A Study on Effectiveness of Big Data Analytics on Organizational Growth with reference to Manufacturing Sector

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Abstract

Big data describes data sets that are too big or complex for conventional data-processing application software to handle. While data with more fields have more statistical power, they may also have a higher false discovery rate than data with fewer fields. The objective of this research is to study the impact of big data analytics on organizational growth of manufacturing companies. The researchers have collected the data from 50 employees working in manufacturing companies in PCMC (Pimpri Chinchwad Muncipal Corporation), Maharashtra using survey method with the help of well-structured questionnaire. The researcher identified that descriptive research design and Non probability convenience sampling method is suitable for the research study. The findings of this study will be useful to many companies to design and modify their analytics strategies and policies.

Keywords: Big data analytics, organizational growth, Market share, Sales growth, Cost reduction etc.

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Introduction

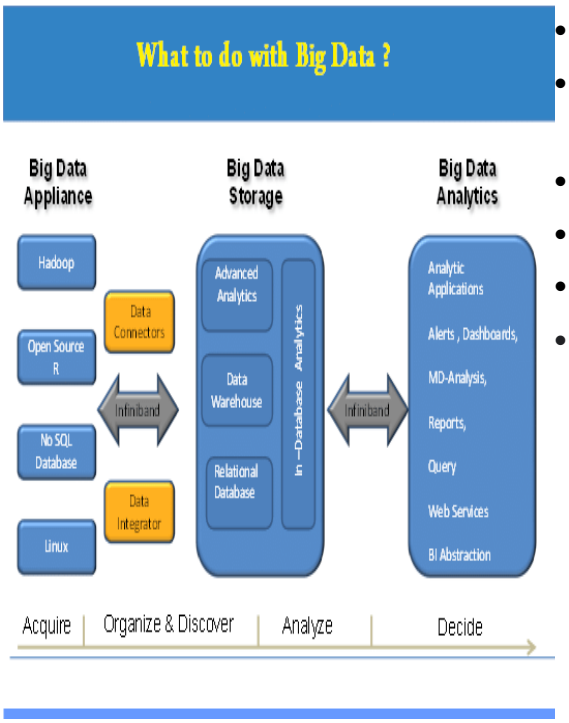
Big data is defined as data that is either impractical or impossible to process using conventional techniques because it is so huge, quick, or complex. Large-scale data access and storage for analytics has been practised for a very long time. Big data aims to accelerate the release of products to the market, cut down on the time and resources needed to reach target markets and audiences, and guarantee customer satisfaction. Organizations may harness their data and use big data analytics to find new opportunities. This results in wiser company decisions, more effective operations, greater profitability, and happier clients.

Evolution of Big data Analytics

Data warehousing, Relational Database Management (RDBMS), and the ensuing business intelligence (accepted by Howard Dresner, then at Gartner, in 1989) and data mining as the foundation for extract, transform,

and load (ETL) for analysis were all components of the initial wave of data analytics. Big data development can be separated into three stages: structured data that is saved and controlled by DBMS; non-structured web-based data; and data that originates from mobile devices and sensors. Big data analysis, processing, and storage techniques are required for big data to be valuable.

Concept of Big Data Analytics



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Big data solutions examine, gather, and keep track of a significant amount of structured and unstructured data that is produced from a range of sources, including production lines, product quality, factory floors, etc. Big data technology aids in the discovery of more recent trends and patterns and offers practical commercial insights.

An organization's final product can be made better with the use of manufacturing analytics. This is accomplished through a number of procedures, including data-driven product optimization, defect density level management, and trend analysis of consumer input and purchase patterns.

Benefits of Big Data in Manufacturing

- Faster Integration of Automation
- Predict Machine Failure & Reduce Downtime
- Enhance Product Quality and Cut Costs
- Improved Research
- Greater Customer Service
- Increased Competitiveness

Literature Review

For commercial value to be produced by using big data, the appropriate technological architecture, analytics, and tools are required, and these depend on the data scale, dispersion, diversity, and velocity (Russom, 2011). However, the three key characteristics of big data—data volume (size), data velocity (rate of data change), and variety (range of data formats and types as well as required types of data analysis)—are the easiest to define (Elgendy and Elragal, 2014; Schelén, Elragal, and Haddara, 2015; Chen and Guo, 2016; Elragal and Klischewski, 2017).

