Implementation and Effective Utilization of Analytical Tools and Techniques in Knowledge Management

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Abstract: Knowledge management is a multidisciplinary approach to achieve organizational objectives by making best use of knowledge and information resources. Analytics is the process of systematic analysis of the past data/statistics and trying to predict the future trends or data with various tools and techniques. With the advancement of technology and increasing competition, companies are prone to make better use of the information and analytics to sustain their position in the marketplace. Software as a Service (SaaS) has become an important trend in organizations in addition to that of the usual Excel and Google sheets analytics. In this study, comparative analysis has been done between SPSS & Google Sheets Techniques and also Google data studio with Tableau, Power BI & Google Sheets for data visualization processes. Efficient dashboard was created using the different data visualization tools and compared with their pros and cons. A survey was conducted in the form of Questionnaire and the responses are obtained from people ranging from Interns to Managerial level and the factors that influence the Knowledge management processes in an efficient manner are obtained. Google apps script coding and basic excel techniques like VLOOKUP, HLOOKUP, Conditional formatting, Data Validation are being implemented as a part of automating the repetitive tasks.

Index Terms: *Knowledge Management; SPSS; Regression; Analytics; Google; Apps script*

I. INTRODUCTION

Knowledge is an important aspect for an economy to develop. We are seeing a lot of transformation rapidly happening in our society. Every day we are seeing that we are becoming more and more dependent on knowledge. If this is the case with our societies, the scenario is not much different for organizations. Nowadays, if top management is asked to underline a single resource which is most critical for their organization to achieve and sustain competitive advantage, most of them will be selecting - "Knowledge". With such an importance to knowledge, managing it has become a serious concern for organizations. An organization which can built excellent process to manage knowledge, certainly will have a competitive edge over its competitors.

There are several dimensions to Knowledge Management (KM) and the most popular framework distinguishes between "tacit" knowledge and "explicit" knowledge. Tacit knowledge refers to the internalized knowledge that individuals in an organization possess and where he or she might not be aware that they have the knowledge about how they accomplish particular tasks. On the other hand, explicit knowledge is the knowledge that individuals in organizations know that they have and are conscious of it.

The crucial element in any Knowledge Management system is to ensure that tacit knowledge is captured and converted to explicit knowledge. Moreover, it has been hypothesized that even explicit knowledge needs to be converted into information that is meaningful and useful. After all, mere data is not useful and only when data is transformed into information and codified as knowledge is it useful.

In today's rapidly changing business world, it is critical for business leaders to have the right insight and data to make the right calls at the right time. Finding the right blend of what, why and how to use this enormous amount of data is something that needs attention in present day competitive business environment. Business strategies and operational decisions are being undertaken based on the analysis provided by past operational data. Hence it is tremendously important for global business entities to equip themselves with the emerging technologies like business analytics software for better decision making and forecasting.

Analytics is the discovery, interpretation, and communication of meaningful patterns in data; and the process of applying those patterns towards effective decision making. In other words, analytics can be understood as the connective tissue between data and effective decision making, within an organization. Especially valuable in areas rich with recorded information, analytics relies on the simultaneous application of statistics, computer programming and operations research to quantify performance.

In this project the research is limited to following tools and the techniques used inside it.

1. Google Data studio
2. Google sheets
3. Google scripts coding
4. SPSS

A. Significance of the study:

- To study about the implementation and effective use of analytical tools and techniques in Knowledge management processes.

B. Objective of Study:

- To do comparative analysis between different data visualization tools.
- To analyse and find whether analytical tools and techniques help in Knowledge management and Decision-making process in an organisation.

C. Hypothesis of study:

H0: There is no significant relationship between Knowledge management processes and Analytical Tools/Techniques.

H1: There is a significant relationship between Knowledge management processes and Analytical Tools/Techniques.

D. Scope of study:

The study is limited to only a specific set of analytical tools and techniques namely SPSS, Google sheets/Excel Analytics, Google script coding, Google Data Studio and maybe Tableau Public and some sample random data is taken for analysis.

II. REVIEW OF LITERATURE

- Through the assessment of relevant references mentioned the trends, relevant problems and development of big data and data management.[1] Despite the unchallenged potential and altogether likelihood 'future' of big data, it's exhausting to examine it substitution activities like competitive and business intelligence and a lot of to the purpose, knowledge management within the predictable future. Even the temporary treatment afforded to data management frameworks, ways and cultures within the paper ought to indicate that tiny if any attention has until now been paid to those areas within the literature of big data.

- Data analytics strategies have been utilized for various assembling applications in different regions. [2] A typical suspicion of information investigation models is that the condition that produces information is stationary, that is, the element (or mark) space or circulation of the information does not change after some time. Be that as it may, in reality, this suspicion isn't legitimate particularly for assembling. In non-stationary situations, the precision of the model abatements after some time, so the model must be retrained occasionally and adjusted to the relating environment

- Methodology on empowering information investigation in assembling is exhibited. [3] Right now, the principle impediments for information investigation in electric car fabricating are the missing information and constrained openness of existing information because of the circulation of generation databases. So as to empower information investigation, getting every single imaginable datum isn't an alternative from a budgetary point of view. Retroactively gathering information isn't an alternative, because of the time lost, until a measurably applicable measure of information is gathered.

- The capability of big data is in the connecting of information and the capacity to see examples and patterns, giving chances to separate new learning. [4] This will improve arranging and execution of ventures later on. There is likewise a theory that enormous information (huge information investigation) may

supplant learning the board in associations later on. Through our eyes, managing the implicit components of information, and guaranteeing the correct translation of the learning that is displayed by enormous information examination can represent a test, in any event for the present. In such manner, it is vital to give satisfactory consideration on the general population point of view of learning the executives

- The ongoing decades have seen an exceptional development in the volume of unstructured information in computerized printed positions. [5] Organizations are presently beginning to perceive the potential monetary esteem lying undiscovered in their content information vaults and sources, including outer ones, for example, online networking stages, and inward ones, for example, security reports and other organization explicit archive accumulations. Data removed from these literary information sources is profitable for a scope of big business application and for educated basic leadership.

