Importance of Data Management in taking Financial Decision in an Organisation

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ABSTRACT

The aim of this research is to determine the data management human and technology resources. To discuss the importance of data management to take financial decisions for any company.

Amazon Development Centre is a unit of largest e-commerce giant "Amazon.com". The company basically is involved in providing services to the customer with the objective of Customer centricity for the businesses and has its operation in various countries worldwide like United Kingdom, China, India, Japan etc. The company for the measurement and management of its performance uses an integrated information system. Company use the integrated information system to take the necessary data which is required to be processed by Data Management Team which not only make the data presentable but the analysis shows a clear picture to help the leadership team to take any financial decision for enhancing business process for the company.

Data Management is basically managing these data and to create reports. Management, support operations and decision-making are the basic and fundamental aim of information system There are many challenges that have come up due to improper integration of data which had made it difficult to manage various reports and the further processing of the salaries of the worker which are involved in the ongoing project.

Thus, it can be concluded from the problems that an organisation requires a proper data management information system and a team to carry out the necessary requirement. The outcome of which could be faster and improved process for managing of data.

Keywords. Data, Data Management, Data Set, Information, Reports, Decision - Making

1.Introduction

Now a days the importance of data is increasing in the functioning of an organisation which has further pose challenge over the organisation to manage the numerous raw data and to process the same which gave rise to the importance of data management in an organisation.

Data has always been considered the most important by product of any process being carried out by an organization. The way business function in today's time is quite different. Many new business initiatives have realized the value of data which has helped them in reporting as well as analytical working. There are few companies that have shifted their working approach to sharing, capturing and managing data sets. But along with the organization needs to create strategies to deal with data for fulfilling this commitment they need to adjust to the dynamic technology and business norms along with the changing goals and objectives.

Data can be stated as a characteristic or information which are collected through the process of observation and are typically numerical in nature. In a more broad and technical aspect data is considered set of qualitative and quantitative variable about a certain object or person which produces a set of valuable information on processing whereas 'DATUM' Latin word i.e. singular form of data which means single item of value in a data.

Data is basically a set of raw information which is created, collected observed and processed with the aim of further analysis, interpretation and validation to arrive at better research results giving rise to the need of data management. Data Management has led to provide efficient use of storage and resources which has reduced the computation and analysis time of data leading to better decision making in an organisation.

In case any business organization operate without have a proper strategy to handle data it could pose major challenges in the organization because each individual activity happening in the organization access to some different data which could sometime create the problem of duplication of efforts and cost in case if it's not effectively coordinated. Therefore, there should be an effective strategy to collaborate, communicate and share data practices across the organization.

Data management has played a magnificent role for the organisation in order to generate sufficient revenue, controlling the cost incurred and to anticipate and take measure to mitigate risks. Data management has eased the process of storing, protecting, sharing and retrieving data which provides an organisation with a competitive advantage to deal with the dynamic business environment. Managing and dealing with the results of customer data has led to improvement in customer relationships, which helps in increasing the revenues. i.e. if an organisation has a data management base and a policy guiding the same could help the organisation reduce their cost as well as the risk. The need for data management has arrived due to the growing digital data available in an organisation replacing the pen paper documentation work. Organisation functioning without a data management base could face a lot of struggle of losing the data it can be either due to hardware failure, software obsolescence or improper storing of information.

It includes all the process of planning of data, handling data, analysis of data, documentation of data and storage of data. It helps in creating a reliable database containing all the important confidential information of the organisation.

According to the Data Management Association, they have defined data management as *"Data management is the development, execution and supervision of plans, policies, programs and practices that control, protect, deliver and enhance the value of data and information assets."*

1.1 Importance of Data Management

1. Increased Transparency and Accountability:

Data management has increased the transparency and accountability of data which is handled by a dedicated data management team who is held accountable for management of data across the organisation. Data management base has led to taking of decision in an organisation in an effective and efficient manner. It has helped an organisation to maintain a record keeping of all data making the organisation accountable in accessing and managing its data. Data Management has ensured transparency in the organisation by prioritizing each and every information that may affect the overall objective of an organisation.

2. Drive for Continuous Improvement

Data management has led to data driven decision making in an organisation which help them to anticipate the dynamic changes that's affecting the organisation decision, to monitor the important and vital metrics and data that are important to the organisational functioning which helps in enhancing the performance of an organisation.

