ROLE OF DISRUPTIVE TECHNOLOGY IN IMPROVING BUSINESS INTELLIGENCE AND DECISION MAKING: AN EMPIRICAL INVESTIGATION

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Abstract

Disruption doesn't always lead to chaos- this phrase can describe the idea behind disruptive technologies which quickly replace the antiquated way of doing something by radical transformation of the old. Increasing digitalisation is fundamentally altering the way business is conducted, disruptive technologies are becoming more and more a part of this. The amalgamation of such complexly detailed technologies (like social media, the internet of things- IoT, artificial intelligence-AI, machine learning among others) with established business models has led to their enhanced development and survival in the growing market. Keeping up with innovations and not shying away from 'disruption' is an imperative part of the decision-making process today. Existing commercial organisations should assiduously either adopt or adapt in order to keep their wheels going in this competition-led space. The present review aims to empirically investigate the role of disruptive technologies in improving business intelligence (BI) and decision making. The study had considered 189 people from different business sectors among which the survey was conducted to know the role and impact of disruptive technology in improving Business Intelligence and Decision Making. The study concludes that there is significant impact of disruptive technology on Business Intelligence and Decision Making.

Keywords: Disruptive technology, Business Intelligence, Decision making, Industry 4.0, Empirical study.

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1. Introduction

Disruptive innovations have been part of human life since time immemorial. As Majumdar et. al. (2018) put it, from Babylon's agricultural revolution to Lord Ram's cultivation tactics, disruptive practices introduced in the somewhat stagnant environment quickly takeover for good reasons- better efficiency, technology, or economy. It now believed that 'Industry 4.0' or the fourth industrial revolution also entails such advancements. Until 2008, most research on disruptive innovation was idealistic, however, the work of Schmidt and Druehl (2008) brought out the empirical nature of the same by analysis of diffusion rates from the lower to the upper end of the market. They also highlight the difference between sustainable (high-end encroachment pattern and downward diffusion in the market) and disruptive (low-end encroachment pattern and upward diffusion in the market). Thus, these two concepts are mirrored images of each other and one is often coupled with the other.

Such novelties are the up-and-coming trend to lookout for in business intelligence and decision making. Many a business have become outmoded by not following up with Clayton M. Christensen's theory of disruptive innovation. Take the company Nokia for example, an average customer today will seldom be found with one of their mobile phones in comparison to their large market-share almost two decades ago. The takeover by android phones can largely account for the company's collapse (King & Baatartogtokh, 2015).

BI is important for integrating data from different sources, for an eagle's eye view-point with attractive and understandable representation and for swift and straightforward analysis. This eventually eases the load of decision-making on strategy developers to come up with better operational tactics for efficient functioning of the system (Marshall & De la Harpe, 2009). The challenges facing this process can only be addressed as fast as possible by a new trend that not only provides a solution but also ensures its persistence in the long run. The compositive nature of the trend may be a simple aggregation of existing techniques or an entirely unique amelioration (Anchal et. al., 2022).

Literature Review

In an empirical study by Anchal et. al., (2022), they conveniently sampled 169 respondents from varying industrial sectors, age and gender. The respondents were presented with a questionnaire and mean calculation and t-test was carried out. The revealed that "Emerging disruptive technologies improves the capabilities of decision-makers in understanding external environment," among other significant statements. Thus, the unrealised power of a business cannot be discovered without its coalescence with modernised and contemporary technologies such as augmented and virtual reality, blockchain, robots, neural networks, and nanotechnology. However, as entrepreneurs, it is often difficult to look beyond the confinements of available data. Moreover, the hierarchical architecture of a company often necessitates that analysts and knowledge workers wait for IT department or report developers to generate report. To tackle this issue, Schlesinger and Rahman (2015) have proposed a self-reliant BI network wherein the IT department works in coalition with knowledge workers, thereby forming a unified and adaptable semantic layer which makes the comprehensive and meaningful metadata available directly to the BI users.