According to Yi et al(2014) .'s research, the network's necessary building blocks include an original data network, transmission bridges for connecting to data centres, and at least one data centre. Another study (H. Eszter, 2015) emphasised the difficulties in utilising big data in particular places and shown that consumers were unable to pick data through the data network. The biggest difficulty for storage models is how to handle the sheer volume of data, as ultra-scalable solutions can impede the processing of certain data sources, leading to inefficiency. It is difficult to create more scalable big data technology, and any new technology must provide data collection and dissemination among nodes dispersed throughout the world (Lv et al., 2017).

Appropriate data management and processing could expose new information and make it simpler to react promptly to new opportunities and issues (Chen et al., 2013). However, it appears that the growth of the many computer infrastructures already in place is exceeding the growth of data in the digital world. The massive amount of data must be analysed iteratively and quickly (Juki, Sharma, Nestorov, & Juki, 2015). Any new technology must provide data distribution and collection among nodes dispersed over the globe (Lv et al., 2017).

Research Methodology

Objectives of the study

- To study the scope and significance of big data analytics for manufacturing companies.
- To study the big data analytics tools and methods adopted by manufacturing companies.
- To study the effectiveness of big data analytics on organizational growth.

Hypothesis of the Study

H1: There is positive correlation between big data analytics and decision making activities of an organization.

H2: There is positive correlation between big data analytics and cost reduction of an organization.

H3: There is positive correlation between big data analytics and sales growth of an organization.

H4: There is positive correlation between big data analytics on market share of an organization.

H5: There is positive correlation between big data analytics on profitability of an organization.

Scope of the study

- The study is conducted across PCMC.
- The study is related to only manufacturing companies.

Following methodology was designed for the study to collect primary data.

a. Identify a sample of 50 employees working in manufacturing sector in

PCMC area, using convenience sampling.

b. Design and validate questionnaire

c. Seek responses on a 5-point frequency scale.

d. Conduct the survey

e. Summarize the responses

f. Analyze the results

Scheme formed for testing of hypotheses

a. Responses were collected under 2 sections

b. For each of the sections an average was calculated.

c. Percentages to questions under a particular section of the questionnaire were averaged to get a single score for that section,

d. P-values were calculated, and the null hypotheses were checked for rejection or non-rejection.

Reliability and Validity

The researcher has carried out reliability test using SPSS. The Cronbach's Alpha identified is 0.790, and it is more than 0.700, that's why the Questionnaire is measured to be reliable. The researcher has used face validity and content validity and confirmed that this research tool is valid for the study.

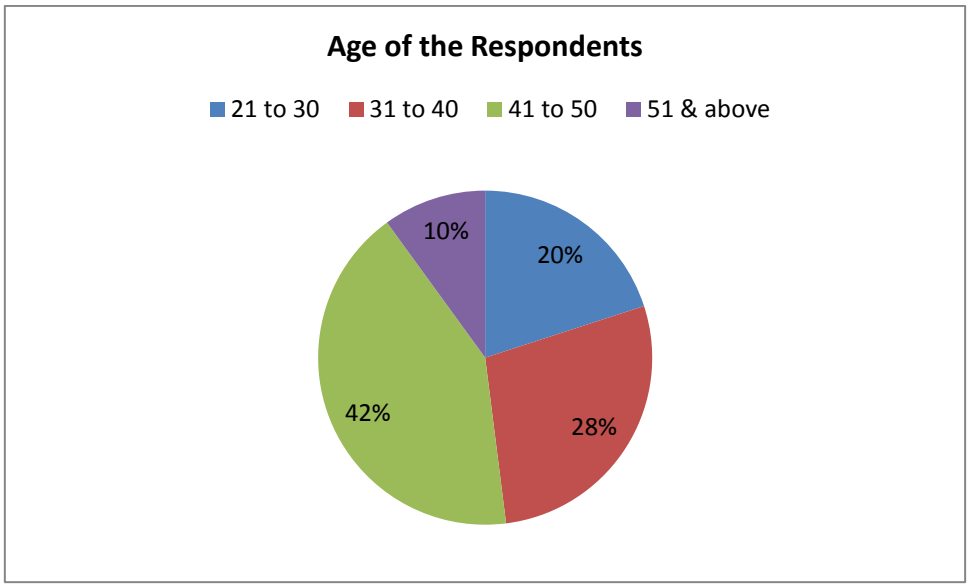
Research design

Type of Research Design	Descriptive Research Design
Sampling Technique	Non-Probability Convenience Sampling
Sampling Area	PCMC
Sample Size	50 employees
Primary Data	Well-structured questionnaire
Secondary Data	Research papers, Articles, Books, Journals etc.
Data Analysis tools	IBM SPSS-20 and Ms Excel-2010

