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NATIONAL INSTITUTE OF BUSINESS MANAGEMENT
HIGHER NATIONAL DIPLOMA IN SOFTWARE ENGINEERING

COURSEWORK

STATISTCS FOR COMPUTING

Cloud Gaming Services

CONTENTS

SUMMARY

This report investigated the factors influencing the adoption of cloud gaming services using a structured approach. Key insights include:

1. **Identified Key Factors**: The study highlighted factors such as cost, internet speed, game library, and user familiarity as significant predictors of adoption intention.
2. **Methodology**: A pilot-tested questionnaire was distributed to a target population of 100 gamers, ensuring demographic and behavioral diversity.
3. **Statistical Analysis**: Techniques such as descriptive statistics, hypothesis testing, and regression analysis revealed strong correlations between service performance and user satisfaction.
4. **Recommendations**: Based on findings, strategies such as enhancing service performance, expanding the game library, and introducing flexible pricing models were proposed.
5. **Conclusion**: The study provides valuable insights for cloud gaming service providers, emphasizing the need to focus on user experience and accessibility.

Future research could explore adoption trends across different countries or the role of emerging technologies like 5G in cloud gaming.

1. Chapter 01 – Introduction

The rapid growth of the IT Industry has raised some technologies among the gaming service. Unlike traditional gaming, cloud gaming delivers seamless gaming experiences without the need for high-end expectations and reshaping the user expectations and making the market strategy dynamically. This report involves critical factors influencing user adaptation over cloud gaming services and uncover insights of it.

The primary objective of this research is to analyze these statistical measures like descriptive, hypothesis testing to provide recommendations on cloud gaming services. Investigation into cloud gaming services will enhance some models, infrastructure, and pricing requirements that within the context of sampling techniques and statistical analysis.

Through this thorough research, we inspire each other to contribute some understanding of the user interactions over cloud gaming services thereby assisting stakeholders in optimizing their offerings to align with the market.

2. Chapter 02 – Foundational Knowledge

2.1 Sampling Techniques

- **Random Sampling**: Every individual has an equal chance of being selected.
- **Stratified Sampling**: The population is divided into subgroups (strata), and samples are taken from each group proportionally.
- **Systematic Sampling**: Selecting every nth member from a list.
- **Cluster Sampling**: Dividing the population into clusters and randomly selecting entire clusters.
- **Convenience Sampling**: Choosing samples based on ease of access (though it may introduce bias).

2.2 Descriptive Statistics

- **Measures of Central Tendency**: Mean, median, and mode to represent the central value
- **Measures of Dispersion:** Variance, standard deviation, and range to understand data .
- **Graphs**: Charts such as histograms, pie charts, and box plots to visualize data

2.3 Hypothesis Testing & Inferential

- **Hypothesis Testing**: A method to test assumptions about a population using sample data.
    - **Null Hypothesis (H_0)**: Assumes no effect or difference exists.
    - **Alternative Hypothesis (H_1)**: Indicates a significant effect or difference.
    - Common Tests: *t-tests*, *chi-square tests*, and *ANOVA*.
- **Inferential Statistics**: A technique to generalize findings from a sample to the broader population
    - Methods include *confidence intervals* and *p-values*.

2.4 Correlation & Regression Analysis

- **Correlation Analysis**: Measures the strength and direction of a relationship between two variables. The coefficient ranges from -1 (perfect negative) to +1 (perfect positive).
- **Regression Analysis**: Examines how one variable (dependent) changes in response to another (independent). Types include:
- **Simple Regression**: One independent variable.
- **Multiple Regression**: Several independent variables.

2.5 Probability Basics

- **Random Variables**: Variables with outcomes determined by chance.
- **Combinatorial Probability**: Counting methods to determine probabilities, e.g., combinations and permutations.
- **Expected Value**: The mean of all possible outcomes weighted by their probabilities.

2.6 Common Probability

- **Binomial Distribution:** Used for binary outcomes (success/failure) in a fixed number of trials.
- **Poisson Distribution:** Models the probability of a given number of events occurring in a fixed interval (e.g., customer arrivals).
- **Normal Distribution:** A bell-shaped curve where most values cluster around the mean, used in many natural phenomena.
- **Exponential Distribution:** Models the time between events in a Poisson.

