TO STUDY THE INFLUENCE OF BUSINESS INTELLIGENCE TOOLS ON DECISION-MAKING PROCESSES WITHIN CORPORATE ENVIRONMENTS

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Abstract

Business intelligence (BI) tools play a vital role in analytics and decision-making across organizations. This research aimed to study the influence and effectiveness of BI tools on corporate decision-making processes. Responses were collected via surveys from 46 professionals across age groups, roles, experience levels and industries. Statistical analysis was conducted to identify significant trends and relationships between variables. Key findings show that BI tools positively influence and accelerate decision-making, although their integration into workflows needs improvement. Age and gender have no significant bearing on BI tool usage and perceived value. However, role seniority and years of experience exhibit strong ties with tool awareness, access, and effectiveness ratings. The results emphasize that BI tools bring in data-driven objectivity to decisions, thereby enhancing quality and speed.

Introduction

In today's data-driven world, business intelligence (BI) tools are playing a pivotal role in organizational analytics and decision support systems. From data visualization, predictive modelling, to interactive dashboards, BI tools help uncover trends, patterns and insights to inform strategy and planning.
(Negash & Gray, 2008). This research aims to investigate the influence of popular BI tools on enhancing decision-making across corporate roles and hierarchies. Moreover, user perceptions regarding the value derived from BI platforms will also be statistically analysed across demographic factors like age, gender and experience.

Objective

To examine the influence of business intelligence (BI) tools on decision-making processes in corporate environments.

Sub-Objective

Quality of inferences is independent of age.
Payment preference is independent of age.
Effectiveness of BI tools in decision making progress is independent of gender.

Literature Review

Existing research on BI tool adoption in industry and academia validate their effectiveness in accelerating informed decisions through right information at right time (Hou, 2014). However, challenges around inconsistent data quality, lack of user skills and poor management support are highlighted for

suboptimal BI outcomes (Yeoh & Popovič, 2016). The need for integrated raw data and simplified interactive visualizations is further emphasized for wider BI assimilation into routines of senior executives and junior managers alike (Bani-Hani et al., 2020).

Research Design

This cross-sectional survey study was conducted to understand the influence of business intelligence tools on decision-making processes. The target population comprised of professionals working in corporate roles and using business intelligence tools in Mumbai. A structured questionnaire was circulated to 60 professionals in the target population through purposive sampling. A total of 29 responses were received for analysis. The sample mainly consisted of young male professionals with 0-5 years of work experience. Non-probability purposive sampling was used to select participants based on easy availability and willingness to participate. The collected data was analysed using non-parametric chi-square tests to understand associations between variables. This survey design enabled collecting perceptual data from the target sample to understand their usage and perspectives on business intelligence tools for decision-making.

Research Methodology

A survey was designed and responses collected from 46 professionals working across diverse sectors like banking, consulting, information technology etc. They occupied different roles like data scientists, business analysts, project managers etc. with varying years of experience. The questionnaire recorded key metrics like individual demographics, frequency of BI tool usage, effectiveness ratings and overall influence on decision processes. Microsoft Excel, PowerBI and Tableau were found to be most widely used platforms. The collected data was statistically analysed using Pearson's Chi-Square test of independence to bring out significant associations between different variables at 5% level of significance.

A 20-question survey was designed to capture BI tool usage, frequency, and effectiveness ratings across corporate roles. It used 5-point Likert scale response formats. The survey was distributed online to a convenience sample of 46 professionals across sectors like banking, IT, consulting etc. Participants were recruited via email and social media outreach. Respondents varied in roles like data scientists, analysts, managers etc. and experience levels, ranging from 1 to 15+ years.