3. Providing Analytic Insight to business decision

Data management has played a vital role in an organisation in taking data-based decision which helps organisation to mine data in a manner that it provides useful insights. It helps the organisation in testing various strategies what could be useful for the organisation to stand out by fulfilling the organisational and customer need.

4. Minimization of Errors

The most effective and efficient data management helps in identifying the potential errors that are caused by some bad data and reducing the damages caused by it.

5. Protection of data from unexpected risk

Protection and security of data is a very crucial work for an organisation; data management plays a very vital role in ensuring that data is not lost and as well as protected inside in an organisation. It protects and secures the company and employee from various data breaches, data theft and data loss.

The three major example of success based on data driven decision making-:

1. **Google –** Google is one of the prominent examples of decision making based on data driven methods. The data scientist part of the Google company conducted a survey to determine the fact that is manager important or the functioning of the organisation. The data were collected from the subordinate and with the help of it the data analyst spotted the data on the graphs and it was found that the subordinates perceived

the importance of manager as satisfactory. Then they went further in the analysis by dividing the good and bad manager into two different strata and performed regression to arrive at a conclusion that manager is important or the functioning. To identify the top eight major qualities of a good manager it further went on to do its analysis by distinguishing managers who were exceptional in their performance. Data management and analysis team played a great role in filtering all the data it received rom its employee to arrive at a conclusion.

2. **Walmart-** In 2004, Walmart perform in the similar manner as google when it comes to the preparation of merchandise that is the emergency requirement during Hurricane. The executives analysed the data of the past purchase during an emergency situation and based on the past record present in the database to ascertain the essential commodities that they need to stock before hurricane.

3. **Southwest Airlines-** Airline industry is benefited to a large extended with the decision making that are based on data. The airline from its frequent customer created the data base to get an insight of the new services that they wish and want to avail. This also helped them in providing their customer with various benefits which diverse their customer base. The data driven decision making landed the airlines into profit t a great scale.

2.Literaure Review

Bellgard, M. ,2020 while working on research based on exemplar driven research data management states that its application is difficult in an organisation. The main reason behind this was the five 'Vs' for the research data which were generated are; its Variety, Volume, Veracity, Value and Velocity. These all need to be constantly considered. In every case, to determine the all possible combination of data V the best way for researcher was to manage it through archiving, addressing, security, compliance, sharing, privacy, reuse. For e.g., Institutions always confront with describing the practices, shaping the strategies and practices and refining the strategies and practice. The purpose behind this is to ensure the adequate and consistent research data management policies and its guidelines for the scholar & researcher. Researcher has emphasized on fair data principles and its importance for accepting open data opportunities. Researcher has concluded that data management practices needs to be established in a comprehensive and detailed way and not restricted. In addition, Information & Communication technology continuously changed and available for institutions and provided the choices to use local infrastructure / cloud - private or public infrastructure. As per researcher, if institutions adopted the mixture of traditional and technical infrastructure, it will enhance the analysis of any set of data. However, the research data management strategies must be continuously evaluated and amended as per requirement and advancement. The balance of primitive research methodology is the key to develop an institutional policy that is more relevant. On one side there is dynamically catering for the eclectic research data management and analytics needs of researchers and their interactions that are developing with the collaborators that are external to the organisation on the other side, it is necessary to frequently navigated. The important feature of this framework includes that it is a two-dimensional frame-

- The basic Standard Linear Approach for developing a research data management strategy, policies, guidelines, assessment of risk, option matrix and auditing are kept on one axis.

- The activities related to exemplar research where these activities are basically used to define the classes of research-oriented data management and analysis are kept on another axis.

ERDMAS (Exemplar-driven Research Data Management and Analysis Strategy) has made it possible to do a continuous and structured evaluation and comparison by highlighting the variation of difference the issues pertaining to the contemporary research data management. Thus, it could be said that ERDMAS is an approach that is proactive in nature and will all the institutional stakeholders as well as the research to increase the integrity of the research, the efficiency of the research, enabling collaboration among researcher and stakeholders and to make the research output more significant.