3. CHAPTER 03 – Conceptual Framework

3.1 Identify Key Factors

Using the questionnaire provided, the key factors influencing the intention to adopt cloud gaming services can be identified as follows: Demographic and Personal Information

- **Age (Q2) and Gender (Q3):** User characteristics may influence gaming preferences and technology adoption.
- **Region (Q5):** Geographic location affects internet infrastructure and service availability.
- **Income Source (Q7):** Determines affordability and willingness to pay for subscriptions. Gaming Behavior and Preferences
- **Gaming Frequency (Q8) and Platform (Q9):** Indicate how embedded gaming is in the user's lifestyle.
- **Familiarity with Cloud Gaming (Q10) and Usage History (Q11):** Highlight the current awareness and penetration of cloud gaming. Service-Specific Factors
- **Cost Importance (Q13):** Determines the role of pricing in adoption.
- **Game Library Size (Q14):** Reflects how content breadth influences decisions.
- **Internet Speed (Q15) and Latency (Q17**): Evaluate technical requirements for satisfactory gaming experiences.

o User Satisfaction and Perceptions

- **Satisfaction with Internet (Q16) and Cloud Gaming Performance (Q18**): Measure current user sentiment towards gaming-related services.
- **Affordability (Q19) and Likelihood to Recommend (Q20):** Reflect the perceived value of cloud gaming.

o Additional Influencing Factors

- **Cross-Platform Support (Q22):** Addresses usability across devices.
- **Updates and Game Releases (Q25):** Highlights the importance of service freshness.
- **Data Privacy (Q26) and Customer Support (Q27**): Reflect trust and reliability factors.

3.2 Develop a Model

Independent Variables (Factors):

- **Demographics**: Age, region, income source.
- **Gaming Behavior**: Frequency, platform, familiarity.
- **Service-Specific Attributes**: Cost, game library, internet speed, and latency.
- **User Perceptions**: Satisfaction, affordability, cross-platform support. **Dependent Variable:**
- **Adoption Intention**: Willingness to adopt or switch to cloud gaming as the primary platform (Q24).

3.3 Explain Factor selection Demographics:

These factors, like age and region, provide context for understanding the target audience. For instance:

- Younger users might adopt cloud gaming faster due to tech-savviness.
- Regional differences could highlight infrastructure barriers.
    - **Service-Specific Attributes:**
    - Factors like cost and game library are central to the decision-making process:
- Cost impacts affordability, a critical barrier for adoption.
- Game Library size determines whether users feel the platform meets their entertainment needs.
    - **Technical Aspects:**
    - Internet speed and latency are technical prerequisites:
- Cloud gaming depends on a fast, stable connection. Poor performance due to high latency would deter adoption.
    - **Trust and Security:**
    - Data privacy and customer support are essential for fostering trust:
- Users must feel secure when using cloud-based platforms, especially with sensitive information involved.

4. CHAPTER 04 - Questionnaire

4.1 Include Different Question Types

QUESTIONNAIRE FOR INVESTIGATING FACTORS AFFECTING THE INTENTION TO USE OF CLOUD GAMING SERVICES

1. **Name with Initial:**

   _____

2. **Select Your Age:**
   ☐ 15-20 ☐ 21-25 ☐ 26-30 ☐ Above 31
3. **Select Your Gender:**
   ☐ Male ☐ Female ☐ Other
4. **Email:**