A large share of India's economy is dependent on agriculture-led enterprises and even this field incorporates the use of disruptive technologies (AgTech) as an immediate result of Industry 4.0. These include- biotechnology, data analytics, robotics and more to make agriculture more profitable, sustainable and productive. A decision-making model (DMM) with six blocks (Domain, two-fold Risk, Environment, Modelling, and Risk profile) and consequent execution steps has been presented by Popchev and Radeva (2020). The DMM aims to provide a theoretical framework as well as an action plan for known risk-management (labour market fluctuations, political and governmental policies, ecosystem and ethics, economic and social changes etc.) in AgTech. Taking the ever-growing healthcare sector as another example, the financial sector acknowledges the potential of blockchain to efficiently disrupt older business models by engendering new proceeds, improving process performance, and increasing operational risks. Blockchain can not only help maintain an impregnable permanent database of medical records safely locked in complex codes but also maintain patient privacy thereby enhancing customer experience. Furthermore, taking financial services into consideration, blockchain's major advantage is providing a secure, transparent and decentralised system in a relatively inexpensive setup (Reddy et. al., 2020). Similarly, the IoT has several applications in businesses like manufacturing and public utilities and any other industry where Big Data is involved- from smart monitoring in energy to fleet and asset tracking in automotives, from point-of-sale kiosks in retail to personal navigation or fitness monitors in consumerism, there isn't a single business sector that will remain untouched by disruptive advances like the internet of things and machine-to-machine (M2M) (Ebersold & Glass, 2015).

In such a scenario, the responsibility of driving the company forward by taking quick 'adopt or adapt' decisions as described earlier lies on the shoulders of the chief information officers (CIOs). These decisions should be based on the BIDC model (Business, IT, Digital, Core.) which highlights the

importance of having core IT systems separate from business unit IT to create a sustainable competitive advantage. The model will help encourage a faster, dominant decision based on better arguments and thoughts, leading to development of transformed initiatives that will help keep the company's boat afloat in a technologically driven world (Padayachee et. al., 2017). Taking decision making one step further to the global stage, Garrison et. al. provide up-and-coming examples of international disruptive fields such as Enterprise Resource Planning, (ERP- provides an explanation to the issue of ineffective global organizational operations resulting from disparate pockets of data, inadequately constructed business procedures, and incompatible and poorly integrated technology deployed across various regions of the world) Radio Frequency Identification that allows on-site scanning of consumer goods and Micro-electromechanical systems (MEMS merges computing capabilities with minuscule mechanical sub-devices such as sensors, valves, gears, actuators, and mirrors, all of which are incorporated within semiconductor chips. These have a wide range of applications from biomedical science to engineering.) Another emerging 'technology shock' in terms of international business is additive manufacturing (or AM), which encompasses a phrase that the common man might be more familiar with is '3D printing.' What started with paper and cardboard has now become potent enough to handle alloys like Inconel making it reach industries like aircraft engineering, security and defence, automobiles and fashion and jewellery among innumerable others. AM aims to economically de-globalise production and manufacturing of goods and open their geographical boundaries from China, Mexico and Eastern Europe to the entire world. This paradigm shift enables developing economies to matters under their control and be efficacious even with small-scale production leading to more customised and exclusive products. (Hannibal & Knight, 2018).

Now the question arises as to how does one build a disruptive model? According to Amshoff et. al. (2015), there are three different categories of pattern business models for disruptive technologies- the framework model, the prototypical model, and the solution pattern. Due to its recurring success and potential for generating novel offspring business models, Amshoff et al. elected to pursue the lattermost model for further research. They came to a conclusion that patterns help analyse the untapped markets in countless industries and on the other hand, commercial exploitation of disruptive technologies leads to establishment of fresh patterns. Remember that the 'new' may just be a previously untried, radical recombination of the existing pattern. Another model proposed by Da Silva et. al (2013) is focused on value context, creation and capture that strategizes income streams and resources to form an efficiently-spread value network. Although both the old business models and the disruptive ones focus on value proposition at their core, the latter also aims to incorporate low cost and profit margins, lower simpler and more convenient performance as well as open-source accessibility. A commonality between the aforementioned models is that they comprise of a cohesive set of decision variables in strategy, operation and finance. Such models deliver a differentiated value to the customer, thereby attracting them and leading to the whirlwind success of disruption (Schiavi & Behr, 2018).

Any of these services require government assistance in a way that forms a positive-feedback loop of frequent developments. They can also set standards, handle intellectual property rights and make both public and private sectors inter-operable to help proliferate an otherwise slightly vague field. This need of legislative tools and modern policymakers was highlighted by Ebersold & Glass (2015). The rolling out of government tools like demonetisation, uniform Goods and Service Tax and the more recent digitalisation by the Indian government is one such disruptive move that hasn't been attempted elsewhere in the world. These tactics have surely put India on the path to financial liberalisation in the global economic status (Majumdar et. al., 2018). For such national-level abet disruption that affects all individuals of a country, many ethical issues may arise which also need to be addressed by the Government 3.0 or e-government. Imagine a corporate failure that occurs because of the falters of AI, who is to be held accountable for it? The government who introduced these reforms or the CEOs who accepted them? How do you ensure privacy and inclusivity in the diverse AI applications in Big Data? Thus, it is the need of the hour to draft legislative statutes and frameworks that can control such implications (Ronzhyn & Wimmer, 2019). This opens the field of empirical research since most studies so far are conceptual in nature. Rigorous analysis is needed to fully harness the potential of disruptive business for its diffusion into all sects of the society (Hopp et. al., 2018).

