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University business consultancy

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Abstract

Although there are studies regarding university business consultancies. This data set "Business Consultancy - UNICOLMAYOR" provides the response rate of the business consultancy service received by the business consultancy of the Universidad Colegio Mayor de Cundinamarca – Unicolmayor" of the business consulting advisors to questions posed by four constructed identities [i.e., gender (male, female) x Type of Advisor (entrepreneur, Entrepreneur)]. The purpose of this study was to determine the quality of the business advisory service received from the business consultancy of the Universidad Colegio Mayor de Cundinamarca.

323 entrepreneurs and businessmen participated. They completed an online survey divided into sections such as characterization, the analysis of contingency tables and the Chi-Squared Tests. And Vovk-Sellke was found to accept the alternative hypothesis (H1): "There is a significant association between the variables Gender and Type of Adviser, with a greater participation of the female gender in the entrepreneurial category, reinforcing the hypothesis and Chi-Squared."

In the Bayesian contingency table, the categories of Gender, Type of Advisee and four Age Ranges converged. The Bayes Factor 10 indicates the independence between the age of the advisee and their gender, the Log Odds Ratio quantified the strength of the relationship between variables for a 95% credibility for the interval between 18 years and 25 years, which observes that the BF_{10} = 797 and BF_{01} of 0.00125 with the central value record of 1857. There is a relationship or association between the variables Gender and Type of Adviser.

Keywords: University Business Consulting, perception of quality, business consulting.

Introduction

There are many universities not only in Colombia but throughout the world that have been betting on training not only their students but also microentrepreneurs, as a way to strengthen the entrepreneurial spirit. Which has not only generated valuable experience in terms of strengthening the relationship between teachers and their students, as well as between teachers and microentrepreneurs and microentrepreneurs with students, in this sense, Zúñiga (2007) states that: Business Consultancy allows the knowledge obtained in the academy to be applied for the benefit of the community, at the same time, students can gain some experience and develop skills that lead them to be a highly competitive professional.

Business consultant are understood mainly as strategies for linking and strengthening students in training with the community and the work area in which they are projected, where not only the users of the office benefit but also the providers of the consulting services, which in this case are the students. (Alvear - Pájaro, 2022). In addition, the limitations that entrepreneurs have must be taken into account, such as the lack of knowledge about managing a company, that is why a business consultancy is important to provide that support in a consultancy.

Higher education institutions (HEIs) have promoted interaction with the industry and new ecosystems through the National Development Plan 2018-2022 – Pact for Colombia, which covers economic, cultural, political and administrative aspects; This merger allows the realization of projects aimed at structuring dynamics directed to generating knowledge with high impact on the organizational sector to which it is directed. (Guerrero et al., 2021)

In that sense, higher education institutions (HEIs) are the main axis so that the consulting system can be promoted with the aim of strengthening entrepreneurship in the country, what the "National Development Plan for the period 2018-2022" seeks, this facilitates the employment generation and strengthens collaboration between universities and the business sector.

Advice and consulting currently emerge as first rate tools in the business world, the complexity of markets and the urgent need to increase their levels of competitiveness make these services a timely package to add value to businesses. (Álvarez Contreras & Jiménez Lyons, 2020).

From the above, it can be inferred that university business consultancies are both educational and business initiatives that can be set with objectives that take advantage of the practical experience of students with the provision of consulting services to microbusinesses and entrepreneurs.

These business consultancies are linked to educational institutions, such as universities and business colleges and their main objective is to facilitate experiential learning for students while providing support to the local business community. A collaboration between universities and the business sector must be proposed, which will allow obtaining benefits by being able to share knowledge and resources, just as technology transfer and strengthening in terms of innovation can be carried out. According to that, Bianchini et al., (2016) states that: More generally, university-industry relations (including consulting) may benefit students by creating new or better job opportunities.