   _____

5. **Which Region of Sri Lanka are you located in?**
   ☐ Western Province ☐ Central Province
   ☐ Southern Province ☐ Other
6. **What is the Highest Qualification in the academic progress?**
   ☐ High School ☐ Undergraduate
   ☐ Postgraduate ☐ Other
7. **What is your primary source of income?**
   ☐ Full-Time Job ☐ Part-Time Job
   ☐ Student ☐ Unemployed
8. **How often do you play video games?**
   ☐ Daily ☐ Weekly ☐ Rarely ☐ Never
9. **What gaming platform do you primarily use?**
   ☐ PC ☐ Console ☐ Mobile ☐ Other
10. **How familiar are you with cloud gaming services?**
    ☐ Very Familiar ☐ Somewhat Familiar
    ☐ Not Very Familiar ☐ Not Familiar at all
11. **Have you ever used a cloud gaming service?**
    ☐ Yes ☐ No
12. **How would you rate your overall satisfaction with cloud gaming services?**
    ☐ Very Satisfied ☐ Satisfied
    ☐ Dissatisfied ☐ Very Dissatisfied
13. **How important is the cost when choosing a cloud gaming service?**
    ☐ Very Important ☐ Important
    ☐ Somewhat Important ☐ Not Important at all
14. **How important is the game library size when choosing a cloud gaming service?**
    ☐ Very Important ☐ Important
    ☐ Somewhat Important ☐ Not Important at all
15. **How important is internet speed for your cloud gaming experience?**
    ☐ Very Important ☐ Important
    ☐ Somewhat Important ☐ Not Important at all
16. **How satisfied are you with your current internet connection?**
    ☐ Satisfied ☐ Unsatisfied
17. **How important is latency (response time) in your cloud gaming experience?**
    ☐ Very Good ☐ Good ☐ Not Good ☐ Other
18. **How satisfied are you with the performance (graphics, smoothness) of cloud gaming services?**
    ☐ Satisfied ☐ Unsatisfied
19. **Do you feel that cloud gaming services are currently affordable?**
    ☐ Yes ☐ No
20. **Would you recommend cloud gaming services to a friend?**
    ☐ Yes ☐ No

21. How secure do you feel when using cloud gaming services?

☐ Very Secure ☐ Secure

☐ Somewhat Secure ☐ Not Secure at all

22. How important is cross-platform support (ability to play on different devices) for cloud gaming?

☐ Very Important ☐ Important

☐ Somewhat Important ☐ Not Important at all

23. How important is it to play without having to download or install games?

☐ Very Important ☐ Important

☐ Somewhat Important ☐ Not Important at all

24. Would you switch to a cloud gaming service as your primary platform if it meets your expectations?

☐ Yes ☐ No

25. How important are regular updates and new game releases for cloud gaming services?

☐ Very Important ☐ Important

☐ Somewhat Important ☐ Not Important at all

26. How important is data privacy to you when using cloud gaming platforms?

☐ Very Important ☐ Important

☐ Somewhat Important ☐ Not Important at all

27. How important is customer support when choosing a cloud gaming service?

☐ Very Important ☐ Important

☐ Somewhat Important ☐ Not Important at all

28. How does cloud gaming compare to traditional gaming platforms in terms of performance?

☐ Better ☐ Same ☐ Worse ☐ Other

29. Do you find the variety of games available in cloud gaming better than on other platforms?

☐ Yes ☐ No

30. Would you consider paying for a cloud gaming service on a monthly subscription basis?

☐ Yes ☐ No

31. What is the most you would be willing to pay per month for a cloud gaming service?

☐ Less than Rs.3500 ☐ Rs.3600 - Rs.5000

☐ Rs.5100 - Rs.10000 ☐ More than Rs.10000

32. How do you rate the availability of your favorite games in cloud gaming services?

☐ Very Poor ☐ Poor ☐ Very Good ☐ Good

33. Do you think cloud gaming will become the dominant gaming platform in the future?

☐ Yes ☐ No

34. What do you like most about cloud gaming services?

_____

35. What improvements would you suggest for cloud gaming services?

_____

36. What is your biggest concern about adopting cloud gaming services?

_____

4.2 Pilot Testing

Pilot testing was conducted to validate the questionnaire and ensure it effectively captures the required data. A sample of **10 participants**, representative of the target population of **100 gamers**, was selected for the pilot test. These participants were chosen to reflect diverse demographics, including age groups, gaming platforms, and levels of familiarity with cloud gaming services.

The objectives of the pilot testing were to:

1. **Assess Clarity:** Evaluate if all questions were clear, unambiguous, and easily understood by the participants.
2. **Check Relevance:** Ensure all questions were aligned with the research objectives and adequately addressed the factors influencing cloud gaming adoption.
3. **Test the Format:** Verify the usability and layout of the questionnaire to provide a smooth respondent experience.
4. **Identify Issues:** Detect any technical or content-related issues that could hinder data collection.