Faisal M., et.al., 2020 stated that effective management of data is a critical step to making data FAIR. The goal of this paper was to bring an overview of current state of the art of data management and data management planning solutions (DMP). The researcher started the paper discussing why data management is an important for supporting adoption and implementation of the FAIR principles, the background, context and historical development, as well as major driving forces, being research initiatives and funders. Then researcher discussed an overview of the current leading DMP tools in the form of a table presenting the key characteristics. Next, researcher provided insights on emerging common standards for DMPs, especially the topic of machine-actionable DMPs. To conclude, sound DMP is not only a precursor of FAIR data stewardship, but also an integral part of it, we discuss its positioning in the emerging FAIR tools Ecosystem. Capacity building and training activities are an important ingredient in the whole effort. Researcher finally discussed the relations of DMP to FAIR principles, as there are other important connections than just being a precursor. Ghasemaghaei M., et.al., 2018 has stated that a quantitative research (questionnaire) technique is adopted to investigate the non-functional requirements and users' understanding. During experimental analysis, we found that the selected ERP systems are unproductive to provide an appropriate knowledge for decision-making. Therefore, an acquisition of tacit knowledge would be required to improve the decision-support capabilities of ERP systems.

Enterprise resource planning (ERP) / information systems are maintained the business-process integration, which provides past records for decision-making. By integrating the information of different departments, the ERP systems are capable for real time management of internal indispensable data that can solve certain problems with an appropriate decision. The decision-making capabilities are necessary for managers to perk up the quality of fabrication, sales, forecasting and business development. This paper basically diverts the focus towards the experiences encountered by the corporate managers regarding the ERP system with the special focus on the financial module. To perform this research study which is basically empirical in nature involves a group of financial experts and financial managers that belong to the textile industry.

Hazen B., et.al., 2016 basically outline in the research paper that the major difference between Information System (IS) i.e. which is basically an organisational system which is used to collect process and store and dispense information in the organisation and Information Technology (IT) i.e. it refers to the use of computer system to store, retrieve and send information. There is a lack of satisfactory distinction between Information System (IS) and Information Technology (IT) which are on a usual basis interchangeably used by professionals which clearly

states that if there is lack of distinction between the two then it could adversely affect the various processes, activities and the structure in an organisational environment. This paper clearly provides a distinction between the two stating the Information System is a broader term whose one of the subsets is Information Technology.Jones, S., et.al., 2020 in his research paper has basically outlined how data analytics are using data management along with Business Intelligence which helps in generating significant information that ultimately assist the decision-making process in the organisation. This paper basically deals with Business Intelligence along with Big Data are together being used in an organisation due to the arising complexity which couldn't be resolved otherwise leading to diverse research trends. The findings in the paper states that the Management Information System (MIS) and Computer science are the major areas or we could say discipline that has ease the process of research and decision making which basically require Business Intelligence along with Big Data.

Liang T., et.al., 2018 in the research paper has basically examined how big data analytics have complimented business intelligence and have helped the organisation to deal with massive data set which involves complex decision making. This paper has basically presented how (BASOA) have helped the organisation in enhancing Business Intelligence and information system being used by the organisation. BASOA is basically a software design which provide services to other component i.e. business intelligence through a communication protocol over a network. These articles outline as what decision maker expect out of business intelligence in terms of the product, system and services of organisation.Matheus R., et.al., 2018 has stated that in recent times, some topics have generated discussion with analytics of big data. Researches on operation is considered the base on which the researcher has discussed the concept of mathematical methods and analytical methods. The researcher has pointed that there is a presence of misalignment between the work of the OR scholars and the needs and requirement of the manager that are in practice preferably in the area of supply chain management and operation management where decision making is based on data driven concepts. The researcher has evaluated both the application i.e. applied as well as the OR scholars work which are based on analytical techniques and tools of Big Data within the area of supply chain management and operation management to focus on its future scopes and potentials. This research paper basically highlights and suggest the scholars the most preferable solution that can be used to solve problems relating to big data analytics with reference to supply chain management and operation management.

Mukherjee, S. 2013, in his research paper has basically outlined the five multidimensional formative index enable the development and validation of the basic theory of Data Analytics Competency. The five multidimensional formative index mainly constitute-

- Quality of Data
- Analytical Skills
- Data Amount
- Knowledge of Domain
- Sophistication of Tools

And it deals with how it has impacted an organisation decision making process. in the paper the findings were gathered from 151 information and technology managers and the data management and analyst team which clearly stated that there is a significant and important relationship between the data analysis in an organisation and the

decision making based over it. The findings have proved that data analytics used by the organisation has help them in improving the quality of decision being taken. Moreover, all the dimensions except the massiveness of data that has caused the efficiency of decision to increase. The paper includes the various guideline that are used in today's time by any organisation to improve their existing decision-making performance.