Studies looking at the relationship between academic consulting and research performance are rare when compared to the attention placed on other forms of knowledge transfer activities such as patenting, spin-off activities or joint-research partner ships. (Rentocchini et al., 2014), from which it can be infer the need to carry out more research and analysis in the field of academic consulting and seek to have a great impact in the field of research, what is important for knowledge transfer and collaboration between academia and the business sector.

In recent years, university–industry relationships have been extensively studied by academic researchers and have often been debated by policymakers. (Bodas Freitas et al., 2013), from the academic field, work has been done to

strengthen the relationship with the business sector, which includes improving training provided by business consultancies run by universities.

Business consultancies of the universities, apart from the strong collaboration with the business sector and apart from providing a consulting service, they seek to transfer knowledge and scientific research methods to provide solutions to specific problems. This is why Muscio et al., (2013) infer that: There is increasing awareness in industrialised countries of the importance of scientific research in creating the foundations for technological change and economic competitiveness.

The role of the university cannot be viewed as an isolated efort; it must be in rapport with private companies and supported by public policies. Even from training, entrepreneurship must be considered from the joint effort of the actors with whom an entrepreneur interacts. (Morales et al., 2022), so the collaboration that can occur between the university, private companies and public policies is very important to promote entrepreneurship because the business consultant of the universities can offer adequate training to entrepreneurs and microentrepreneurs.

Consulting is a tool that must be considered as a pedagogical initiative, because it is an extension activity, for that reason, it becomes a timely strategic resource to add significant value to your business environment. Therefore, entrepreneurial education takes different forms and encompasses multiple contents in the learning process, requiring different pedagogical initiatives, such as extension activities. (Moraes et al., 2022)

Likewise, we are in a rapidly advancing digital age, therefore, universities must take advantage of that relationship that is fundamental with entrepreneurs and micro-entrepreneurs, because it will allow them to have a positive impact on Society.

Nowadays, all organizations (large and small) face relevant situations: new management trends, use of technological tools, more advanced software, multichannel and omnichannel, etc. However, it is observed that, in particular, MSEs do not accept and do not use ICT tools, which prevents them from taking advantage of potential growth opportunities. (Vásquez Reyes, 2021, p. 273).

The economic activities carried out by microbusinesses range from small neighborhood miscellaneous goods to specialized consulting services, including the liberal professions, street sales and home-made clothing. (Dane, 2022), this means that there is a wide range of economic activities that fall into the category of microbusinesses, which lack advice that allows them to compete in a specific market.

At a global level, internally in companies there is enormous concern about the adoption of information and communication technologies that allow them to improve their performance, optimize their processes and even accelerate their distribution chain. (Nogales Ballesteros & Goyzueta Rivera, 2021). In summary, the importance of technology in the business world is highlighted and how a University Business Consultant can play a relevant role in providing support and advice to local companies in the adoption of information and communication technologies to improve their performance and competitiveness.

Finally, the university business consultancy will provide an enormous experience for both teachers and students who carry out their internships, thus contributing to students achieving the development of business and consulting skills, as they learn and apply theoretical and practical concepts in the company of entrepreneurs or micro-entrepreneurs, thus strengthening their professional life.

Methodology

323 entrepreneurs and businessmen participated, who completed an online survey divided into sections such as characterization, analysis of contingency tables and the Chi-Squared Tests. Y Vovk-Sellke Maximum p -Ratio: Based the p -value, the maximum possible odds in favor of H_1 over H_0 equals $1/(-e\ p \log(p))$ for $p \leq .37$ (Sellke, Bayarri, & Berger, 2001).

Data description

This data set "Business Consultancy" - Universidad Colegio Mayor de Cundinamarca (2021), provides the response rate of the business advisory service received by the business consultancy of the Universidad Colegio Mayor de Cundinamarca - Unicolmayor, from the consultancies of the consultancy to questions posed by four constructed identities [i.e., gender (male, female) x Type of Advisee (entrepreneur, Entrepreneur)].

Variables

Gender: Row – identity constructed in business consulting (F = Female, M = Male).