After gathering feedback from the pilot group, the following adjustments were made:

- Simplification of question wording where confusion was reported.
- Refinement of response options for better clarity (e.g., expanding Likert-scale definitions).
- Minor formatting changes to improve the visual layout.

5. CHAPTER 05 – Sampling and Data Collection

5.1 Target Population

Gamers:

- Individuals who currently play games on PCs, consoles, or mobile devices.
- Includes both casual and frequent gamers to ensure a diverse set of responses.

Geographic Region:

- Gamers located in Sri Lanka, as specified in the questionnaire.
- Further segmented by provinces (e.g., Western, Central, Southern) to account for regional differences in internet connectivity and infrastructure.

Demographics:

- Age group: 15–45 years, as this range represents the most active gaming demographic.
- Education levels: From high school to postgraduate, ensuring representation of varied backgrounds.

Technology Awareness:

- Gamers familiar with or interested in cloud gaming services

5.2 Sampling Strategy

Strata Definition:

- Divide the population into subgroups such as age, region, and primary gaming platform.

Sampling Within Strata:

- Randomly select participants within each subgroup. For example, ensure equal representation of PC and mobile gamers or age groups like 21–25 and 26–30.

Justification

- Stratified sampling avoids overrepresentation of one group (e.g., urban gamers) and ensures insights are comprehensive.

5.3 Sample Size

- **Minimum Size:** At least 100 participants, as suggested for meaningful analysis in small population
- **Considerations**:
- Confidence Level: 95%.
- Margin of Error: 5%.

5.4 Data Collection Process

1. **Survey Distribution**:
    - **Platform:** Use online tools like Google Forms for wide reach and convenience.
    - **Channels:** Share the survey through social media, gaming communities, and forums.
2. **Timeline**:
    - Allocate 2–4 weeks for responses to allow participants ample time to complete the survey.
3. **Pilot Testing**:
    - Distribute the questionnaire to a small group initially (e.g., 10–15 gamers) to identify and correct ambiguities.
4. **Ethical Considerations**:
    - Guarantee anonymity and confidentiality of responses.
    - Provide participants with an option to opt out.
5. **Follow-ups**:
    - Send reminders through email or social platforms to maximize response rates.

6. CHAPTER 06 – Statistical Analysis

6.1 Descriptive Statistics

This is our Descriptive Statistics analysis and we found the mean, median,mode,variance and standard deviation.

Data boundr	frequanc	Xm	F*Xm	F*Xm^2
			0	0
0.0 -9.5	26	4.75	123.5	586.625
			0	0
9.5-19.5	21	14.5	304.5	4415.25
			0	0
19.5-29.5	14	24.5	343	8403.5
			0	0
29.5-39.5	10	34.5	345	11902.5
			0	0
39.5-49.5	14	44.5	623	27723.5
			0	0
49.5-59.5	7	54.5	381.5	20791.75
			0	0
59.5-69.5	4	64.5	258	16641
			0	0
69.5-79.5	3	74.5	223.5	16650.75
			0	0
79.5-89.5	1	84.5	84.5	7140.25
	100		2686.5	114,255.13

mean	26.865
mode	7.97
median	21.64
variance	420.82
standred deviat	20.51

6.2 Hypothesis Testing

- Example Null Hypothesis (H_0): "Cost is not a significant factor influencing cloud gaming adoption."
- Tests to Use:
- t-Test: Compare satisfaction levels between groups (e.g., users from different regions).
- Chi-Square Test: Analyze associations (e.g., cost importance vs. adoption intention).

6.3 Correlation and Regression Analysis

Correlation Diagram

	Column 1	*Column 2*	*Column 3*	*Column 4*
Column 1	1			
Column 2	-0.33627	1		
Column 3	-0.60502	-0.48169	1	
Column 4	-0.47985	-0.20404	0.346003	1

In this column1, column2, column3, column4 in our questionaries we have mention it MCQ A, B, C and D.