Data Analysis

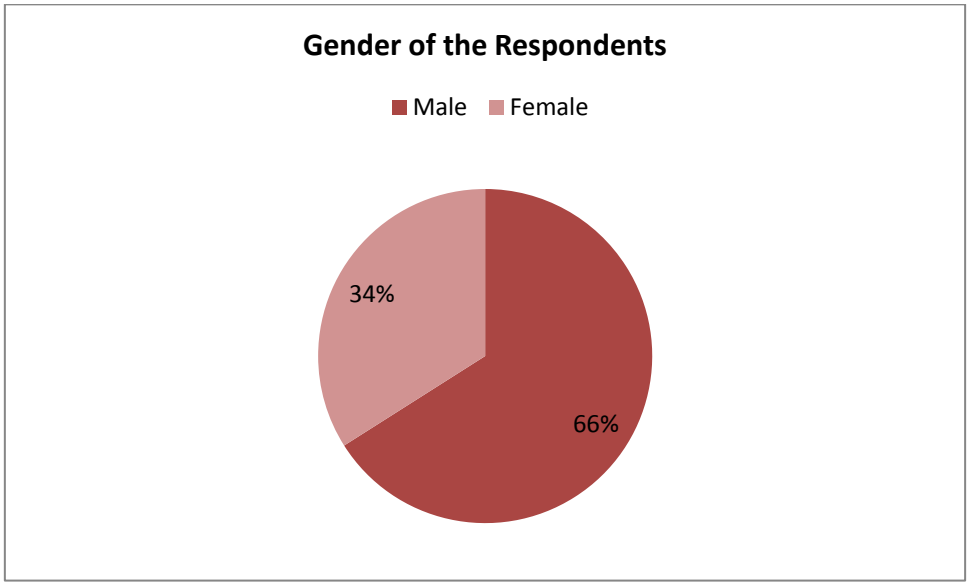
Age of the Respondents

Age	Frequency	Percentage
21 to 30	10	20
31 to 40	14	28
41 to 50	21	42
51 & above	5	10
Total	50	100