Type of Advisee: Column Classification constructed in university business advice (EM = Entrepreneur, EP = Entrepreneur).

Count: Count - the rating number that the business advisory service received from the business consultancy of the Universidad Colegio Mayor de Cundinamarca. (from 1 to 5, with 5 being the highest rating) that are included in the combination of categories.

This work prepared in JASP Team (2022). JASP (Version 0.16.3) [Computer software]. Demonstrate the use of a Chi-Squared test of independence. Specifically, we will evaluate the suitability of the null hypothesis that all identities have the same perception of the probability of obtaining quality in the business advisory service received from the business consultancy of the Universidad Colegio Mayor de Cundinamarca.

Below, Table 1 shows the data summarized in a contingency table. The highest response rate observed was female entrepreneur with an expected response rate of: 600.128

Table 1 Types of advisees by gender

		TYPES OF ADVISORS		
GENDER		**ENTREPRENEUR**	**BUSINESS PERSON**	**Total**
FEMALE	Count	628.000	283.000	911.000
	Expected count	600.128	310.872	911.000
	% within row	68.935 %	31.065 %	100.000 %
	% of total	43.824 %	19.749 %	63.573 %
MALE	Count	316.000	206.000	522.000
	Expected count	343.872	178.128	522.000
	% within row	60.536 %	39.464 %	100.000 %
	% of total	22.052 %	14.375 %	36.427 %
Total	Count	944.000	489.000	1433.000
	Expected count	944.000	489.000	1433.000
	% within row	65.876 %	34.124 %	100.000 %
	% of total	65.876 %	34.124 %	100.000 %

Cumulatively, the relative response rates refer to participation within the female category, the type of entrepreneurial advisor with 68.935 %, which is higher than the type of business advisor that registers 31.065 %, on the other hand, the male category presents 60.536 %. for entrepreneurs and 39.464 % for business person.

Next, and in order to evaluate the null hypothesis Ho in which there is no significant association or relationship between the categorical variables or the alternative hypothesis H1 in which it does exist, we proceed with the Chi-Squared test:

Null hypothesis (H0): There is no significant association between the two variables (Gender and Type of Adviser)

Alternative hypothesis (H1): There is a significant association between the variables Gender and Type of Adviser.

Table 2 Chi-Squared Tests

	Value	**df**	**P**	**VS-MPR***
X^2	10.413	1	0.001	43.996
X^2 continuity correction	10.043	1	0.002	37.108
Likelihood ratio	10.324	1	0.001	42.232
N	1433			

* Vovk-Sellke Maximum *p* -Ratio: Based the *p* -value, the maximum possible odds in favor of H_1 over H_0 equals 1/(-e *p* log(*p*)) for $p \leq .37$ (Sellke, Bayarri, & Berger, 2001).
Considering that the value of X^2 10.413 is greater than 0.001 and 0.002, it can be stated that the null hypothesis is rejected and the alternative Hypothesis (H1) is accepted: "There is a significant association between the variables Gender and Type of Adviser." In addition, there is a degree of freedom of 1 and a Likelihood ratio of 10.324.

In order to establish the strength and direction of the relationship between the categorical variables, the table that summarizes these criteria is presented.

Nominal	**Value**
Contingency coefficient	0.085
Phi-coefficient	0.085
Cramer's V	0.085
Lambda (rows)	0.000
Lambda (columns)	0.000
Lambda (symmetric)	0.000

In summary, Contingency coefficient, Phi-coefficient and Cramer's V demonstrate a weak association between the variables, a fact that is revalidated with the figures in zeros of Lambda (rows), Lambda (columns) and Lambda (symmetric) that demonstrate no relationship between the columns.