Regression Diagram

This is we have got the only for the whole MCQ A answers.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.242398
R Square	0.058757
Adjusted R	0.023896
Standard Er	0.220366
Observatio	29

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regression	1	0.081848	0.081848	1.685468	0.20518
Residual	27	1.311152	0.048561		
Total	28	1.393			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*Upper 95.0%*
Intercept	0.268404	0.088309	3.03937	0.005216	0.087209	0.449599	0.087209	0.449599
1	0.00635	0.004891	1.298256	0.20518	-0.00369	0.016385	-0.00369	0.016385

This is what we have gotten the only for the whole MCQ B answers.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.215904
R Square	0.046615
Adjusted R	0.011304
Standard Er	0.173468
Observatio	29

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regression	1	0.039724	0.039724	1.320132	0.260645
Residual	27	0.812462	0.030091		
Total	28	0.852186			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*Upper 95.0%*
Intercept	0.308532	0.069515	4.438333	0.000138	0.165898	0.451166	0.165898	0.451166
1	0.004424	0.00385	1.14897	0.260645	-0.00348	0.012323	-0.00348	0.012323

This is what we have gotten only for the whole MCQ C answers.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.383215
R Square	0.146854
Adjusted R	0.115256
Standard Er	0.178933
Observatio	29

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regression	1	0.1488	0.1488	4.647559	0.040171
Residual	27	0.864455	0.032017		
Total	28	1.013255			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*Upper 95.0%*
Intercept	0.290433	0.071705	4.050388	0.000387	0.143307	0.43756	0.143307	0.43756
1	-0.00856	0.003971	-2.15582	0.040171	-0.01671	-0.00041	-0.01671	-0.00041

This is what we have get the only for the whole MCQ D answers.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.185741
R Square	0.0345
Adjusted R	-0.00126
Standard Er	0.083381
Observatio	29

ANOVA

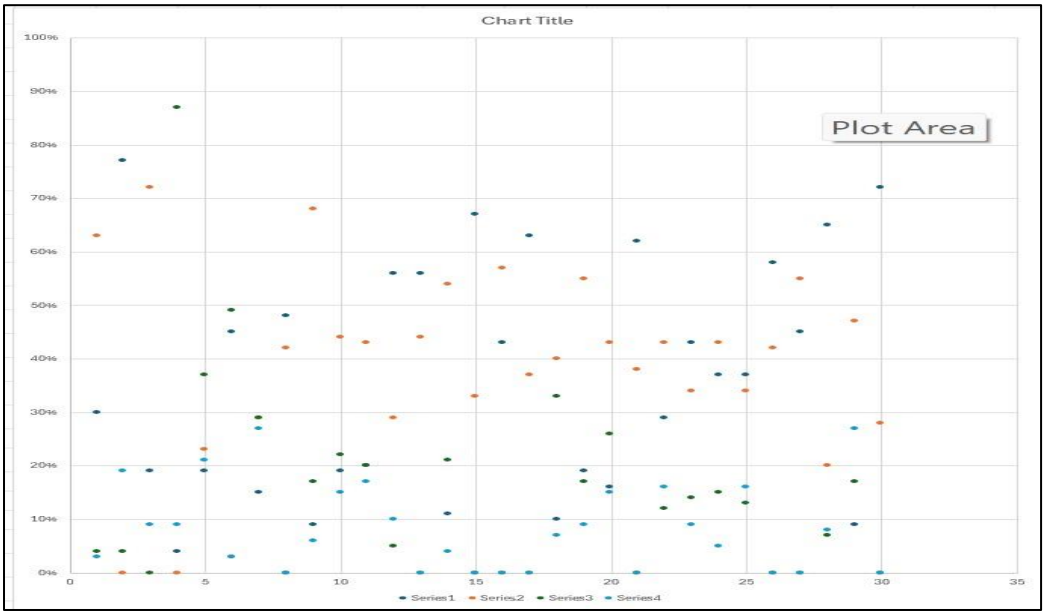
	df	*SS*	*MS*	*F*	*ignificance F*
Regression	1	0.006707	0.006707	0.964774	0.334707
Residual	27	0.187713	0.006952		
Total	28	0.194421			