Objective

1. To measure the role of disruptive technology in improving Business Intelligence and Decision Making.
2. To find the impact of disruptive technology on Business Intelligence and Decision Making.

2. Methodology

The study had considered 189 people from different business sectors among which the survey was conducted to know the role and impact of disruptive technology in improving Business Intelligence and Decision Making. The data of this study was

collected through "random sampling method." The data was analysed by "Explanatory Factor Analysis (EFA)" and "Multiple Regression Analysis (MRA)" tools to get the results.

Findings

Table below is sharing general details of the respondents. In total 189 people 59.8% are male and 40.2% are female. Among them 27.5% are below 34 years of age, 38.6% are between 34 and 41 years of age and rest 33.9%are above 41 years of age. 21.2% of the respondents are in media and entertainment business sector, 20.6% are in financial services, 27.5% are in retail, 19.0% are in telecommunication and rest 11.6% are in other business sectors.

General Details

Variables	Respondents	Percentage
Gender		
Male	113	59.8
Female	76	40.2
Total	**189**	**100**
Age (years)		
Below 34	52	27.5
34-41	73	38.6
Above 41	64	33.9
Total	**189**	**100**
Business sectors		
Media and Entertainment	40	21.2
Financial Services	39	20.6
Retail	52	27.5
Telecommunication	36	19.0
Others	22	11.6
Total	**189**	**100**

"Factor Analysis"

"KMO and Bartlett's Test"

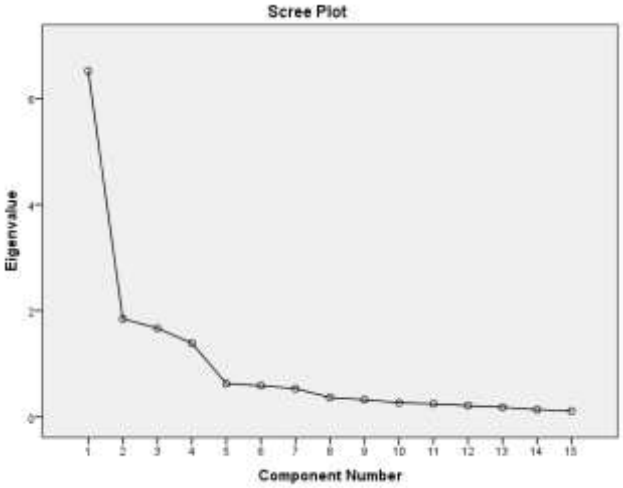
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.839
Bartlett's Test of Sphericity	Approx. Chi-Square	1940.834
	df	105
	Sig.	.000

In table above "KMO and Bartlett's Test" above, KMO value found is .839.

"Total Variance Explained"

"Component"	"Initial Eigenvalues"			"Rotation Sums of Squared Loadings"		
	"Total"	"% Of Variance"	Cumulative %	"Total"	"% Of Variance"	Cumulative %
1	6.519	43.459	43.459	3.222	**21.477**	21.477
2	1.847	12.311	55.770	2.978	**19.856**	41.332
3	1.668	11.122	66.891	2.954	**19.693**	61.026
4	1.389	9.257	76.149	2.268	**15.123**	**76.149**
5	.625	4.165	80.313			
6	.587	3.913	84.226			
7	.532	3.550	87.776			
8	.364	2.430	90.205			
9	.321	2.142	92.347			
10	.267	1.777	94.124			
11	.244	1.626	95.750			
12	.212	1.411	97.161			
13	.180	1.201	98.361			
14	.135	.903	99.264			
15	.110	.736	100.000			

All the 4 factors explain total 76% of the variance. The variance explained by first factor is 21.477% followed by the second Factor with 19.856%, third Factor having 19.693% and fourth factor explains 15.123% of variance.



Above is the Graphical presentation of the Eigen values obtained from the Total Variance Explained table.