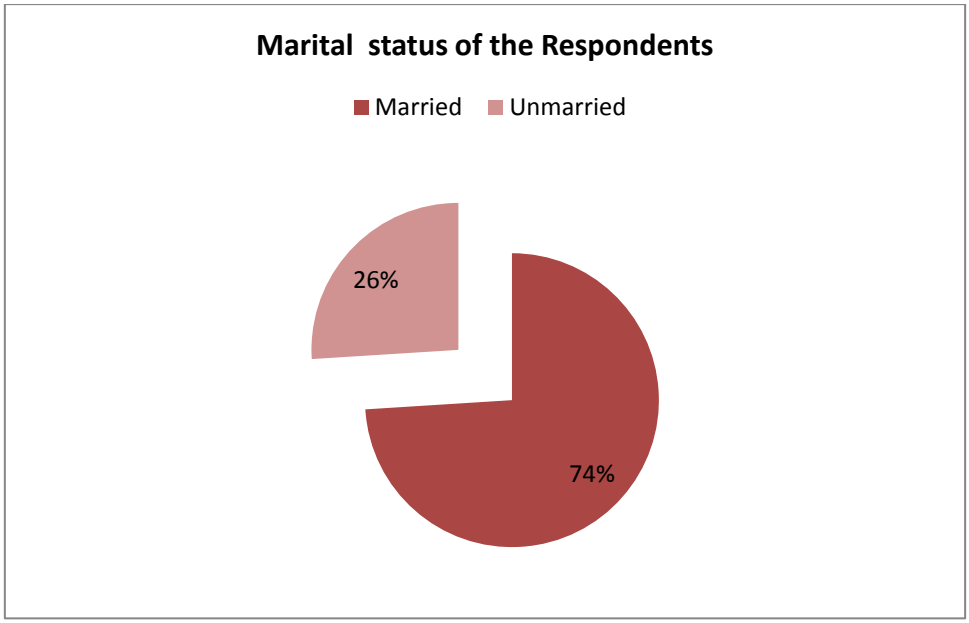
Gender of the Respondents

Gender	Frequency	Percentage
Male	33	66
Female	17	34
Total	50	100



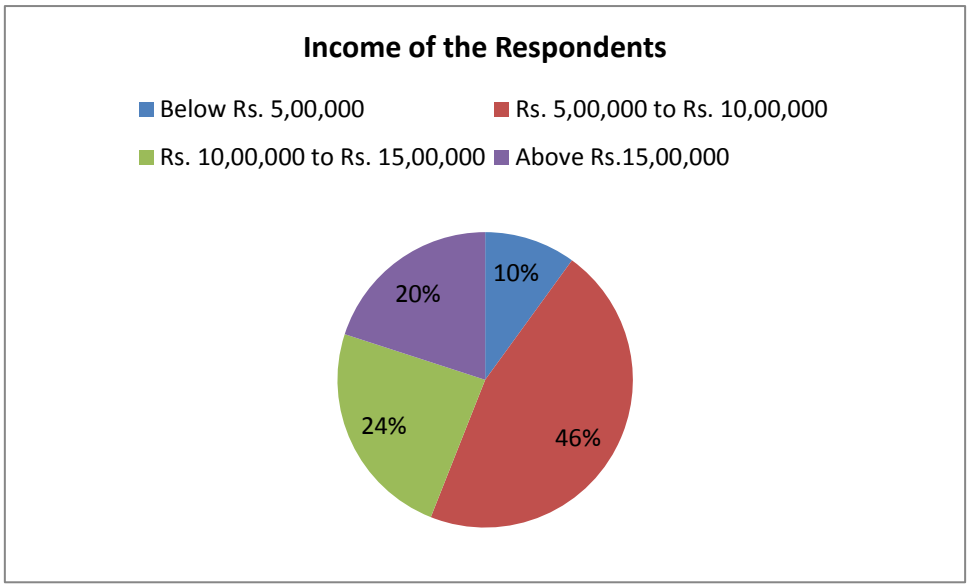
Marital status of the Respondents

Marital Status	Frequency	Percentage
Married	37	74
Unmarried	13	26
Total	50	100



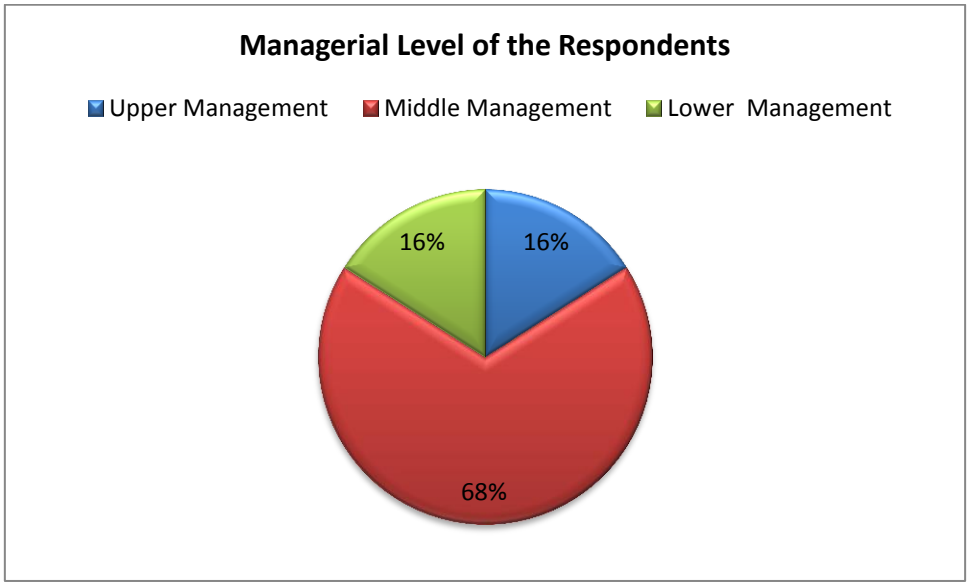
Income level of the Respondents

INCOME	Frequency	Percentage
Below Rs. 5,00,000	5	10
Rs. 5,00,000 to Rs. 10,00,000	23	46
Rs. 10,00,000 to Rs. 15,00,000	12	24
Above Rs.15,00,000	10	20
Total	50	100