- The quick development of huge information condition forces new difficulties that conventional knowledge discovery and data mining process (KDDM) models are not enough fit to address. [6] We propose a snail shell process show for knowledge discovery via data analytics (KDDA) to address these difficulties. We assess the utility of the KDDA procedure display utilizing certifiable diagnostic contextual analyses at a worldwide multi-media organization.

- The information combination scientific classification with comprehend the connections among traditional marketing analytics (TMA), big data analytics (BDA), and new product success (NPS). [7] With high volume and speed of data and learning from various partners in the computerized economy, the scientific classification expects to help firms manufacture system to join information from both showcasing and huge information spaces.

- Rising patterns in information examination and Knowledge Management (KM) work showcase by utilizing the in Knowledge, skills and abilities (KSA) structure. [8] The discoveries from the examination give bits of knowledge into educational modules improvement and scholastic program structure. The examination followed and recovered occupation advertisements on LinkedIn to understand how information investigation and KM interaction regarding work capacities, learning, aptitudes and capacities required for employments, just as vocation movement. Directing substance investigation utilizing content examination and numerous correspondence investigation, this paper broadens the structure of KSA

- proposed by Cegielski and Jones-Farmer to the field of information examination and KM.

- An intensive investigation of the distinction between business intelligence (BI) and knowledge management (KM) and to set up a system for relating one field to the next. [9] An audit of the writing from around 1986 through 2004 filled in as the

- reason for examination and correlation of BI and KM. The hypothetical extent of the paper is to recognize BI and KM to illuminate the job of each in a business domain. BI centers on express learning, yet KM incorporates both inferred and unequivocal information.

- The capability of enormous information content investigation as a strategy by featuring the profundity of learning that can be created from huge information for viable learning the board through the representation, association, understanding and examination of data that would not generally be possible. [10] In spite of the expanding enthusiasm for huge information and business investigation, the point stays immature inside the KM writing, and its job as an empowering influence of KM specifically isn't surely known.

- A basic comprehension of the capacity of information in enormous information/diagnostic structure, usage and use, it turns out to be totally certain that KM ought to accept a main hierarchical job in the administration and administration of the utilization of huge information/investigation in authoritative settings. [11] KM has the hypothetical base and the down to earth involvement to choose what information is required for the association to run proficiently and viably, how that information ought to be investigated to give data most helpful to hierarchical procedures and basic leadership, and how to create learning based criticism circles with the goal that adjustments in information gathering and examination can be made in light of changes in the business condition, both inner and outside.

- Big Data Analytics (BDA) ensures that information might be broke down and sorted into helpful data for organizations and changed into huge information related-learning and productive basic leadership forms, accordingly improving execution. [12] Be that as it may, the administration of the information produced from the BDA just as its reconciliation and blend with firm learning have barely been researched, in spite of a developing need of an organized and coordinated methodology. The paper expects to examine these issues.

- The utilization of information representation instruments as a technique for investigating the added substance producing (AM) arrangement space. [13] One of the difficulties of AM is understanding the exchange offs that happen inside the plan space. Usually testing to comprehend the general execution of a structure if there are numerous execution markers. This paper exhibits an AM information representation dashboard which is portrayed by a three-organize separating process.

- A compact outline of the multifaceted writing on data representation from the perspective of the errands and wanted attributes of the PMS improvement process as displayed in the past writing. It additionally represented how perception strategies upheld the improvement of PMSs in five case conditions. [14] As its principle commitment, the paper proposes potential representation methods for the structure, execution and utilization of a PMS. It uncovers that representations can have a wide range of steady jobs in execution estimation. Dashboard plans identify with just thin piece of assignments around a PMS improvement, most outstandingly announcing.

- Developing and executing dashboards is normal in substantial organizations. Be that as it may, these practices ought to be adjusted to small and medium enterprises (SMEs), since they contrast in a few qualities, including at data framework level. [15] This paper proposes a methodology to create dashboards for SMEs went for improving the execution of gainful hardware and procedures, at shop floor level. The created dashboard expects to improve execution by proficiently giving data to the gainful territories and transform this data into information, plans, and activities which advance a powerful shop floor movement. The primary periods of the proposed strategy are characterized dependent on the customary procedure of item advancement. One of the fundamental stages, the advancement of the dashboard design, was performed considering visual administration and persistent improvement approaches, for example, kaizen and Total Productive Maintenance.

III. METHODOLOGY

A. Type of Research:

- Descriptive as well as Exploratory research design has been used in the analysis. Descriptive research is used in the form of survey conducted to find out the factors influencing the Knowledge management and decision-making processes in an organization, frequency and percentage analysis and measure of central tendency and also in the comparative study of the different Analytical tools and techniques.

- Exploratory Research is carried out in the study of Google script coding, Google Data Studio Dashboard creation processes, Google sheet data tracking, and Google sheets Automation where the exact final output of the process is not defined. The research is done to explore more about the benefits as well as disadvantages of these tools and techniques and to make a better use of it in all possible ways.

B. Sampling Method and Tools used:

- In this research source of data used is both Primary and Secondary data. Primary data is collected through Google form Questionnaire distributed. Sampling method used is Purposive as well as Convenience Sampling. The questionnaire consists of both open and close ended questions. Open ended questions are asked in order to get suggestions about latest analytical tools and trends the respondents are aware of. Open ended questions are asked to get demographic details of the respondents like Name,

- Age, Gender, Designation etc. Close- ended questions are asked in the form of 5-point Likert scale namely Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree. 5-point Likert scale is used for better computation of the response.

