



14. To Study on the analysis of Cloud API for Improved Business Management Efficiency of Software Company in Chennai

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Need For Study:

- **Enhanced Efficiency:** The study aims to explore how leveraging cloud APIs can enhance the efficiency of business management processes within software companies. Efficiency gains could translate into cost savings, streamlined operations, and improved overall performance.
- **Scalability and Flexibility:** Cloud APIs offer scalability and flexibility, allowing software companies to adapt to changing business requirements and market conditions more effectively. Understanding how these attributes translate into tangible benefits for business management is essential for informed decision-making.
- This study aims to analyze the advantages and disadvantages of cloud APIs to help businesses make informed decisions which is best suited for their specific needs. The study will cover the following areas: Cost, Scalability, Integration, Performance and Security

Objectives:

A. Primary Objectives: To Study on the analysis of Cloud API for Improved Business Management Efficiency of Software Company in Chennai.

B. Secondary Objectives:

- To Study the Process Needs of the Business.
- To Study the Cost, Scalability, Agility, And security of Cloud APIs..
- To Study the performance of Cloud APIs.
- To Study insights that will help Business make informed decisions.
- To study the Cross functional Collaboration across different applications.

Literature Review:

Patel, R. - 2022 - "Next-Generation GPS Car Navigation Systems: A Comprehensive Review" - This study provides a comprehensive review of next-generation GPS car navigation systems developed post-2020. It explores advancements in real-time traffic

prediction, personalized route recommendations, and integration with smart city infrastructure. The paper also discusses the role of artificial intelligence and machine learning in improving navigation accuracy and efficiency.

Smith, J. - 2021 - "Advancements in GPS Car Navigation Systems Post-2020" - This paper reviews advancements in GPS car navigation systems after 2020. It discusses developments in augmented reality navigation, integration with autonomous driving technologies, and enhanced user interfaces. Additionally, it examines the impact of emerging trends such as 5G connectivity and vehicle-to-infrastructure communication on the evolution of GPS navigation systems.

Emily Smith - 2021 - "Enhancing User Experience in GPS Car Navigation Systems: A Human-Centered Approach" - This study focuses on improving user experience in GPS car navigation systems through a human-centered design approach. It explores user preferences, needs, and pain points related to navigation interfaces and features. The research emphasizes the importance of intuitive design, personalized recommendations, and proactive assistance to enhance user satisfaction and engagement.

Loianno, Giuseppe; Franchi, Antonio; Kumar, Vijay - 2020 - "Advanced Navigation Techniques for Autonomous Vehicles" - Focusing on advanced navigation methods for autonomous vehicles, this book explores sensor fusion, localization, and path planning techniques. It addresses the unique challenges of autonomous navigation, offering state-of-the-art solutions and research directions.

Gupta, S. - 2020 - "Security and Privacy Considerations in GPS Car Navigation Systems" - This paper addresses security and privacy considerations in GPS car navigation systems. It examines potential vulnerabilities such as location tracking, data breaches, and spoofing attacks, and proposes strategies to mitigate these risks. The study discusses the importance of encryption, authentication, and privacy-preserving algorithms in protecting user data and ensuring the integrity of navigation systems.

Wang, Hua; Eskandarian, Azim (Eds.) - 2018 - "Advanced Driver Assistance Systems for Safe and Comfortable Driving" - This edited volume covers advanced driver assistance systems, including navigation functionalities, aimed at enhancing vehicle safety and comfort through sensor integration and intelligent algorithms.

Lin, Feng (Ed.) - 2018 - "Modern Navigation, Guidance, and Control Processing" - This edited volume explores modern navigation techniques and processing algorithms applicable to various platforms, offering insights into Kalman filtering, sensor fusion, and trajectory optimization methods.

Teunissen, Peter; Montenbruck, Oliver (Eds.) - 2017 - "Handbook of Global Navigation Satellite Systems" - Covering various aspects of GNSS technology, this handbook serves as a definitive reference on GPS and other satellite systems. It includes system architectures, signal processing techniques, and applications in navigation and timing.

Fan, Xiaocong - 2015 - "Real-time Embedded Systems: Design Principles and Engineering Practices" - Focused on design principles and engineering practices, this book covers topics relevant to GPS navigation system implementation, including real-time operating systems and system integration

Leick, Alfred; Rapoport, Lev; Tatarnikov, Dmitry - 2015 - "GPS Satellite Surveying" - This book offers practical guidance on GPS surveying techniques, covering geodetic positioning, data processing methodologies, and applications in geomatics and engineering surveys.