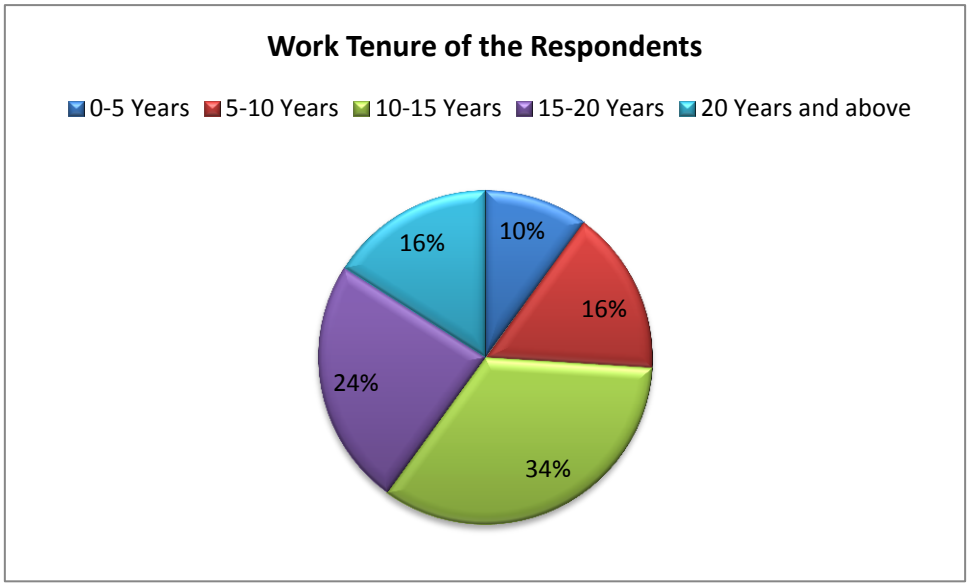
Managerial level of the Respondents

Managerial Level	Frequency	Percentage
Upper Management	8	16
Middle Management	34	68
Lower Management	8	16
Total	50	100



Work tenure of the Respondents

Work Tenure	Frequency	Percentage
0-5 Years	5	10
5-10 Years	8	16
10-15 Years	17	34
15-20 Years	12	24
20 Years and above	8	16
Total	50	100