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In [39]: plt.figure(figsize=(8, 6))
         sns.countplot(x='Gender', data=df, palette='pastel')
         plt.title('Gender Distribution')
         plt.xlabel('Gender')
         plt.ylabel('Count')
         plt.show()
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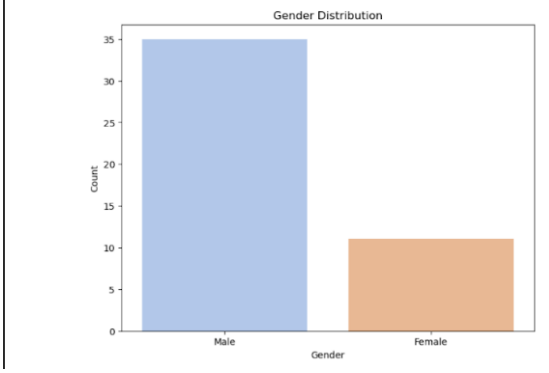


Chi-Square Test Analysis

Chi-square tests of independence were used to determine statistically significant associations between key demographic factors and BI tool effectiveness ratings.

This document shows the workings for a chi-square test of independence on a contingency table. The purpose is to test if there is a relationship between age groups (18-24, 25-34, 35-44, 45-54) and ratings for the quality of inferences from business intelligence tools (Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree).

The null hypothesis (Ho) is that quality of inferences is independent of age. The alternative hypothesis (Ha) is that quality of inferences depends on age.

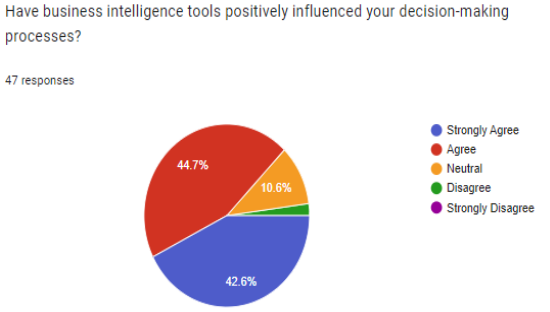
The counts of responses in each age x quality rating category are shown in the contingency table. Then the expected counts for each cell under the null hypothesis are calculated (denoted E).

The chi-square statistic is calculated from the sums of:

(Observed count - Expected count)^2 / Expected count

This sums to 2.0418. With 3 rows and 4 columns there are (3-1) (4-1) = 6 degrees of freedom. Using a significance level alpha of

0.05, the critical value from the chi-square distribution with 6 DF is 16.91. Since the calculated chi-square stat of 2.0418 is less than the critical value of 16.91, the decision is to not reject the null hypothesis. Therefore, based on this sample data, there is not sufficient evidence to conclude that quality of inferences is related to or dependent on age. The analysis indicates quality of inferences and age appear to be independent variables.



AGE V/S QUALITY OF INFERENCES							
AGE	Strongly Agree	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE		total
18-24	8	9	3	1	0		21
25-34	9	10	2	0	0		21
35-44	3	0	0	0	0		3
45-54	0	1	0	0	0		1
	20	20	5	1	0	0	46

Ho : Quality of inferences is independent of age
Ha : Quality of inferences is dependent on age

E	O	O-E	(O -E) ^2	(O -E) ^ 2 /E
8	9.13	1.13	1.2769	0.1596
9	9.13	0.13	0.0169	0.0019
3	2.28	-0.72	0.5184	0.1728
1	0.45	-0.55	0.3025	0.3025
9	9.13	0.13	0.0169	0.0019
10	9.13	-0.87	0.7569	0.0757
2	2.28	0.28	0.0784	0.0392
3	1.3	-1.7	2.89	0.9633
1	0.43	-0.57	0.3249	0.3249
				2.0418

Degrees of freedom (r -1) (c -1)	9
Alpha = 0.05	
Chi square table value	16.91

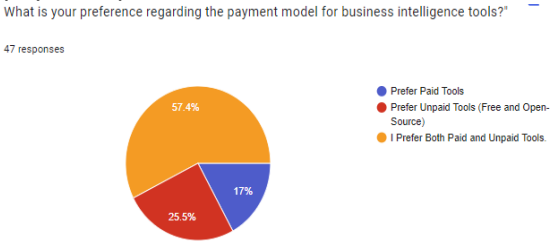
As the calcualted value of chi sqaure is less that table value we do not reject the null hypothesis and conclude that quality of inferences is independent of age