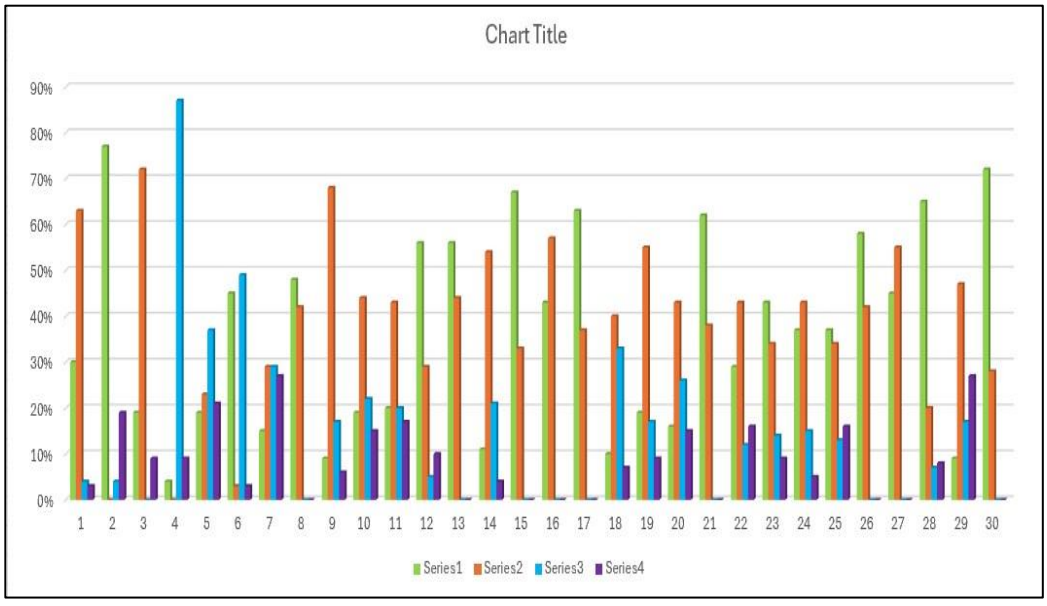
	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*Upper 95.0%*
Intercept	0.11598	0.033414	3.471026	0.00176	0.047421	0.18454	0.047421	0.18454
1	-0.00182	0.001851	-0.98223	0.334707	-0.00561	0.001979	-0.00561	0.001979

6.4 Probability Distribution

Identify patterns in responses, such as:

- **Poisson Distribution:** For event frequencies (e.g., gaming sessions per week).
- **Normal Distribution:** For continuous variables like satisfaction ratings.





7. CHAPTER 07 – Discussion and Recommendations

7.1 Discussion

- **Methodology**:
  - The team distributed questionnaires to 100 participants and collected data numerically.
  - Results were represented using statistical graphs, including pie charts, bar graphs, and scatter plots.
- **Findings**:
  - Responses were analyzed across multiple-choice questions (MCQ options A, B, C, and D).
  - Each MCQ option was evaluated to determine the percentage of votes, revealing user preferences and trends in key adoption factors.
- **Insights**:
  - Cost and affordability emerged as critical factors for cloud gaming adoption.
  - Technical performance, such as internet speed and low latency, heavily influenced user satisfaction.
  - Game library diversity was another significant factor impacting user decisions.
- **Conclusions from Analysis**:
  - Statistical tools confirmed strong correlations between user satisfaction and factors like service cost, internet speed, and game library size.
  - Data privacy and cross-platform support were also highlighted as important considerations for users.
- **Implications for Cloud Gaming Providers**:
  - Service improvements focusing on pricing flexibility, infrastructure upgrades, and content expansion were recommended.
  - Strategies should prioritize addressing technical and user experience challenges to boost adoption rates

7.2 Recommendations

Based on the analysis:

- **Improve Internet Speed:** Encourage providers to invest in better infrastructure.
- **Enhance Game Library:** Focus on exclusive titles to attract diverse audiences.
- **Flexible Pricing:** Introduce tiered subscription models to appeal to various income groups.
- **Data Privacy:** Strengthen measures to ensure user trust.

7.3 Conclusion

Summarize the study:

- Restate the key objectives and findings.
- Highlight the practical implications for cloud gaming service providers.
- Suggest areas for future research (e.g., deeper exploration of geographic disparities).

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