- Secondary data is collected through review of different articles, journals, online magazines for the comparison of different analytical tools and techniques. The sampling method carried out is

Stratified random sampling from set of people working in different domains in organizations such as Marketing, HR, Finance, Operations, Technical support, and engineering domains. The respondents consist of people ranging from Interns in an organization to the top Managerial level persons. Observation method is also used to understand the research from other person's point of perspective.

C. Period of Study:

The research was carried out for a period of 3 months from January 1st week to April 1st week.

D. Sample Size:

The sample size of the population obtained from the questionnaire responses is **75**.

E. Framework of Analysis:

1. Comparison was done between Excel analytics and SPSS

2. Comparison was done between Google Data Studio and Google sheets, Power BI, Tableau for Visualization and Dashboard Creation.

3. Techniques like V-lookup, Conditional Formatting, Data Validation of Google sheets are discussed.

4. Google script coding for Knowledge Base Creation Tracker is done.

5. Using SPSS following techniques are run,

- Descriptive Statistics
- Inferential Statistics
  - Correlation
  - Regression
  - Factor Analysis, Chi-square test
- Reliability Test

Table 1: Google Data Studio Vs Power BI

Basis for Comparison	Google Data Studio	Power BI
Definition	Web based visualization tool	Desktop as well as Cloud based Visualization tool
Background	Released in 2016 as part of Google Analytics 360 suite.	Released in 2013 and backed up by Office 365 Services.
Suitable for	Consumers and small businesses	Medium sized business and Large enterprise.
Ease of use	User Interface is similar to that of Power BI but it will be a little difficult for those who had not worked before in any of Google Analytics suite.	User Interface is simple as its similar to Microsoft Excel/word services and Visualization is made easier with drag and drop options by few mouse clicks.
Complexity and Integration	**1.** It has native support for google analytics, Google sheets, AdWords…. **2.** This has standard bar charts, pie chart, line chart, Geomap. **3.** Functions are extremely limited and manual workaround needed.	**1.** Power BI can collect information from some other sources also like Microsoft Dynamics, Salesforce, Excel. **2.** Other than standard charts, this has KPI trackers, Forecasting to calendar visuals and infographic designers. **3.** More functions to blend data from multiple sources and add new metrics.
Reliability	More stable compared to Power BI as it has fewer moving parts and less features.	Occasional issues with refreshing data and visual customisation options.
Pricing	Free of cost and all features are completely available online.	Has both free and Pro Version. Free version has basic reporting features and 1GB data limit.Pro Provides more advanced and real-time dashboard updates at $9.99 per month.
Final Verdict	Google Data Studio is best for free service with basic features.	It's a more established solution offering a robust set of functions for a small monthly fee.

Table 2: SPSS Vs Google Sheets

BASIS FOR COMPARISON	SPSS	EXCEL/GOOGLE SHEETS
Definition	Statistical package for social science, a tool used for data statistical analysis.	Data entry and data manipulation to store some information software from Microsoft.

Usage	IBM Guidelines for Statistical calculations and manipulation of data	Microsoft defined Managing and storing data with formulated operations.
Benefits	Speed and Performance	Data Redundancy reduction
Real Time Usage	Used in supercomputers for advanced and ultra-fast devices.	Large volume of customer data is being managed and handled.
Academics	Initially under SPSS, Now under IBM name.	Exists and evolved with developing branch of science and technology
Industry	Data Scientist / Analyst are the professions to become after studying in this field	Data Scientist / Analyst are the professions to become after studying in this field
Applications	Applies to all technical industries and large-scale companies	Applies to companies where large-scale sensitive data is to be managed
Field	Covers entire technological field which is a superset of Data Science	A subset of computer science where the study of data is done by using different methods and technologies

Table 3: Google Data Studio Vs Tableau

Basis for Comparison	Google Data Studio	Tableau
Background	Data Visualization tool from Google Analytics 360 suite.	Business Intelligence tool from Tableau Software for data Visualization.
Web Vs Desktop	Purely web based free application	It's a desktop-based application with licensing.

Types of Visualization	It has very basic Visualizations like bar, pie, line charts, Geomaps…	It has far more advanced Visualizations compared to Data Studio to analyse complex data.
Connectivity	It connects almost all possible programs like Google sheets, AdWords, Google Analytics, Youtube Analytics and more.	Its connections are limited and Third-party compatible extensions are required to connect with all programs.
Pricing	It's a cost-effective option available at free of cost.	It's a bit costlier ranging from $999 to $1999.
Final Verdict	Easily its best option for those who need a visualization tool for basic functions. (Small organisations)	Only needed by big organisations where Big data are needed to be visualized which are too complex to handle and not affordable by small business people.

Table 4: Google Data Studio Vs Google Sheets

Basis for Comparison	Google Data Studio	Google Sheets
Background	Free web-based data visualization tool	Online spreadsheet service provided by google
Data Connections	It has data connections to Google Analytics, AdWords, Attribution 360, YouTube Analytics, Search Console, MySQL, PostgreSQL and many more.	Google sheets can also be connected to all these data sources but a plugin such as Supermetrics will be needed.
Data Preparation and Blending	1. Data preparation is easier here as it allows data to be previewed, edited or changed to different data types before importing for analysis. 2. Data blending cannot be done here.	1. Data can be imported easier but can't be previewed or edited before import. 2. Data blending can be done with the help of formulas but it's a little complex process.