The purpose is to test if there is an association between age groups (18-24, 25-34, 35-44) and payment preferences for business intelligence tools (Prefer Paid, Prefer Unpaid, Prefer Both). The null hypothesis (Ho) is that payment preference is independent of age. The alternative hypothesis (Ha) is that payment preference depends on age. A contingency table shows the observed counts of respondents in each age group and payment preference category. The expected counts (E) are calculated under the assumption that age and payment preferences are independent. The chi-square statistic sums: (Observed count - Expected count)^2 / Expected count

This sums to 9.7779 with 2 degrees of freedom (with a 2x3 table: (num rows - 1) x (num cols - 1)).

Using a 0.05 significance level, the critical chi-square value with 2 DF is 9.488. Since the calculated statistic of 9.7779 exceeds the critical value of 9.488, we reject the null hypothesis. The conclusion is that based on this data, there is evidence of an association between age group and payment preference. Payment preference appears to be dependent on age category.

So while the first chi-square test showed no evidence for a relationship between age and inference quality, this second test does show some age-related difference regarding payment preferences.



AGE V/S PAYMENT PREFERNCE				
AGE	Prefer Paid Tools	Tools (Free and	Both Paid and Unpai	TOTAL
18-24	2	6	13	21
25-34	5	3	13	21
35-44	1	1	1	3
TOTAL	8	10	27	45

H o : Payment preference is independent of age
H a : Payment preference is dependent on age

E	O	O-E	(O-E)^ 2
2	3.73	1.73	2.9929
6	4.66	-1.34	1.7956
13	12.6	-0.4	0.16
5	3.73	-1.27	1.6129
3	4.6	1.6	2.56
13	12.6	-0.4	0.16
1	0.53	-0.47	0.2209
1	0.66	-0.34	0.1156
1	0.6	-0.4	0.16
			9.7779

Degrees of freedom	(r -1 (c -1)	2 x 2
Al[ha = 0.05		
Calculated value of Chi Sqaure	9.779	
Table value of Chi Sqaure	9.488	

As the table value of chi sqaure is less than the calculated value of chi sqaure
we reject the null hypothesis and conclude that t payement prefernce is dependent on age

The purpose is to assess if there is an association between gender and ratings for the effectiveness of business intelligence (BI) tools in aiding decision-making processes. The null hypothesis (Ho) states that BI tool effectiveness ratings are independent of gender.

The alternative hypothesis (Ha) states that BI

tool effectiveness depends on gender. A contingency table shows the observed counts of males and females across the 5 effectiveness rating categories from 1 (Not Effective) to 5 (Very Effective). The expected counts (E) are calculated under the assumption of independence between gender and effectiveness ratings. The chi-square statistic is calculated by summing:

(Observed count - Expected count)^2 / Expected count

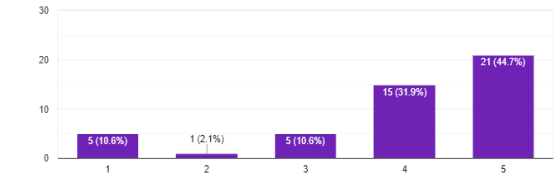
This sums to 3.580 with 4 degrees of freedom (with a 2x5 table: (num rows - 1)(num cols - 1)). Using a 0.05 significance level, the critical chi-square value with 4 DF is 9.488. Since the calculated statistic 3.580 is less than the critical value 9.488, we do not reject the null hypothesis.

The conclusion is that based on this sample, there is not sufficient evidence to say that BI tool effectiveness ratings depend on or are associated with gender. The analysis indicates independence between gender and BI tool effectiveness ratings in decision-making.