Methodology:

Research Methodology:

Research Methodology is a way to systematically solve the research problem. The research begins its formation when the problem or objective of the research is identified for which a research report is conducted.

Type of Research: - Descriptive: Descriptive research includes surveys and fact-finding enquiries of different kind. The major purpose of descriptive research is description of the situation as it exists at present. The main characteristic of this method is that the researcher has no control over the variable, he/she can only report what has happened or what is happening.

Research Design:

A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. In fact, the research design is the conceptual structure within research is conducted; it constitutes the blueprint for the collection, measurement, and analysis of data.

Different types of Research Design are as follows:

- Research design in case of exploratory research studies.
- Research design in case of descriptive studies.
- Research design in case of diagnostic research design.
- Research design in case of hypothesis testing research design.

In this study, Descriptive research studies is used because descriptive research studies are those studies which are concerned with describing the characteristics of a particular individual, or a group and situation etc.

The design in such studies must focus attention on the following or process in descriptive research design is as follows:

- Formulating the objective of the study.
- Designing the methods of data collection.

- Selecting the sample.
- Collecting the data.
- Processing and analyzing the data.
- Reporting the findings.

Sources of Data: The task of data collection begins after a research problem has been defined and research design plan chalked out. Basically, two types of data are available to the research namely:

- **Primary Data:** We collect primary data during experiment research but in case we do research of the descriptive type and performs surveys, whether sample survey or census surveys, that we can obtain primary data either through observation or through direct communication with respondents in one form or another on through personal interviews. This is the data which is collected for the first time and never been published before, and it is gathered personally by the researcher for the purpose of the research in the form of distributing questionnaire.
- **Secondary Data:** Secondary data means data that are already available i.e., they refer to the data which have already been collected and analyzed by someone else.

In the present study, primary, as well as secondary data has been used.

Sample Design:

In most of the research design it becomes almost impossible to examine the entire universe. So, the only alternative is to report to sampling. This is true for the present study as well. Basic principles to be followed in sampling are that the sample chosen must be representative of entire universe to be studied. Universe and Survey population: Universe is the set of objectives to be studied. It can be finite and infinite. And survey population is a part of universe that represents the whole universe. In this present study universe is 300 and survey population is 150 peoples.

Sample Size: In this present study we have taken the sample size of 150 peoples to get their views regarding Cloud APIs.

Sampling Method: In the present study, **Convenience sampling method** has been used.

Convenience sampling is a non-probability sampling method where units are selected for inclusion in the sample because they are the easiest for the researcher to access. This can be due to geographical proximity, availability at a given time, or willingness to participate in the research. Sometimes called accidental sampling, convenience sampling is a type of non-random sampling.

Data Collection Method:

In dealing with any real-life problem, it is often found that data at hand are inadequate, and hence, it becomes necessary to collect data that are appropriate. There are several ways of collecting data which differ considerably in context of a survey, data can be other resources at the disposable of the researcher.

Primary Data can be collected through various methods like:

- Questionnaire method.
- Observation method.
- Interview method.

In the present study Primary data is collected through:

- **Questionnaire method (Likert – scale).**

Secondary Data can be collected through various methods like:

- Magazines
- Newspapers
- Websites
- Books

In the present study Secondary Data is collected through:

- **Online Websites**
- **Books**

Data Analysis:

Chi Square Analysis: A chi-square (χ^2) statistic is a test that measures how a model compares to actual observed data. The data used in calculating a chi-square statistic must be random, raw, mutually exclusive, drawn from independent variables, and drawn from a large enough sample. For example, the results of tossing a fair coin meet these criteria.

Analysis 1: Cloud APIs have facilitated the automation of essential business processes. The adoption of cloud APIs has reduced manual intervention in business operations.

Hypothesis:

Null Hypothesis (H0): There is no relationship between Reduced manual intervention and Facilitated automation.

Alternative Hypothesis(H1): There is a significance Relationship between Reduced manual intervention and Facilitated automation.

Assuming significance as 5%.

Hence if $P > 0.05$, Reject H_0 .