Factors and Variables

S. No.	Statements	Factor Loading	Factor Reliability
	Create new market		.893
1.	Disruptive technology alters business for revolutionary changes	.862	
2.	Give rise to different ways of operating new business	.850	
3.	Help to change the business landscape to shape in new market	.830	
4.	Provides robust infrastructure to expand the business	.779	
	Business efficiency		.882
5.	Disruptive technology offers better features for new possibilities to bloom in new market	.891	
6.	Help to improve business performance by increasing their efficiency	.845	
7.	Disruptive technology automates the business using artificial intelligence	.805	
8.	Improves business communication and broaden customer reach	.680	
	Decision making ability		.863
9.	Disruptive technology improves the capabilities of decision-makers in understanding external environment	.831	
10.	Provides accurate data to ease the decision-making process	.815	
11.	Decisions become more reliable through disruptive technologies	.783	
12.	Disruptive technology makes better and time saving decisions with more efficiency	.748	
	Replace existing technology and system		.837
13.	Disruptive technology brings in new products and process	.892	
14.	Quickly replace the outdated way of doing something	.866	
15.	Replace human operation with machine programmed systems	.555	

Development of the factors

1st factor is named as Create new market which includes the variables like Disruptive technology alters business for revolutionary changes, give rise to different ways of operating new business, help to change the business landscape to shape in new market and provides robust infrastructure to expand the business. 2nd factor is Business efficiency and its associated variables are Disruptive technology offers better features for new possibilities to bloom in new market, help to improve business performance by increasing their efficiency, Disruptive technology automates the business using artificial intelligence and Improves business communication and broaden customer reach. 3rd factor is Decision making ability which includes the variables like Disruptive technology improves the capabilities of decision-makers in understanding

external environment, provides accurate data to ease the decision-making process, Decisions become more reliable through disruptive technologies and Disruptive technology makes better and time saving decisions with more efficiency. 4th factor is Replace existing technology and system which includes the variables like Disruptive technology brings in new products and process, quickly replace the outdated way of doing something and replace human operation with machine programmed systems.

"Reliability Statistics"

"Cronbach's Alpha"	"N of Items"
.905	15

Table above is showing the reliability which is 0.905 of all the 15 items that includes the variables related to role of disruptive technology in business intelligence and decision making.

MRA

"Model Summary"

"Model"	"R"	"R Square"	"Adjusted R Square"	"Std. Error of the Estimate"
1	.683[a]	.466	.455	.75257
a. Predictors: (Constant), Create new market, Business efficiency, Decision making ability and replace existing technology and system				

In Multiple Regression analysis, the value of Adjusted R square is 0.466 with 45% of the variation.

"ANOVA[a]"

"Model"		"Sum of Squares"	"df"	"Mean Square"	"F"	"Sig."
1	"Regression"	91.029	4	22.757	40.182	.000[b]
	Residual	104.209	184	.566		
	Total	195.238	188			
DV: Impact of disruptive technology on business intelligence and decision making						
b. Predictors: (Constant), Create new market, Business efficiency, Decision making ability and replace existing technology and system						

The table above that significance value is less than 0.05 which reflects that one or more of the IDVs significantly influences the DV."

"Coefficients[a]"

"Model"	"Unstandardized Coefficients"		"Standardized Coefficients"	"t"	"Sig."
	"B"	"Std. Error"	"Beta"		
(Constant)	3.397	.055		62.053	.000
Create new market	.637	.055	.625	11.599	.000
Business efficiency	.113	.055	.111	2.059	.041
Decision making ability	.222	.055	.218	4.053	.000
Replace existing technology and system	.129	.055	.127	2.350	.020
DV: Impact of disruptive technology on business intelligence and decision making					

Table above is showing that all the factors namely Create new market, Business efficiency, Decision making ability and replace existing technology and system are showing significant impact of disruptive technology on business intelligence and decision making. Highest impact is shown by Create new market with beta value 0.625 followed by Decision making ability (0.218), Business efficiency (0.111) and replace existing technology and system with beta value 0.127.

3. Conclusion

The process of creation is chaotic, disruption may lead to obsolescence of existing business trends however for good reasons only. Proliferating technologies like IoT, M2M, AI and blockchain

discussed in this review are being applied to business intelligence and decision-making at both local and global levels. One should not forget that BI impacts people from diverse sectors- healthcare, finances, manufacturing, retail and consumer products and research and development. Although this field faces grave challenges from government support to ELSI (ethical, legal and social issues), the explanatory and explorative potential of disruption can be tapped completely only with empirical work. In a fast-growing economy, both the choice and timing of disruption needs to be critically examined before commitment. Business-men and CTO alike have to quickly become adept in keeping up with the changing air to ensure that their company has competitive advantage and is the last one standing.

The study explored different role of disruptive technology in improving Business Intelligence and Decision Making and found that disruptive technology Create new market, Business efficiency, Decision making ability and replace existing technology and system where disruptive technology alters business for revolutionary changes, help to improve business performance by increasing their efficiency and improves the capabilities of decision-makers in understanding external environment. The study concludes that there is significant impact of disruptive technology on Business Intelligence and Decision Making.

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