Sanchez, E. 1989 in his research paper has outlined that decision making play a very crucial role in the working of the management of any organisation. With the growing technological advancement decision making has become a key responsibility of the organisation in which data management has played a really crucial role. All the organisation in their everyday working deals with a huge amount of data collected from varied sources. In today's scenario business intelligence tools i.e., it is the recent technologies which is used by the organisation to analyse various information of business, these tools are the most commonly used and the most important part of any business strategy. Organisation rely on business intelligence for better decision making which enables to advance the efforts needed to search, combine and query data to obtain information. This article basically deals with the technology trend that is followed by the organisation to effectively manage data in a manner that decision making process gets better. The researcher has discussed unsupervised and supervised machine learning techniques and the ways in which Artificial Neural Network (ANNs) are using supervised learnings to predict the consequences of decision making with the real-world trials.

Sun Z., et.al., 2016 has focused on the Dashboards and have envisaged that it is a consolidated set of data which is used for a particular purpose which makes it possible for the user of database to diagnose what is actually happening and to take up actions accordingly. Dashboards can most commonly be used by the government authorities to assist their decision-making process and to help them interact in a better manner with the public and also facilitate the process of policy making. The basic objective behind this paper is to get a clear understanding of dashboards and to focus on the functioning of the dashboards which ensures better accountability and transparency. In the paper the cases of two smart city have been investigated which reflects that dashboards have improved accountability and transparency but along with these benefits there are various challenges associated with it. The Challenges mainly include improper quality of data, absence of proper and complete understanding about the data, inappropriate analysis of data, uncertainties regarding the outcomes of data, incorrect interpretation of data and imposing of pre-built practices. These challenges have resulted in improper decision making and hence reducing transparency and accountability. The dashboard should contain feature supporting engagement of citizen, interpretation of data and institutional and governance arrangements

3.Research Objectives

The primary objective of the study caters to -:

To study and understand the importance of data management in taking financial decision in an organisation.

The secondary objective of the study caters to-:

- To study the concept of data management and the roles that it plays in an efficient working of an organisation.
- To study the benefits that are derived by an organisation through an effective data management.

- To study the application of data management by limiting the target area to a specific organisation i.e. Amazon Development Centre.
- To study the response of employee as well as the stakeholders of Amazon Development Centre in order to ascertain the importance of data management.

4. Research Design and Methodology

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Sample Size: 15 RESPONDENTS (5 Employee from Data Management Team and 10 Employee performing different job roles in the organisation)

Sample Unit: AGE GROUP BETWEEN 25-45 YEARS

Sampling Area: AMAZON DEVELOPMENT CENTER, NOIDA

Sampling Technique: STRATIFIED SAMPLING TECHNIQUE

i.e. The employee of the organisation was divided into two strata where the one group contained employee of different domain whereas the other strata contained employee that belonged to the data management team. Total number of 5 employee were selected from data management team that is the first strata and from 10 were the normal employee doing different job roles in the organisation to derive the conclusion on the basis of their response.

RESEARCH DESIGN:

The research study involves the use of survey method to gather data from the employee. A structured questionnaire has been designed and circulated in order to record the responses of the employee. The Research Design that is used is Exploratory Research Design which implies conducting a research in a manner that insights and conclusion could be derived through identifying a particular situation or problem. E.g.-: Identification of the importance and use of Data management in taking financial decision in Amazon Development Centre.
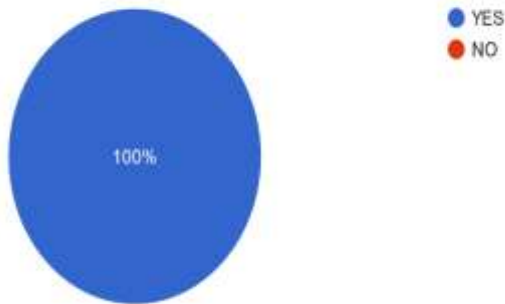
DATA COLLECTION:

Primary data has been gathered through the responses filled in the Questionnaire which was circulated to the employee of Amazon Development Centre.

Secondary data has been collected from the website of the company, www.google.com, and from the employee of the company i.e. in accordance with the norms of privacy of the company.

5.Data Anaysis and Prsentation

Q1.)

Does your organisation maintain any database for data collection?
5 responses

- YES
- NO

100%

According to the survey conducted with the Data Management Team, 100% i.e. each and every employee of the team says that organization maintain a database for effective collection of data. This implies that collection of data is important for an organisation.

Q2.)