$P < 0.05$, Accept H_0

Observed Table		Observed responses of reduced manual intervention					
		Strongly agree	Agree	Neutral	Disagree	StronglyDisagree	Total
Observed responses of Facilitated automation	Strongly Agree	6	13	11	3	1	34
	Agree	3	15	19	2	2	41
	Neutral	1	5	13	1	1	21
	Disagree	5	12	10	2	0	29
	Strongly Disagree	4	11	8	1	1	25
	Total	19	56	61	9	5	150

Observed Table		Observed responses of reduced manual intervention					
		Strongly agree	Agree	Neutral	Disagree	Strongly Disagree	Total
Observed responses of Facilitated automation	Strongly						
	Agree	6	13	11	3	1	34
	Agree	3	15	19	2	2	41
	Neutral	1	5	13	1	1	21
	Disagree	5	12	10	2	0	29
	Strongly Disagree	4	11	8	1	1	25
Total	19	56	61	9	5	150	

Observed	Expected	(O-E)	(O-E)^2	(O-E)^2/E
6	4.31	1.69	2.86	0.66
3	5.19	-2.19	4.8	0.92
1	2.66	-1.66	2.76	1.04
5	3.67	1.33	1.77	0.48
4	3.17	0.83	0.69	0.22
13	12.69	0.31	0.1	0.01
15	15.31	-0.31	0.1	0.01
5	7.84	-2.84	8.07	1.03
12	10.83	1.17	1.37	0.13
11	9.33	1.67	2.79	0.3
11	13.83	-2.83	8.01	0.58
19	16.67	2.33	5.43	0.33
13	8.54	4.46	19.89	2.33
10	11.79	-1.79	3.2	0.27
8	10.17	-2.17	4.71	0.46
3	2.04	0.96	0.92	0.45
2	2.46	-0.46	0.21	0.09
1	1.26	-0.26	0.07	0.06
2	1.74	0.26	0.07	0.04

Observed	Expected	(O-E)	(O-E) ²	(O-E) ² /E
1	1.5	-0.5	0.25	0.17
1	1.13	-0.13	0.02	0.02
2	1.37	0.63	0.4	0.29
1	0.7	0.3	0.09	0.13
0	0.97	-0.97	0.94	0.97
1	0.83	0.17	0.03	0.04
			Total	11.03

Significance level: 5%

Degree of Freedom: It is calculated by $(R-1)*(C-1)$

Hence $R = 5$; $C = 5$. Therefore, degree of freedom = **16**

Test Statistics: The value calculated from the table. **11.03**

Critical Value: The value from the Chi-square table. **7.96**

Result:

Since calculated value is greater than table value, i.e. $11.03 > 7.96$ Null hypothesis is rejected.

Therefore, there is a significance relationship between Reduced manual intervention and Facilitated automation

Correlation Analysis:

Correlation analysis is a statistical technique to study the degree and direction of relationship between two or more variables. A correlation coefficient is a statistical measure of the degree to which changes to the value of one variable predict change to the value of another

Analysis 1:

The performance of cloud APIs meets or exceeds our expectations.

Cloud APIs contribute significantly to the overall efficiency of our business operations.

Hypothesis:

Null Hypothesis (H₀): There is no correlation between performance of cloud APIs and overall efficiency of our business operations.

Alternative Hypothesis (H₁): There is a correlation between performance of cloud APIs and overall efficiency of our business operations.

Assuming significance as 5%.

Hence if $P > 0.05$, Reject H_0 .

$P < 0.05$, Accept H_0

Correlation Table		Performance of cloud APIs		
		Strongly Agree	Agree	Total
Overall efficiency of our business operations	Strongly Agree	27	18	45
	Agree	24	31	55
	Neutral	15	10	25
	Disagree	11	5	16
	Strongly Disagree	6	3	9
	Total	83	67	150

From the above table, we found,

$\bar{X} = 16.6$

$\bar{Y} = 13.4$

	X	Y	x	y	x^2	y^2	xy
	27	18	10.4	4.6	108.16	21.16	47.84
	24	31	7.4	17.6	54.76	309.76	130.24
	15	10	-1.6	-3.4	2.56	11.56	5.44
	11	5	-5.6	-8.4	31.36	70.56	47.04
	6	3	-10.6	-10.4	112.36	108.16	110.24
Total	83	67		0.84894	309.2	521.2	340.8

The r value is found to be 0.84894. Hence the correlation coefficient is 0.84.

Result:

Since r value lies between 0.5 to 1, Hence it has a strong correlation.

Therefore, performance of cloud APIs and overall efficiency of our business operations are correlated to each other.

Regression Analysis:

Regression analysis is a simple and statistical method to understand and quantify the relationship between two variables or more. It helps a business estimate one dependent variable based on the values of one or more independent variables.

Analysis 1: Scalability, agility, and security are essential factors influencing our decision to use cloud APIs.

Security features of cloud APIs instill confidence in the protection of sensitive business information.

The agility of cloud APIs allows us to respond promptly to customer demands.

Scalability of cloud APIs ensures smooth operations during peak business periods.

Hypothesis:

Null Hypothesis (H0): There is no relationship between Essential factors influencing decision and Security, agility and scalability of cloud APIs.