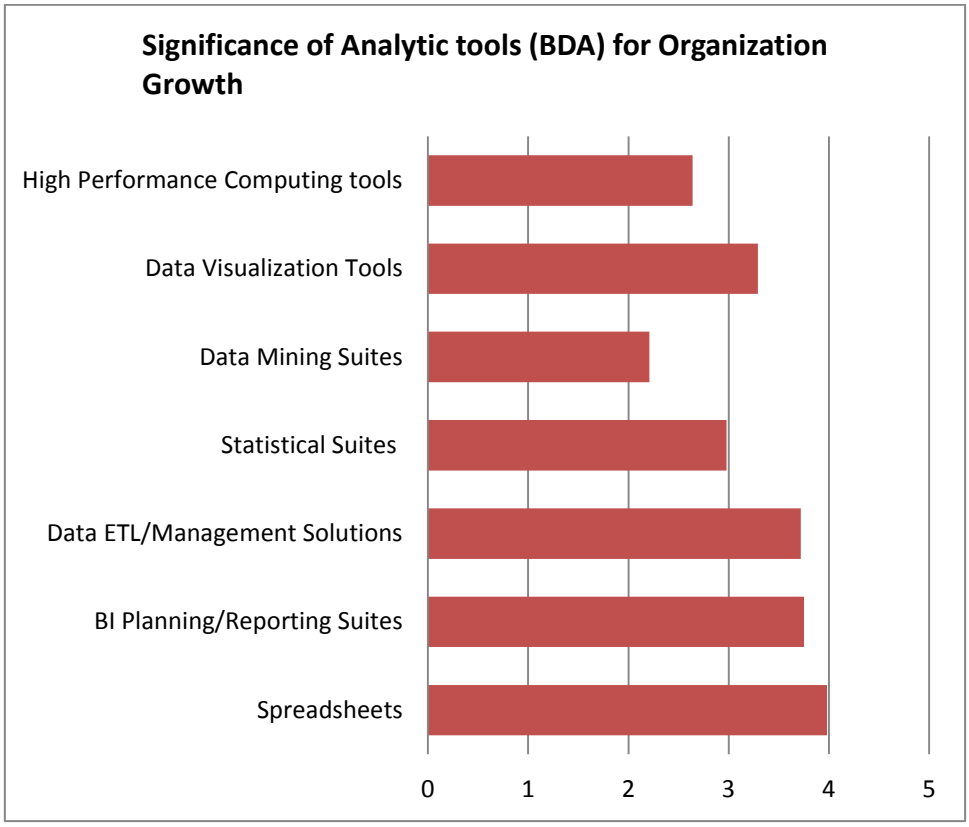
Measurement tool - 5 Point rating scale

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Rating	1	2	3	4	5

Importance of Analytic tools (BDA) for Organizations

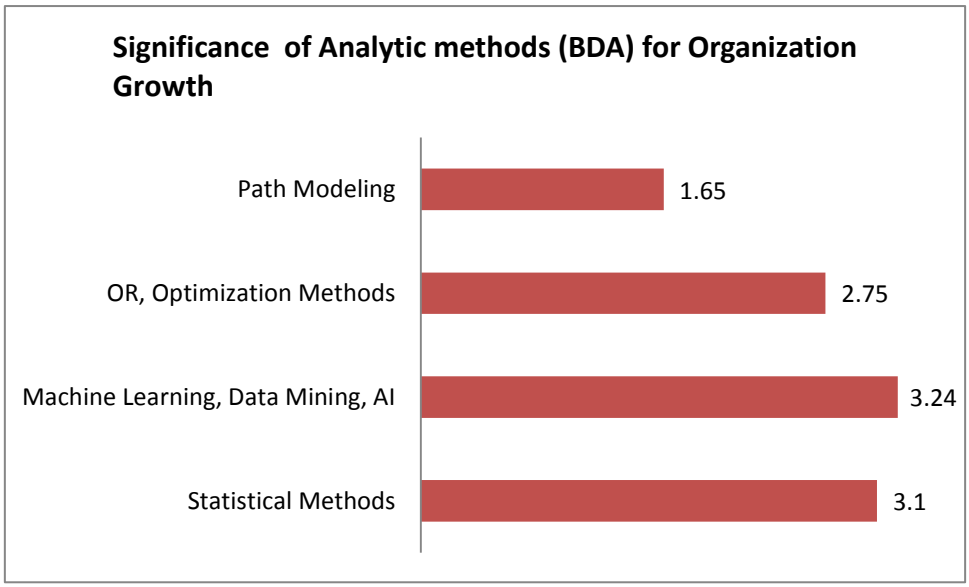
Analytic Tools (BDA)	**Mean**
Spreadsheets	3.98
BI Planning/Reporting Suites	3.75
Data ETL/Management Solutions	3.72
Statistical Suites	2.98
Data Mining Suites	2.21

Data Visualization Tools	3.29
High Performance Computing tools	2.64



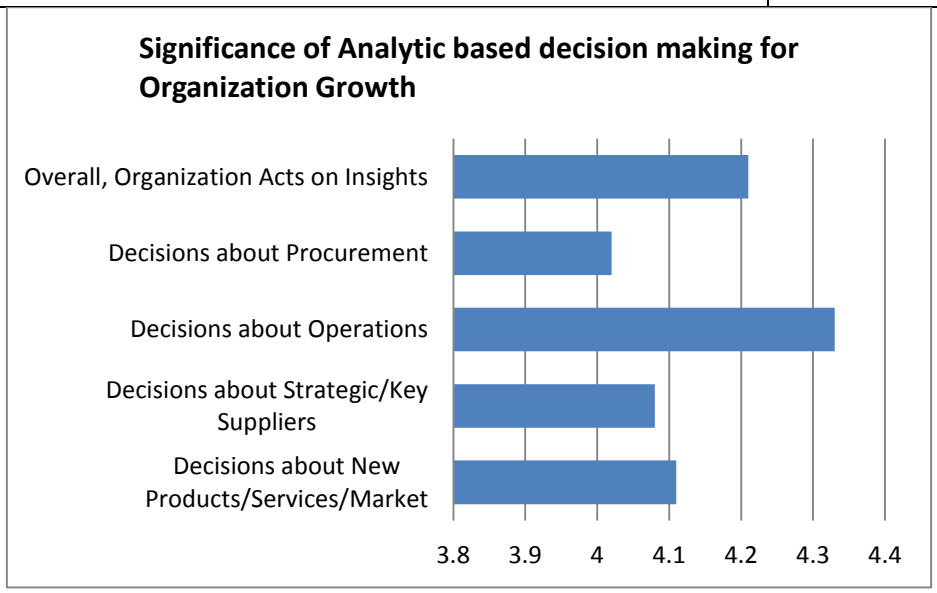
Importance of Analytic methods (BDA) for Organizations

