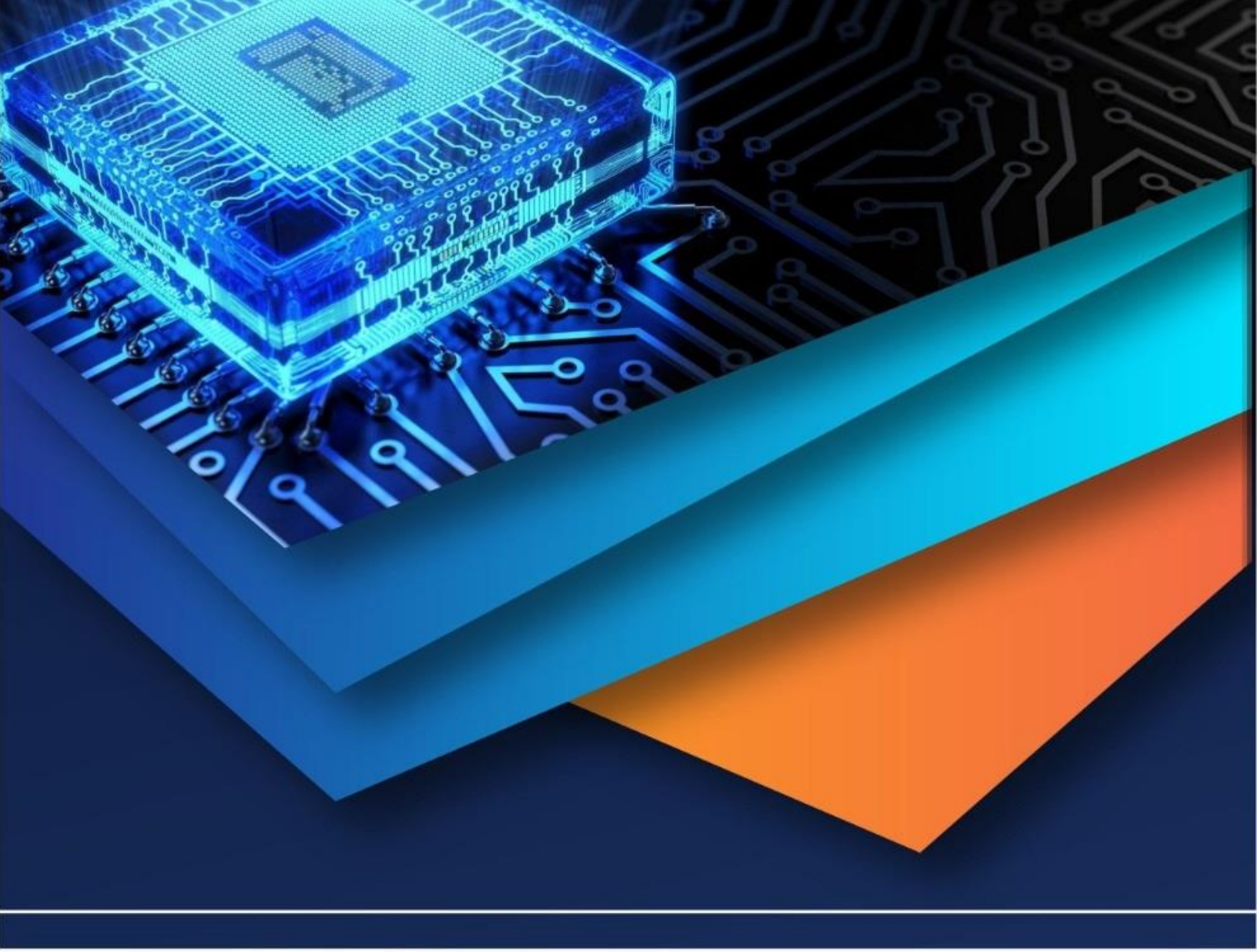

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