Who is authorized to access the database?
5 responses

- Stakeholders of the organisation
- Employee of the organisation
- Data management team of the organisation
- Both A and B

100%
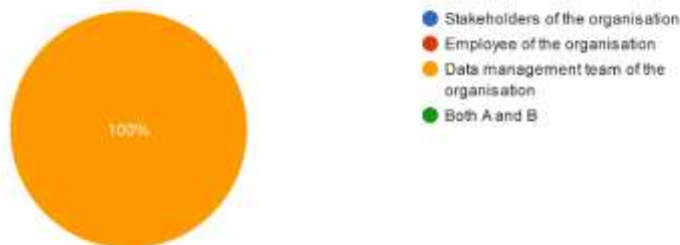
According to the survey conducted with the Data management Teams, the responses that was received states that only the employees of Data Management Team are authorize to access the data present in the database. This is to ensure the security of data for the organisation.

Q3.)

Which programming language are often used in your organization to handle the database?
5 responses
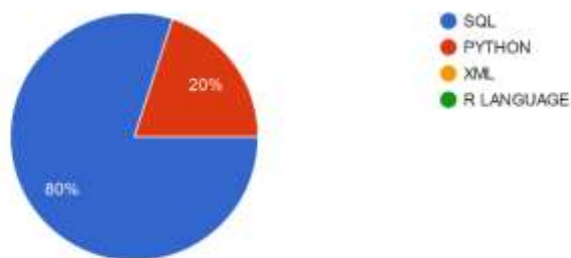
According with the survey conducted with the Data Management Team, 80% of the employee of the team believe that SQL is important programming language i.e. used by the organisation for managing the database whereas 20% of believe that Python is the preferred programming language.

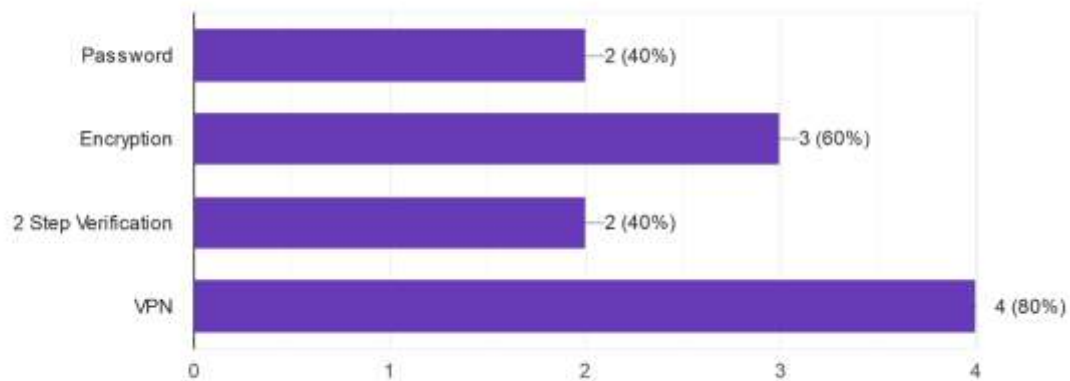Q4.)

Which tool is used for analyzing the data?
5 responses

According to the survey conducted with the Data Management team, 100% of the employee believe that MS EXCEL is the preferred tool for analysing the data.

Q5.)

How do you secure the data on your database?
5 responses

According to the survey conducted with the Data Management Team, 40% of the employee use password, encryption, 2-step verification and VPN in combination to protect the data. On the other hand, 20 % rely only on encryption and 20 % on VPN only.

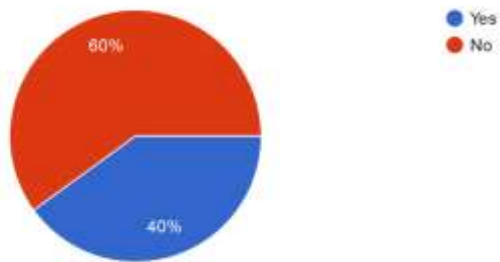Q6.)

How often do you backup the data?
5 responses
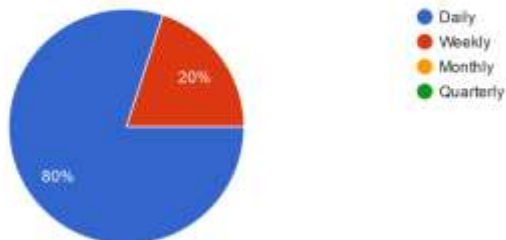
According to the survey conducted with the Data Management Team, 80% of the employee of the team backup their data on daily basis whereas 20% believes that it should be done on weekly basis.