Overall Usability	Google data studio provides very much intuitive click, drag and drop interface with pre-created simple / Simple dark background. The charts or the required visuals can be added easier and the properties panel is simple to chose between data sources, dimensions, metrics, filters, segments and formatting. Filters such as for data dimension source, date format can be applied for per chart or whole dashboard level as well.	Sheets also has simple drag and drop interface but background canvas creation is still a complex process. Shapes and Textbox cannot be easily added. Sheets is less intuitive compared to Data studio. For creating filters, data validation along with formulas is needed to be done. Selecting dimensions and metrics is little complex compared to data studio. Custom Date Range selector is not available.
Design Capabilities	Added advantage in this is Scorecard which is used to show KPI'S along with a percent change in metric with up and down arrows. Design here is more creative and Flexible.	Scorecard cannot be easily created especially percent change using arrows. Design is not flexible and creative.
Calculated Metrics	Calculated metrics cannot be analysed across different data sources. Only within same source of data it can be calculated.	Metrics can be calculated across different data source using formulas especially for calculating KPI indicators.
Data Refresh	Data source automatically refreshes when we open report and also can be manually refreshed.	Only Direct data source is refreshed when we open report or file, but Google Analytics data source wont refresh automatically, only refresh schedules can be setup.
Custom Automation	Custom automation cannot be done here.	It can be done with the help of Google Apps Script

		Coding.
Shareability	Can be shared to any google account and also end user don't need to have direct access to original data source to view the report. Here the numbers cannot be copy pasted from report to excel sheets.	Can be shared to any google account and also end user don't need to have direct access to original data source to view the report. Here the numbers can be copy pasted from report to excel sheets or any other data source.
Final Verdict	It's a intuitive tool for creating dashboards except for the cons of not able to do calculated metrics across different data sources. In near future it will become best freeware tool for visualization with advanced updates.	Creating Dashboards with more complex KPI's is done better with Google sheets as of now. Its better suited for creating individual charts and graphs rather than single dashboard whose design is not much creative.

IV. ANALYSIS AND INTERPRETATIONS
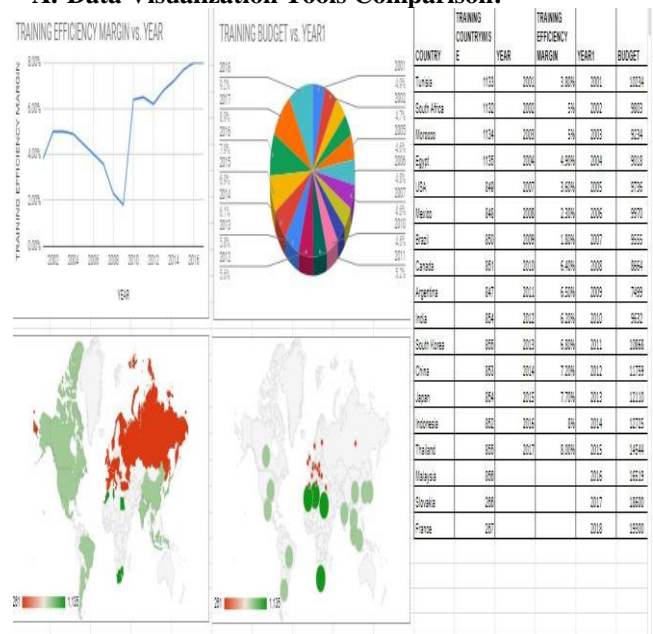
A. Data Visualization Tools Comparison:

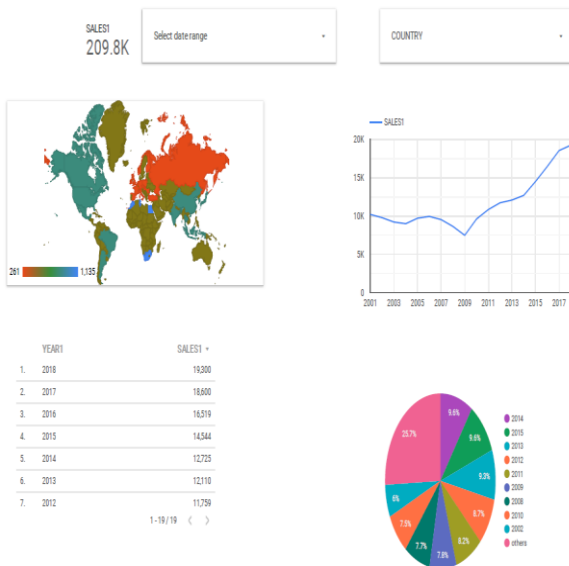**Figure 1: Google sheets Data Output**

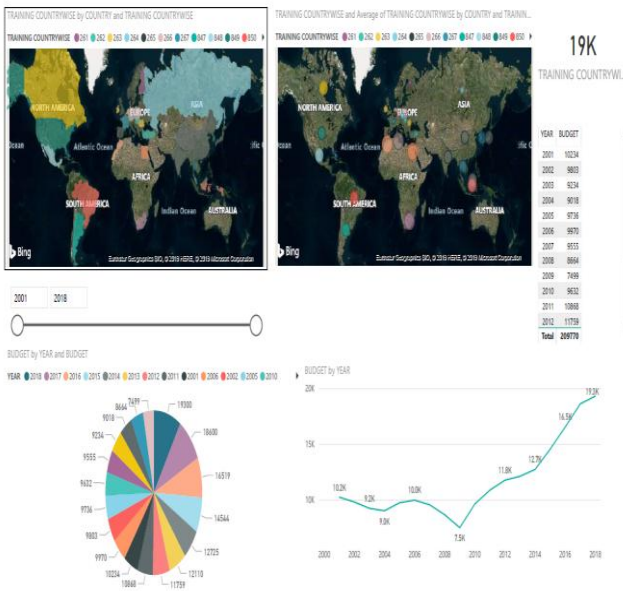**Figure 2: Google Data Studio Output**
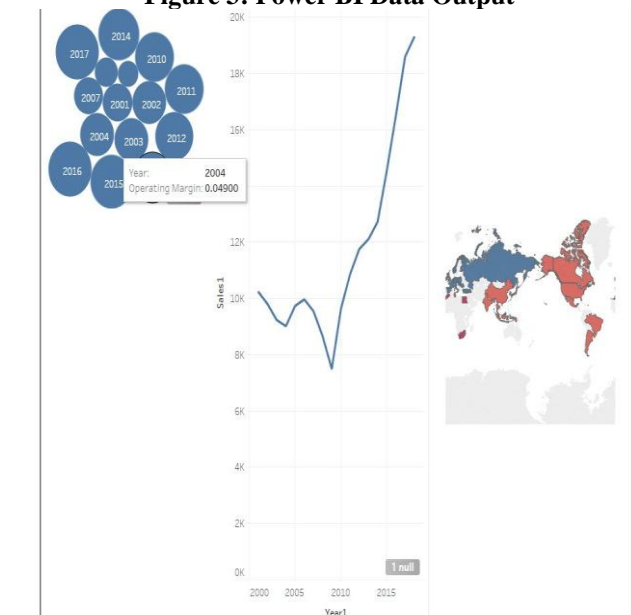