Alternative Hypothesis (H1): Security, agility and scalability of cloud APIs is positively related to the Security, agility and scalability of cloud APIs.

Assuming significance as 5%.

Hence if $P > 0.05$, Reject H_0 .

$P < 0.05$, Accept H_0 .

By multiple regression analysis,

Considering, effective automation framework as Dependent variable (Y)

And the different automation framework as independent variable (X1, X2, X3)

We know that regression is expressed as, $Y = aX + b$, since it is a multiple regression, it is expressed as $Y = aX_1 + bX_2 + cX_3 + d$.

Where,

Y = Dependent variable

X1, X2, X3 = Independent variable a, b, c = intercept

d = Beta coefficient or slope

Summary Output:

Regression Statistics	
Multiple R	0.640966346
R Square	0.410837857
Adjusted R Square	0.398731785
Standard Error	0.495463648
Observations	150

Where, **Multiple R**: Pearson Correlation Coefficient.

R Square: Coefficient of determination. R square measures the proportion of variation in your dependent variable Y explained by your independent variable X for a linear regression.

Adjusted R Square: It is a better model that have different number of variables. The logic behind it is R2 always increases when the number of variables increases.

Standard Error: Standard error of the regression is average distance that observed values fall from regression line, Smaller the regression line means more accurate results

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	3	24.99263627	8.330878757	33.93651347	1.06E-16
Residual	146	35.84069706	0.245484226		
Total	149	60.83333333			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	1.576192251	0.285501125	5.5207918	1.501E-07	1.011943352	2.1404412	1.0119433	2.14044116
Security features of cloud APIs instill confidence in the protection of sensitive business information.	0.073696739	0.06957816	1.0591936	0.2912608	0.0638138	0.2112072	0.0638138	0.21120723
The agility of cloud APIs allows us to respond promptly to customer demands.	0.025309252	0.09168361	0.2760499	0.7829001	0.1558892	0.2065077	0.1558892	0.20650775
Scalability of cloud APIs ensures smooth operations during peak business periods.	0.526784855	0.08586207	6.1352454	7.592E-09	0.35709173	0.696478	0.3570917	0.69647798

Results:

From the above regression table, we found that the significance it found to be 1.06E-16 , which is $p < 0.05$. Hence accepting Alternative Hypothesis. Security, agility and scalability of cloud APIs is positively related to the Security, agility and scalability of cloud API

Findings, Summary, Observation and Conclusion:

Findings:

From Chi-Square Analysis, it is found that,

- There is a significance relationship between reduced manual intervention and Facilitated automation.
- There is a significance relationship between Speed and responsiveness of cloud APIs and Handling the workload of business applications.

From Correlation Analysis, it is found that,

- Performance of cloud APIs and overall efficiency of our business operations are correlated to each other.
- Insights gathered from cloud APIs are valuable and data provided by cloud APIs helps business better are correlated to each other.

From Regression Analysis, it is found that,

- Security, agility and scalability of cloud APIs is positively related to the Security, agility and scalability of cloud APIs.
- Information obtained from cloud APIs is positively related to insights from Cloud API help business Growth.

Summary:

- The study depicts that implementing cloud APIs has improved communication and coordination within the organization. From the different analysis we conclude that cloud API insights help us identify areas for optimization and growth within our business.
- The analysis says that the cost of maintaining and upgrading cloud APIs is reasonable considering the advantages they offer i.e security, collaboration across different business units.
- The study also concludes that cloud APIs contribute significantly to the overall efficiency of the business operations.

Observations:

- Majority of the respondents are Developer.
- Most of the respondents accepts cloud API has positively impacted business process.

- Most of the respondents agreed that adoption of Cloud API has reduced manual intervention.
- 55% of the respondents accepts that scalability, agility, and security are essential factors influencing our decision to use cloud APIs.
- Most of the respondents accept the fact that Insights gathered from the analysis of cloud APIs are valuable for making informed decisions.
- More than 47% of respondents agreed that speed and responsiveness of cloud APIs enhance productivity.
- Most of the respondents accepts that Cloud APIs promote collaboration and information sharing across various business units.

Conclusion:

- The study depicts, Cloud APIs effectively handled the workload of our business applications.
- It also concluded that scalability, agility, and security are essential factors influencing our decision to use cloud APIs.
- The study says that the speed and responsiveness of cloud APIs enhance productivity within our organization.
- The study suggests automation developers to integrate with Cloud API which results in better development of scripts and increases the development faster.
- The survey analysis shows that employees from different departments find it easy to work together with cloud API integration , facilitate seamless collaboration that leading to increased efficiency.

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