Analytic Methods (BDA)	**Mean**
Statistical Methods	3.1
Machine Learning, Data Mining, AI	3.24
OR, Optimization Methods	2.75
Path Modeling	1.65



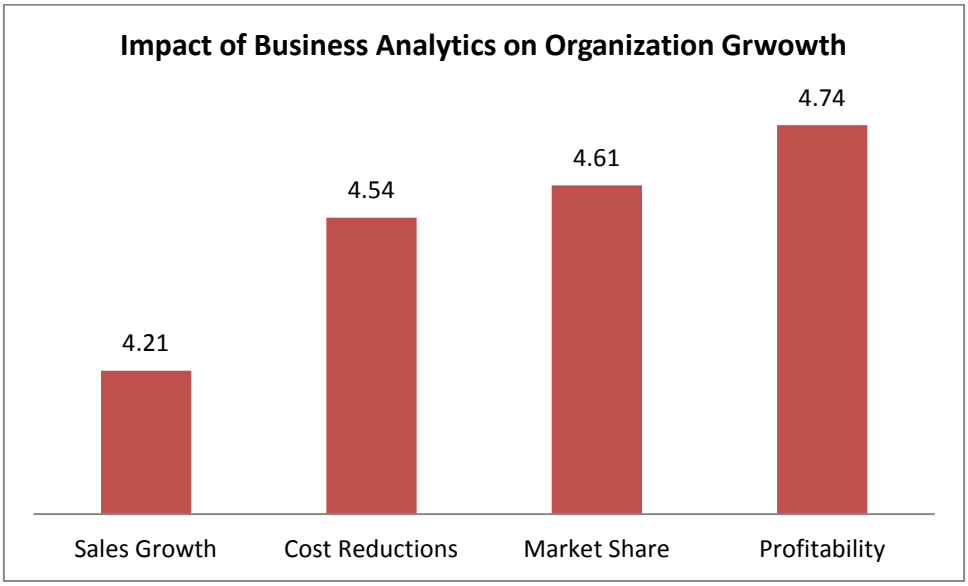
Importance of Analytic based decision making for Organizations

Analytic-Based Decision-Making	Mean
Decisions about New Products/Services/Market	4.11
Decisions about Strategic/Key Suppliers	4.08
Decisions about Operations	4.33
Decisions about Procurement	4.02
Overall, Organization Acts on Insights	4.21



Impact of Business Analytics on Organization Performance

Performance	Mean
Sales Growth	4.21
Cost Reductions	4.54
Market Share	4.61
Profitability	4.74



Hypothesis Testing

		BDA in Organization	BDA in Decision making	BDA in Cost reduction	BDA in Sales growth	BDA in Market share	BDA in Profitability
BDA in Organization	Pearson Correlation	1	0.168	0.136	0.128	0.129	0.119
	Sig. (2 tailed)		0.002	0.001	0.001	0.00	0.001

From the above table we can say that all the hypothesis of this study H1, H2, H3, H4 and H5 are accepted as all the test results are significant. Big data analytics is positively correlated in decision making (r =0.168, p<0.02), Big data analytics is positively correlated in cost reduction (r = 0.136, p<0.01), Big data analytics is positively correlated to sales growth (r=0.128,

p,0.01), Big data analytics is positively correlated to market share (r=0.129, p<0.01, Big data analytics is positively correlated to profitability (r=0.119, p<0.01).

Conclusion

According to the results of the current study, there is a significant correlation between big data analytics and the organization growth. This research study will be useful to the industrial sector in developing new big data analytics and organizational growth strategies. Academicians will find this research study useful in developing theoretical frameworks for big data analytics and related tools. The principles of big data analytics, numerous tools and methodologies of big data analytics, decision-making, organizational effectiveness, etc. will be easier for students to understand after reading this research study. Additionally, there is need for research on issues like the future of big data analytics, the utility of big data analytics for different types of businesses, the significance of big data analytics for customers and employees, etc.