Q7.)

Is raw data beneficial for the leadership team in taking financial decision in an organization?
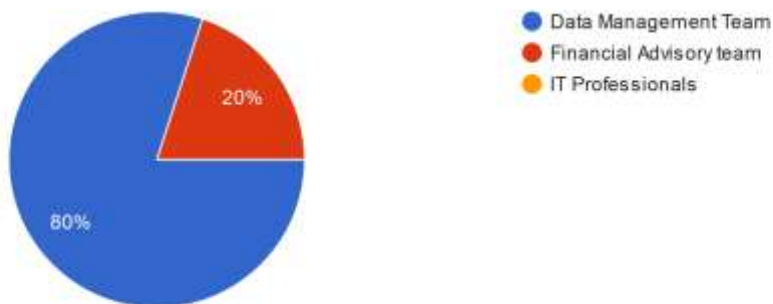
5 responses

According to the survey conducted with the Data Management Team, 60% of them believe that raw data is not required by the Leadership Team to take financial decision in the organisation it is required to be first processed by the Data Management team for taking further decision whereas 40% believe that raw data is useful in taking financial decision.

Q8.)

Which team is responsible for processing the raw data for the organization in order to take financial decision?
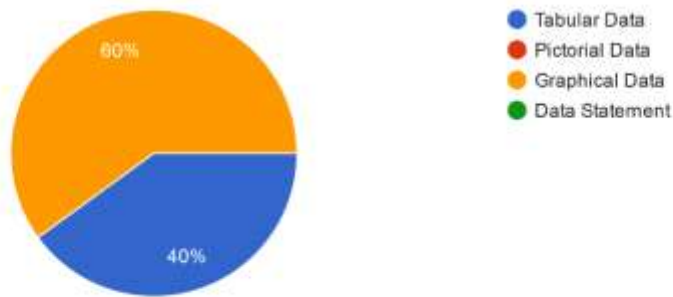
5 responses

According to the survey conducted with the Data Management Team 80% of the employee believe that Data Management Team is responsible for processing raw data whereas the rest 20% think that Financial Advisory Team is responsible for the same.

Q9.)

What is the favorable representation of data from leadership team?
5 responses

- Tabular Data
- Pictorial Data
- Graphical Data
- Data Statement

According to the survey conducted with the Data Management Team 60% of the employee believe that Graphical Data is the most favourable representation of data whereas 40% believe that Tabular Data is the most favourable form of representation to the leadership team.

Employee with Different Job Roles

Q1.)

Does your organisation have a data management team for managing data?
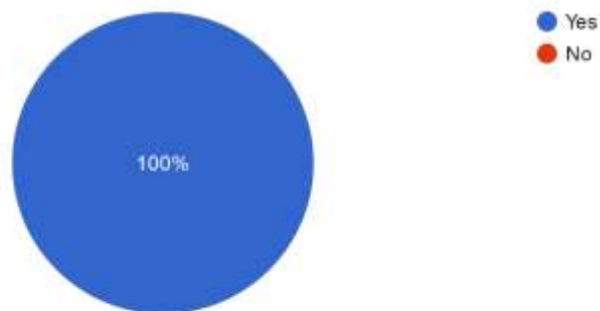10 responses

- Yes
- No
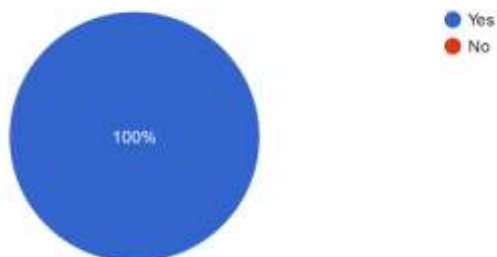
According to the survey conducted with the rest of the employee, 100% of the employee say that Amazon Development Centre has a data management team for managing data.

Q2.)

Do you publish/receive any weekly, monthly or quarterly business reports?
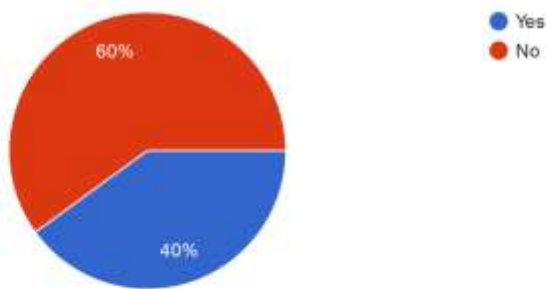10 responses

According to the survey conducted with the rest of the employee of the organisation, 100% of the employee believe that business reports are published on weekly, monthly and quarterly basis.