Figure 3: Power BI Data Output

Figure 4: Tableau Data Output

The theoretical comparison between different data visualization tools was done in Methodology Chapter.

In this chapter, a sample data was taken and a dashboard was created in all 4 data visualization tools. The inferences obtained from the outputs are as follows:
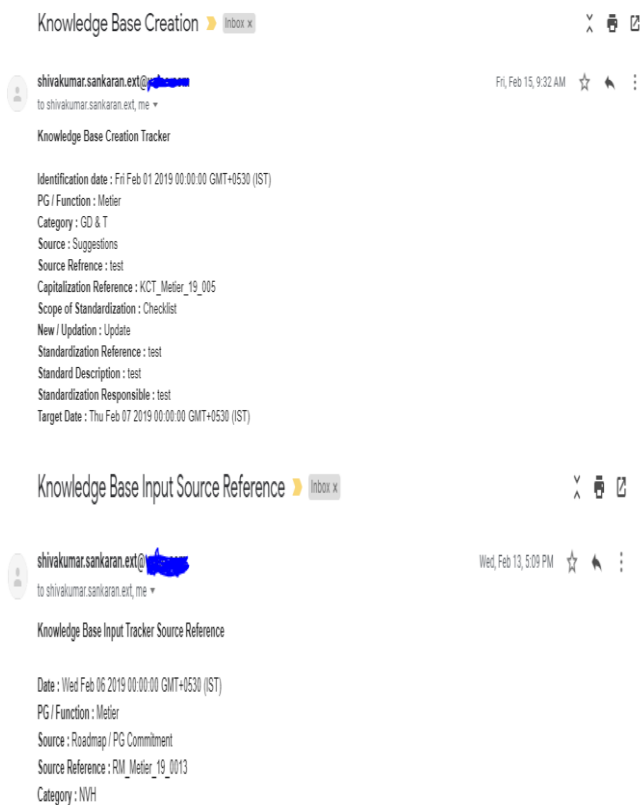
- Simple and best visualization are obtained in **Power BI and Google data studio outputs** especially for Geo-maps. Power BI has various view format (Aerial, street, Road view) for Geomaps. Power BI also many options to create a better design for Geomaps as well as other visualizations.
- Google sheets also has a better visualization but the dashboard background has many gridlines.
- Tableau is useful for very complex visualization techniques and its not that much user-friendly compared with other tools. Also, different charts or graphs cannot be easily placed inside a single dashboard.
- Google sheets does not have an easy date or data source filter options. Google sheets is best suited for normal graphs like pie chart, line chart, bar graphs, scatter plot.
- Google sheets is useful when different data has to be plotted in a same graph which involves blending of data from different data sources.
- Like Google sheets, Power BI has data labels option for graphs which is not available in Data Studio and Tableau.
- Google data studio and Sheets can be easily integrated to most of data source whereas in case of Tableau and Power BI, third party extensions are needed.
- Data preparation is easier in Data studio and Power BI where the data can be edited while importing and
- saved before doing the actual visualization. In sheets we can only edit after importing.
- The dashboard can be exported as a PDF file in all visualization tools.
- Based on user requirement, if free tool is needed, Google sheets/Data studio can be used. If the organization is big and has budget for tools, and if complex visualization is to be done, then Power BI can be used compared to Tableau which is costlier.
- Overall for a user who is new for these tools, Google data studio/ Power BI (Free version) is recommended to be used as it's more user-friendly.

B. Google Apps Script and Google Sheets Analytics:

S.no	Timestamp	Date	PG / Function	Source	Source Reference (Automatically Generated)	Category	Present Condition	Proposed Condition	Document Link
1	2-14-2019 14:44:55	6-Feb-2019 PCE	Suggestions			MH	test	test	
2	2-14-2019 14:46:39	10-Feb-2019 Matler	Knowledge Sharing			GD & T	test	test	
3	2-14-2019 15:54:38	30-Jan-2019 PTR	Roadmap / PG Commit	RM_PTR_19_003		CAD	test	test	
4	2-14-2019 16:13:43	6-Feb-2019 THS	Suggestions		SU_THS_19_004	MH	test	test	

Figure 5. Google Apps Script Outputs

Google apps script is used to automate google sheets or google forms where normal formulas are not effective. Like macros they are used to perform repetitive executions at fixed interval or after a particular event has taken place.