Bibliography

1) A. Bekker, "Big data in manufacturing: Use cases + Guide on how to start," https://www.scnsoft.com/blog/big-data-inmanufacturing-use-cases
2) "Challenges of the manufacturing industry, & big data analytics," August 2017, https://www.msrcosmos.com/blog/challengesof-the-manufacturing-industry-big-data-analytics/
3) R. Delgado, "Applications of big data in manufacturing," April 2016, https://www.automation.com/enus/articles/2016-1/applications-of-big-data-inmanufacturing
4) S. Khanna, Big Data In Manufacturing: A Practical Introductory Guide to Starting Your Big Data Journey. Kindle Edition,2017.
5) Meziane F, Vadera S, Kobbacy K, Proudlove N (2000) Intelligent systems in manufacturing: current developments and future prospects. Integr Manuf Syst 11(4):218–238
6) Vera-baquero A, Colomo-palacios R, Molloy O (2014) "Towards a process to guide Big data based decision support systems for business processes,". In: Conference on ENTERprise information systems towards, vol 00., p 2212
7) Plattner, H., Zeier, A.: In-Memory Data Management: An Inflection Point for

Enterprise Applications. Springer, Heidelberg (2011)

8) Russom, P.: Big Data Analytics. In: TDWI Best Practices Report, pp. 1–40 (2011)
9) Sanchez, D., Martin-Bautista, M.J., Blanco, I., Torre, C.: Text Knowledge Mining: An Alternative to Text Data Mining. In: IEEE International Conference on Data Mining Workshops, pp. 664–672 (2008)
10) Serrat, O.: Social Network Analysis. Knowledge Network Solutions 28, 1–4 (2009)
11) Shen, Z., Wei, J., Sundaresan, N., Ma, K.L.: Visual Analysis of Massive Web Session Data. In: Large Data Analysis and Visualization (LDAV), pp. 65–72 (2012)
12) Russom, P., 2011. Big data analytics, s.l.: TDWI best practices report, fourth quarter.
13) Germann F, et al. Do retailers beneft from deploying customer analytics? J Retail. 2014;90(4):587–93
14) Tsao, Y. C. (2017). Managing default risk under trade credit: Who should implement Big-Data analytics in supply chains? Transportation Research Part E: Logistics and Transportation Review, 106, 276–293. https://doi.org/10.1016/j.tre.2017.08.013
15) Verma, S., & Bhattacharyya, S. S. (2017). Perceived strategic value-based adoption of Big Data Analytics in emerging economy. Journal of Enterprise Information Management, 30(3), 354–382. https://doi.org/10.1108/JEIM-10-2015-0099
16) Chen. C. P. & Zhsns. C. Y. (2014). Dana-intensive applications, challenses. Techniques and technologies: A survey on Bis Data. Information Sciences. 275.314–347.
17) Ludwig. N. FeuemegeL. S. & Neumann D. (2015) Putting Big Data analvtics to work: Feature selection for forecasting electricrtv prices using the LAS SO and random forests. Journal of Decision Systems. 24(1). 19–36
18) Grandon, E., and Pearson , J.M., 2004. E-commerce adoption: perceptions of managers/owners of small and medium sized firms in Chile. Communications of the Association for Information System, 13(8), pp.81–102.
19) Hair, J.F., Christian M. R., and Marko S., 2011. PLS-SEM: Indeed a Silver Bullet. Journal of Marketing Theory and Practice, 19(2), pp. 139-151.
20) Davenport, T. H., & Harris, J. G. (2007). Competing on analytics: The new science of

eISSN 1303-5150

winning. Harvard Business Press

21) Gartner. (n.d.). Big Data, Retrieved June 5, 2019, from https://www.gartner.com/it-glossary/bigdata
22) Schelén, O., Elragal, A. and Haddara, M., 2015. A roadmap for big-data research and education., s.l.: Luleå tekniska universitet.
23) Eldawy, A. and Mokbel, M.F., 2015. Spatialhadoop: A mapreduce framework for spatial data. s.l., IEEE. Elgendy, N. and Elragal, A., 2014. Big data analytics: a literature review paper. s.l., Springer, cham, pp. 214-227.