Q3.)

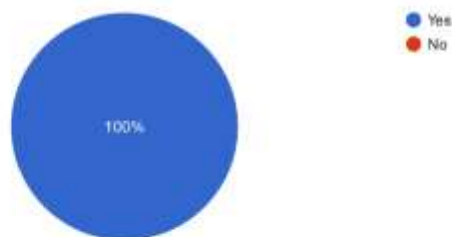Does your business report require the raw data from Data Management Team?
10 responses

According to the survey conducted with the rest of the employee of the organisation 60% believe that they don't require the raw data from the organisation but the processed data whereas the rest 40% require raw data for their business report.

Q4.)

Does the business get affected in case the Data Management Team doesn't provide data on time?
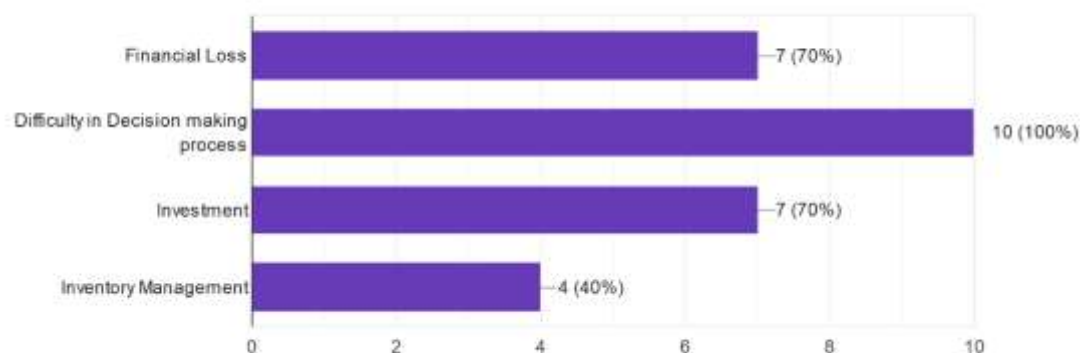
10 responses

According to the survey with the rest of the employee of the organisation, 100% of the employee says that the business gets adversely affected in case the Data Management Team doesn't provide data on time.

Q5.)

If Yes, kindly choose what would affect the business due to delay?

10 responses

According to the survey conducted with the rest of the employee of the organisation 100% believes that in case the data is not provided on time it would create issue in decision making process whereas 70% believe that it would lead to financial loss and investment issue and the rest 40% believe that it could affect the inventory management.

5. CONCLUSION

Thus, I would like to conclude that data play a really important and a very crucial role in the overall functioning of the organisation. According to the norms and the privacy act of the company it doesn't authorize its each and every employee to access the data present in its database because it could be a threat on the organisation secrecy.

Therefore, there is a dedicated Data Management team in the organisation who are basically authorise to access and manage data and to further process data so that it could be further used by the organisation in taking any financial business decision or to create any business reports. Data management is considered as a very important

task of the organisation because it enables the employee to get access to real time data which facilitate them to give more insightful decision.

Data management basically helps the organisation in identifying the areas of loopholes i.e. what is turning favourable for the organisation and what is basically unfavourable which ultimately help the management to implement the strategies which could turn out to be fruitful for the organisation.

After conducting a research survey on the importance of Data Management in Amazon Development Centre I came at the conclusion that Data Management is an investment for the organisation and in case the Data Management Team delays aren't able to send the data as per the deadline then it affects organisational financial position, decision making process, investment decision as well as inventory management decision.

Further I would like to sum up by saying that transparency and accountability could only be attend in the organisation if there is data-based decision management system. An organisation requires to analyse the trend of the past years before taking any financial decision otherwise it could put them at a great loss. So, each and every organisation who wants to adjust to the dynamic and competitive environment where each decision could adversely affect their existence in the market should have an effective decision-making practice that are data-driven.

7.RECOMMENDATION

Decision-making involves various steps like recognizing problems, creating substitutes, assessing replacements, selecting an alternate, executing the decision, and assessing decision efficiency, etc. Data Analysis is progressively taking a major role in decision-making today in every organization. Any successful innovation is vital for the organizational existence in high- technology service facilities. The probability of innovation achievement is associated with the methodical decrease of decision-making ambiguity, consequently of organizational evidence gathering, diffusion, and processing actions. Every organization depends on various decision-making tools and the goal cannot be achieved without the decision-making process. In conclusion, supervised learning ensures a function or pattern from the data can be realized while unsupervised learning aims at defining the hidden grouping or patterns in data from data which is unlabelled. The key difference between unsupervised and supervised learning is the use of data. In supervised learning, input data is well labelled and known while in unsupervised learning, finally, the use of analysed data is to predict results and take important financial decisions.