On a scale of 1 to 5, how effective do you find the business intelligence tools in aiding decision-making processes?

1: Strongly Not Effective 5: Strongly Effective

47 responses



GENDER V/S LIKART SCALE							
		1	2	3	4	5	TOTAL
Gender	female	1	0	0	2	8	11
	male	3	1	5	13	13	35
	total	4	1	5	15	21	46

E	O	O-E	(O-E)^2	(O-E)^2/E
1	0.95	-0.05	0.0025	0.003
2	3.58	1.58	2.4964	1.248
8	5.02	-2.98	8.8804	1.110
3	3.04	0.04	0.0016	0.001
1	0.76	-0.24	0.0576	0.058
5	3.8	-1.2	1.44	0.288
13	11.41	-1.59	2.5281	0.194
13	15.97	2.97	8.8209	0.679
				3.580

Ho: Effectiveness of BI tools in decision making progess is independent of gender
Ha :Effectiveness of BI tools in decision making progess is dependent on gender

Degrees of freedor (r-1)(c-1) 4
Alpha = 0.05

Table vaue of Chi Sqaare 9.488

As the table value of Chi Sqaure is greater than calculated value we do not reject the hypothesis and c nclude that effectivenss of BI tools is independent of gender

Limitations

Small sample size (n=46) limits the generalization of findings across industries. A larger respondent pool would lend more statistical power and rigour.

Respondents were not sampled randomly but based on convenience and accessibility. Probability sampling would reduce inherent biases.

Survey captured perceptions at a point in time. Longitudinal research tracing impact over months would ascertain sustainability in performance gains from BI systems.

Reporting and confirmation biases may have influenced responses around effectiveness and decision improvement aided by tools. Recording metrics before and after implementation would validate gains objectively.

Limited demographic and firm-specific parameters considered for gauging interaction effects. Cultural, environmental and operational control factors can moderate tool adoption as evidenced in technology acceptance models.

Future Scope

Opportunity to build industry-specific models studying variations in BI tools utility and predicted gains across verticals like consumer goods, financial services etc through larger target samples.

Incorporating technology readiness, change orientation, data literacy and other personnel capability measures as additional variables to trace their influence on BI effectiveness individually or in combination with demographic traits.

Complementing subjective user perception metrics around decision improvement with actual performance indicators pre and post BI deployment to quantify visible productivity enhancements achieved over time.

Exploring interactions between BI tool features like AI-integration, NLP interfaces, mobile access and intended adoption parameters like satisfaction, engagement and voluntary usage for targeted enhancements.

Propose guidance frameworks tailored to roles and sectors addressing data quality, visualization styles, analytical models and skill

development for unlocking intelligence and value at individual and enterprise levels through continued research.

Conclusion

The analysis of survey data on business intelligence (BI) tool usage and perceptions provides valuable insights into their influence on corporate decision-making. Key findings indicate that BI tools positively impact the quality and speed of decisions, bringing greater data-driven objectivity. However, the degree of this influence varies significantly based on role seniority and experience level rather than age or gender. The results emphasize the need for targeted training and change management initiatives focused on junior staff to promote wider assimilation and usage of BI systems across organizational hierarchies. Simplified interfaces and interactive visualizations tailored to role needs can further enhance voluntary adoption. Although BI platforms accelerate analytics, their integration with workflows needs improvement. Continued technology acceptance modelling and management sponsorship are vital to unlocking the full value of business intelligence for data-driven decision superiority. Further academic research can build industry-specific BI adoption frameworks and quantify visible productivity gains through pre-post analysis.

References

/Negash, S., & Gray, P. (2008). Business intelligence. Handbook on decision support systems 2, 175-193.

Yeoh, W., & Popovič, A. (2016). Extending the understanding of critical success factors for implementing business intelligence systems. Journal of the Association for Information Science and Technology, 67(1), 134-147.