In this case actually two google forms were created for Knowledge Base Input Tracker and Knowledge Base Creation Tracker. The problem was whenever a new suggestion or improvement or knowledge is being shared by someone, even the persons in the same team were not aware of it and there is no proper document proof for future references. In order to overcome this problem, whenever a new input or a knowledge base is being responded in the forms, a Unique number was supposed to be created for it. Once all details are filled and a unique number is created, the details are being mailed to respective Managers, Team leads and the Quality department.

Google script coding can be decoded as:

- Initial code was to create automatic serial number as and when a response is obtained. Initial number was stored in a far-off cell and its incremented as and when a response is obtained and displayed in serial number column.
- The next code was to create a unique number as per the format specified by the manager as:

    SOURCE_PGNAME_YEAR_S.NO

- Last two digits of the year alone is being displayed in unique number with the help of code.
- After all these details are being obtained in the form, the final form details are being mailed to the respective managers based on PG from which response is obtained.
- In order to have a proper unique number creation and also to send the exact details, a time delay is being used in the code using sleep function.

- MAILAPP function is being used to send the details in mail.
- Trigger function in script is used based on the requirement whether function has to run:
  o On form submit
  o On form edit
  o On form change
  o On specific time/week intervals.

Figure 6: Conditional Formatting

Figure 7: Data Validation

Conditional formatting is used in this case to format cell if actual date is filled with green colour and blank cells with red colour. The Completed / Induction is updated based on the actual date data. If actual date is filled, the status is updated as Completed with green colour or else on induction status is updated. Data validation is being used to save time in typing same data every time and also to avoid invalid data format being filled by providing warning or by ignoring those data.

Figure 8: HLOOKUP

=IFERROR(HLOOKUP($B$7,SKILLS,Manager_synthesis!A72+4,0),)

=IFERROR(HLOOKUP($C$7,SKILLS,Manager_synthesis!A72+4,0),)

Figure 9: VLOOKUP

=VLOOKUP(B3,'Master sheet'!$B$2:J3,7,0)

=VLOOKUP(B4, 'Master sheet'!$B$2:$J$7,8,FALSE)

VLOOKUP and HLOOKUP are being used to return a data which is not easy to identify from huge database based on data which is available with us across rows and columns. In this sample output provided, VLOOKUP is being used to obtained category and Years of experience based on new joinee name. HLOOKUP is being used to obtain the catalog name and competence related to that catalog by using the index number which is available with us. IFERROR is used to return Null value instead of an error if data is not able to be found.

C. Descriptive and Inferential Statistics:
Table 5: Reliability Statistics

Reliability Statistics	
Cronbach's Alpha	N of Items
.892	16

Here the Cronbach's Alpha value is **0.892** which is greater than **0.6**

The Reliability on each item of Questionnaire is 89.2%
Hence the responses collected through questionnaire are **Reliable** and can be further taken for analysis using SPSS.

Table 6: Percentage Analysis

	Mean	Std. Deviation	N
Overall_Analytics_Knowledge	4.31	.771	75
Avoid_Redundant_Data	3.99	.862	75
Save_time	4.21	.759	75
Increase_Work_efficiency	3.96	.979	75
User_Friendly	3.80	.915	75
Simplify_Complex_Jobs	3.99	.797	75
Easy_Grasp_Learn	3.56	.889	75
Understand_Raw_Data	3.92	.897	75
Predict_Future	4.03	.771	75
Error_Rate	3.91	.841	75
Repetitive_Executions	3.89	.798	75
Dashboard_Creation_Simple	3.88	.885	75
Trust_validated	3.99	.878	75
Opensource_Extension_Thirdparty	2.69	1.315	75
Data_Breach_Privacy	3.83	.828	75
Selection_Tools_Challenging	3.56	.962	75

Table 7: Descriptive Statistics
Regression and Correlation:

H0: There is no significant relationship between Knowledge management processes and

Variables	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Overall_Analytics_Knowledge	46.7	40	10.7	2.7	0
Avoid_Redundant_Data	30.7	41.3	25.3	1.7	1.7
Save_time	38.7	46.7	12	2.7	0
Increase_Work_efficiency	38.7	25.3	29.3	6.7	0
User_Friendly	22.7	44	25.3	6.7	1.3
Simplify_Complex_Jobs	28	45.3	24	2.7	0
Easy_Grasp_Learn	16	34.7	38.7	10.7	0
Understand_Raw_Data	30.7	34.7	32	1.3	1.3
Predict_Future	28	49.3	20	2.7	0
Error_Rate	26.7	41.3	28	4	0
Repetitive_Executions	22.7	48	25.3	4	0
Dashboard_Creation_Simple	29.3	33.3	33.3	4	0
Trust_validated	33.3	36	26.7	4	0
Opensource_Extension_Thirdparty	9.3	21.3	24	20	25.3
Data_Breach_Privacy	21.3	45.3	28	5.3	0

Analytical Tools/Techniques.

H1: There is a significant relationship between Knowledge management processes and

Analytical Tools/Techniques.

Table 8: Regression for Overall Analytics vs Independent Variables

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	1.371	.479		2.863	.006
	Avoid_Redundant_Data	.066	.116	.074	.574	.568
	Save_time	.383	.140	.377	2.737	.008
	Increase_Work_efficiency	-.090	.119	-.114	-.755	.453
	User_Friendly	.049	.102	.059	.485	.629
	Simplify_Complex_Jobs	.307	.126	.318	2.442	.017

Regression is run under 3 different cases with **Overall Analytics tools and techniques help in Knowledge management Process** as **Dependent variable** and for each case **5 unique independent variables** are being taken.

The independent variables taken for analysis:

Case 1: Simplify_Complex_Jobs, User_Friendly, save_time, Avoid_Redundant_Data, Increase_Work_efficiency

Case 2: Repetitive_Executions, Easy_Grasp_Learn, Error_Rate, predict_Future, Understand_Raw_Data

Case 3: Selection_Tools_Challenging, Trust_validated, Opensource_Extension_Thirdparty, Data_Breach_Privacy, Dashboard_Creation_Simple

In all cases:

Fitness: Obtained from **ANOVA table**, the significance value is **.000 < 0.1**. Therefore, the model is fit in all 3 cases.