However, some more advanced language like Python is to be used and database like Big Data Systems can enhance the results and reduce the efforts. Also, backing up data is more important. And most importantly securing data will ensure trust in customers and stakeholders.

7.LIMITATION AND FUTURE SCOPE

1. The research was limited to AMAZON NOIDA. Researcher could have diverse the research area to global Amazon but due to the pandemic situation around the world the research area was limited.

2. The research paper could have been based on the comparison between various e commerce companies like Big basket, Flipkart, Snapdeal etc.

3.

The future of scope of this research work is that-:

1. Researcher could go further and enhance the research work by doing a research on database programming language

2. Research could be done on the data initiative taken by the different organization

3. Predictive research could be done on what strategies organization should follow to deal with the pandemic situation going around in order to gain competitive advantage in the market.

4. Research could be done further done on various security concerns considered by various e commerce company to effectively manage and process the data

REFERENCES

- Bellgard, M. (2020). ERDMAS: An exemplar-driven institutional research data management and analysis strategy. *International Journal of Information Management*, *50*, 337-340. https://doi.org/10.1016/j.ijinfomgt.2019.08.009

- Faisal, M., Shahbaz, M., Tariq, S., Ahmad, W., & Abbas, Q. (2020). Assessment of knowledge ability towards decision-making in information systems from managers perspective. *Software Engineering (Mysec)*, *4*(7), 1-4. https://doi.org/10.1109/MySEC.2011.6140717

- Ghasemaghaei, M., Ebrahimi, S., & Hassanein, K. (2018). Data analytics competency for improving firm decision making performance. *The Journal of Strategic Information Systems*, *27*(1), 101-113. https://doi.org/10.1016/j.jsis.2017.10.001

- Hazen, B., Skipper, J., Boone, C., & Hill, R. (2016). Back in business: operations research in support of big data analytics for operations and supply chain management. *Annals Of Operations Research*, *270*(1-2), 201-211. https://doi.org/10.1007/s10479-016-2226-0

- Jones, S., Pergl, R., Hooft, R., Miksa, T., Samors, R., & Ungvari, J. et al. (2020). Data Management Planning: How Requirements and Solutions are Beginning to Converge. *Data Intelligence*, *2*(1-2), 208-219. https://doi.org/10.1162/dint_a_00043

- Liang, T., & Liu, Y. (2018). Research Landscape of Business Intelligence and Big Data analytics: A bibliometrics study. *Expert Systems With Applications*, *111*, 2-10. https://doi.org/10.1016/j.eswa.2018.05.018

- Matheus, R., Janssen, M., & Maheshwari, D. (2018). Data science empowering the public: Data-driven dashboards for transparent and accountable decision-making in smart cities. *Government Information Quarterly*, 101284. https://doi.org/10.1016/j.giq.2018.01.006

- Mukherjee, S. (2013). ANNOUNCEMENT — 2012 HERBERT SIMON AWARD FOR OUTSTANDING CONTRIBUTION IN INFORMATION TECHNOLOGY AND DECISION MAKING. *International Journal of Information Technology & Decision Making*, *12*(01), 5-7. https://doi.org/10.1142/s0219622013010025

- Sanchez, E. (1989). Importance in knowledge systems. *Information Systems*, *14*(6), 455-464. https://doi.org/10.1016/0306-4379(89)90013-6

- Sun, Z., Sun, L., & Strang, K. (2016). Big Data Analytics Services for Enhancing Business Intelligence. *Journal of Computer Information Systems*, *58*(2), 162-169. https://doi.org/10.1080/08874417.2016.1220239

- .org, G. (2020). Gfbio.org. Retrieved 5 May 2020, from https://www.gfbio.org/documents/10184/22817/Reader_GFBio_BefMate_20160222/1ca43f24-2550-44b3-a05e-e180c3e544c0.

- .trb.org, O. (2020). Onlinepubs.trb.org. Retrieved 8 May 2020, from https://onlinepubs.trb.org/onlinepubs/nchrp/cd-22/manual/v2chapter2.pdf.