Overall variance: Obtained from **Adjusted R square of Model summary table**.

Case 1: Independent variables provide a variance of **38.1%** on dependent variable.

Case 2: Independent variables provide a variance of **28%** on dependent variable.

Case 3: Independent variables provide a variance of **38.4%** on dependent variable.

Individual Variances: Obtained from coefficients table.

Case 1: Independent variables Save_time (.008<0.1) and Simplify_Complex_Jobs (0.017<0.1) are found to be significant and their variance are **37.7 %** and **38.1%** respectively.

Case 2: Independent variables Understand_raw_data (.031<0.1) and Error_rate(0.052<0.1) are found to be significant and their variance are **29.7%** and **25%** respectively.

Case 3: Independent variables Trust_validated(.052<0.1) and Opensource_extension_thirdparty(0.000<0.1) are found to be significant and their variance are **24.5 %** and **-46.5%** respectively where Opensource_extension_thirdparty is found to have negative influence

over the Overall_Analytics_Knowledge.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics R Square Change	F Change	df1	df2	Sig. F Change
1	.606[a]	.367	.321	.635	.367	7.994	5	69	.000

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.119	5	3.224	7.994	.000[b]
	Residual	27.827	69	.403		
	Total	43.947	74			

The regression equations can be written as:
Dependent variable=Constant +- Independent variables
Y= a+bx ; Y- Dependent Variable, X- Independent Variables,
a- Constant, b- Value of Independent

Case 1: $Y= 1.371 + .383X_1 + .307X_2$
Case 2: $Y= 1.923 + .255X_1 + .229X_2$
Case 3: $Y= 2.700 + .215X_1 - .272X_2$

As model is fit, Null hypothesis is rejected and its proved that statistically there is a significant relationship between Knowledge management process and Analytical tools/techniques.

Table 9: Correlation Test

From the above table, it's evident that there are so many associations between the variables as the significance value for many comparisons are less than the cut-off significant value of 0.1.

Since from regression, **overall analytical Knowledge, Trust validated tools, Opensource third-party, Raw data understandable, reduce error rate, save time, simplify complex jobs** was only significant, they have been taken to find the strength of associations between them.

Except Opensource, all other variables have associations between them and the strength of association varies from **36.7% to a maximum of 58.5%.**

Opensource alone has a negative association with overall analytical knowledge with **33.3%** which means that opensource software's are not feasible for better analytical implementations compared with Validated one's.

Chi-Square:
Table 10: Chi-Square Test for Experience Vs Error Rate, Dashboard Creation, Opensource_Extension

	Value	Asymptotic Significance (2-sided)
Pearson Chi-Square(Error)	13.498[a]	.036
Pearson Chi-Square(Dashboard)	13.422	.037
Pearson Chi-Square(Opensource)	14.892	.061
N of Valid Cases	75	

H_0: There is statistically no significant association between experience and error rate.
H_1: There is statistically a significant association between experience and error rate.

H_0: There is statistically no significant association between experience and Dashboard Creation

H_1: There is statistically a significant association between experience and Dashboard Creation

H_0: There is statistically no significant association between experience and
 Opensource_Extension_Thirdparty
H_1: There is statistically a significant association between experience and
 Opensource_Extension_Thirdparty
Degrees of freedom = (R-1) * (C-1)
 = (3-1) * (5-1) = 2*4 = **8**
Chi-Square table value for degree of freedom **8 at 10%** significance level is **13.362**
The calculated values are: **13.498, 13.422, 14.892**
Calculated value > Table value in all 3 cases.
Therefore Null Hypothesis is rejected.
This implies that Experience has a significant association/relationship with decrease in error rate, Dashboard creation process and in choosing between Open source or third-party application extensions.
Factor Analysis:

Table 11: Factor Analysis

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.852
Bartlett's Test of Sphericity	Approx. Chi-Square	552.129
	df	105
	Sig.	.000

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.622	44.149	44.149	6.622	44.149	44.149	4.365	29.098	29.098
2	1.525	10.164	54.314	1.525	10.164	54.314	3.114	20.758	49.855
3	1.176	7.842	62.156	1.176	7.842	62.156	1.845	12.300	62.156

Rotated Component Matrix[a]

	Component		
	1	2	3
Understand_Raw_Data	.802	.255	-.114
Error_Rate	.774	.126	.097
Simplify_Complex_Jobs	.724	.307	.132
Repetitive_Executions	.693	.053	.364
Predict_Future	.678	.324	.090
Increase_Work_efficiency	.644	.516	.019
Save_time	.585	.493	.030
Dashboard_Creation_Simple	.574	.405	.373
User_Friendly	.092	.833	.100
Easy_Grasp_Learn	.262	.745	-.077
Avoid_Redundant_Data	.316	.728	.187
Trust_validated	.466	.504	.250
Opensource_Extension_Thirdparty	-.149	.013	.815
Selection_Tools_Challenging	.294	.065	.767
Data_Breach_Privacy	.265	.346	.397

Fitness:
- From correlation matrix many variables have a significant value **greater than 0.3**
- KMO-MSA significance value is **0.852>0.5**
- Bartlett's Test of sphericity significance value is **.000 < 0.1**

Since all 3 conditions are satisfied the model is fit for analysis.

Total variance:
- The 15 items taken for analysis are reduced to **3 Factors** and the overall variance produced by them is **62.15%**
- **From scree plot also its identified that 15 items is reduced to 3 factors as graph drastically reduces below eigen value of 1 after 3 component number.**

From Rotated Component Matrix table, items that come under each factor can be given as:

FACTOR 1 (BENEFITS)	FACTOR 2 (USABILITY)	FACTOR 3 (CHALLENGES)
Understand_Raw_Data	User_Friendly	Opensource_Extension_Thirdparty
Error_Rate	Easy_Grasp_Learn	Selection_Tools_Challenging
Simplify_Complex_Jobs	Avoid_Redundant_Data	Data_Breach_Privacy
Repetitive_Executions	Trust_validated	
Predict_Future		
Increase_Work_efficiency		
Save_time		
Dashboard_Creation_Simple		

Word cloud:

Figure 11: Word clouds

Open ended questions which cannot be analysed using statistical techniques are usually analysed for frequent occurrence of words using either text analytics/ Word cloud formation. Here the word cloud was created using Power BI software.

The most commonly occurred words are:

Engineer, Analyst, Business Operations, Manager, Associate, Support

Google sheets, Datastudio, Tableau, Public, Excel, SPSS

Correlation, Data Validation, Regression, VLOOKUP, Conditional Formatting

V. SUMMARY AND CONCLUSION

The comparative analysis done between different visualization tools infer that each tool is dominant and useful in their own ways. In general, to keep user interface and usability factors in mind, the prominent and most effective tool would be Google Data Studio followed by Power BI. Google sheets can be used for very basic level dashboard when no other tools are accessible. Tableau on other hand can be used for very complex and high-level data visualization processes. Feature wise Power BI and Tableau are found to have a greater advantage as they offer more design related options. The integration between different data sources are almost the same in all the tools.

Google Apps script coding and techniques like VLOOKUP, HLOOKUP, Data validation, Conditional Formatting are useful in automation processes in Google forms and Google sheets. They provide a better way to do repetitive executions in a faster manner. Google apps script are used as an alternative to do specific tasks which can be done by certain extensions / add-ons but they are not trusted/validated.

In this project, Google apps script coding has been used to create serial numbering as soon as a form response is received, create a unique number in a specified format based on the form response and to mail the details received to a specific set of E-mail addresses.

From the survey responses obtained and analysis done in SPSS, the findings can be given as:

- 68 % respondents are at experience level of 0-5 Yrs.
- 72% respondents are male and 28% are female.
- Respondents agree/ strongly agree that analytical tools/ techniques:
  - ❖ Avoid redundant data- 41.3%
  - ❖ Saves time – 46.7%
  - ❖ Increase Work efficiency – 38.7%
  - ❖ User-Friendly – 44%
  - ❖ Simplify Complex Jobs – 45.3%
  - ❖ Easy to grasp and Learn – 38.7% (Neutral)
  - ❖ Understand Raw Data – 34.7%
  - ❖ Predict Future Trends – 49.3%
  - ❖ Reduce error rate – 41.3%
  - ❖ Repetitive Executions – 48%
  - ❖ Dashboard Creation made simple – 33.3%
  - ❖ Use trust and validated tools – 36%
  - ❖ Data Breach and Privacy – 45.3%
  - ❖ Selecting Proper tool Challenging – 41.3%
- Respondents totally disagree on use of open source which are not properly validated – 25.3%.
- From regression and correlation analysis, based on the responses received, there is a relationship / association between Knowledge management processes and the analytical tools/ techniques in the form of Time saving, simplify
- complex jobs, Understand Raw Data, reduce error rate, Trust and Validated tools and Open source Tools have a negative impact. The variance caused range from 36.7% to 58.5%.
- From cross tab (Chi-square) analysis, it has been evident that Experience has association with Reduction in error rate, Dashboard creation and also in choosing between different Open source tools or extensions that can be used.
- From factor analysis, it is evident that 15 items that are taken for analysis can be categorised under 3 factors such as:
  - ❖ Benefits – 8 items
  - ❖ Usability – 4 items
  - ❖ Challenges – 3 items

Knowledge and Innovation Management plays an important role in the growth and progress of an organisation or Industry. There will be huge amount of data which will be unstructured as it will be obtained as and when new ideas are generated and Knowledge transfer or Knowledge acquisition takes place between people. The unstructured data will be difficult to analyse and arrive at a feasible output or solution. In order to have a better and more prominent usage of available Knowledge base or data, they need to be structured or visualized in a proper manner which can be done with the help of various analytical tools and techniques.

Among the tacit, Implicit, Explicit knowledge: More importance has to be given to tacit knowledge which is the most difficult one to obtain and cannot be documented easily. The same problem was there in the organization where I was doing my intern, employees are not aware of the problems / suggestions given by their colleagues as there is no proper proofs or documents being maintained in a central database. In order to overcome this problem only, a central database creation was done with the help of google forms and the responses are collected as and when something is needed to be shared and unique number has been created for that. Also, the links of the document proofs submitted are obtained and maintained in a single file. Google apps script was used to automatically generate unique number with a specific format as response is received.

In order to have better understanding of raw data available, visualization is done using different data visualization tools like Google Data studio, Power BI, Tableau, Google sheets and the most preferred one is Google data studio followed by Google sheets as they both are trusted and validated online google tools and user interface is simple and can be integrated with almost all add-ons.

Overall from the practical as well as theoretical analysis done in this research,

it can be concluded that Knowledge management

process as well as decision making processes can be done in a more efficient way by proper implementation and effective utilization of Analytical tools and techniques as benefits outweigh the challenges

Future Scope of study:

The future study can be done in a more detailed manner comparing almost all aspects of data visualization tool and also taking into account the tools which are left in this study. Survey can be extended further and the questionnaire can be modified with more factors and more items can be added under each factor. Expert sampling method can be followed in to reduce bias in the study and to have a more clear and precise results. Google script coding can be still more simplified with less number of coding snippets.

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