Results

Next, and through the Bayesian contingency table, the categories of Gender, Type of Adviser and four Age Ranges come together:

Table 3 Bayesian Contingency Tables

Contingency Tables					
			TYPE OF ADVISOR		
ADVISOR AGE	**GENDER**		**ENTREPRENEUR**	**BUSINESSPERSON**	**Total**
Between 36 years	FEMALE	Count	157.000	160.000	317.000
		% of total	35.682 %	36.364 %	72.045 %

and 50 years					
	MALE	Count	42.000	81.000	123.000
		% of total	9.545 %	18.409 %	27.955 %
	Total	Count	199.000	241.000	440.000
		% of total	45.227 %	54.773 %	100.000 %
Between 18 years and 25 years	FEMALE	Count	211.000	5.000	216.000
		% of total	55.381 %	1.312 %	56.693 %
	MALE	Count	142.000	23.000	165.000
		% of total	37.270 %	6.037 %	43.307 %
	Total	Count	353.000	28.000	381.000
		% of total	92.651 %	7.349 %	100.000 %
Between 26 years and 35 years	FEMALE	Count	147.000	34.000	181.000
		% of total	53.650 %	12.409 %	66.058 %
	MALE	Count	63.000	30.000	93.000
		% of total	22.993 %	10.949 %	33.942 %
	Total	Count	210.000	64.000	274.000
		% of total	76.642 %	23.358 %	100.000 %
More than 50 years	FEMALE	Count	113.000	84.000	197.000
		% of total	33.432 %	24.852 %	58.284 %
	MALE	Count	69.000	72.000	141.000
		% of total	20.414 %	21.302 %	41.716 %
	Total	Count	182.000	156.000	338.000
		% of total	53.846 %	46.154 %	100.000 %
Total	FEMENINO	Count	628.000	283.000	911.000
		% of total	43.824 %	19.749 %	63.573 %
	MASCULINO	Count	316.000	206.000	522.000
		% of total	22.052 %	14.375 %	36.427 %
	Total	Count	944.000	489.000	1433.000
		% of total	65.876 %	34.124 %	100.000 %

In attention to what is recorded in the contingency table, it was estimated that for the ranges between 36 years to 50 years it is evident that at the gender level the lowest participation occurs for males with 27.955 %, while for the female category there is 72.045%. % that is broken down into 35,682 % who declare themselves entrepreneurs and 36,364 % as entrepreneurs. For the range of 26 years to 35 years, it is distributed with 66,058 % female and 33,942 % male, in which 53,650 % corresponds to entrepreneurial women.

For the range between 18 years and 25 years, the entrepreneur category covers 92.651%, while businessmen comprise 7.349%, in which a greater participation of female entrepreneurs stands out with 55.381 %; Finally, for the range of those over 50 years of age, a participation of 53,846 % for women and 46,154 % for men stands out, in which the highest representation is in charge of female entrepreneurs with 33,432 %.

Table 4 Bayesian Contingency Tables

Bayesian Contingency Tables Tests		
Adviser Age		**Value**
Between 36 years and 50 years	BF_{10} Independent multinomial	9.265
	N	440
Between 18 years and 25 years	BF_{10} Independent multinomial	797.225
	N	381
Between 26 years and 35 years	BF_{10} Independent multinomial	2.804
	N	274
More than 50 years	BF_{10} Independent multinomial	0.440
	N	338
Total	BF_{10} Independent multinomial	11.439
	N	1433

Note. For all tests, the alternative hypothesis specifies that the FEMALE group is not equal to MALE.

The Bayes Factor 10 indicates the independence between the age of advisors and their gender, thus, for the ranges between 36 years to 50 years and between 18 years to 25 years, there is no evidence of moderate or strong evidence of the independence between the two variables, on the other hand, for the traits between 26 years to 35 years and Over 50 years, although it is true that there is moderate evidence of independence, it is not as strong as the two previous ranges, in summary and for the total of 11,439 the moderate behavior of independence between the age of advisors and their gender is confirmed.

The Log Odds Ratio, as a statistical measure for categorical data, quantifies the strength of the relationship between variables for a 95% credibility for the interval.

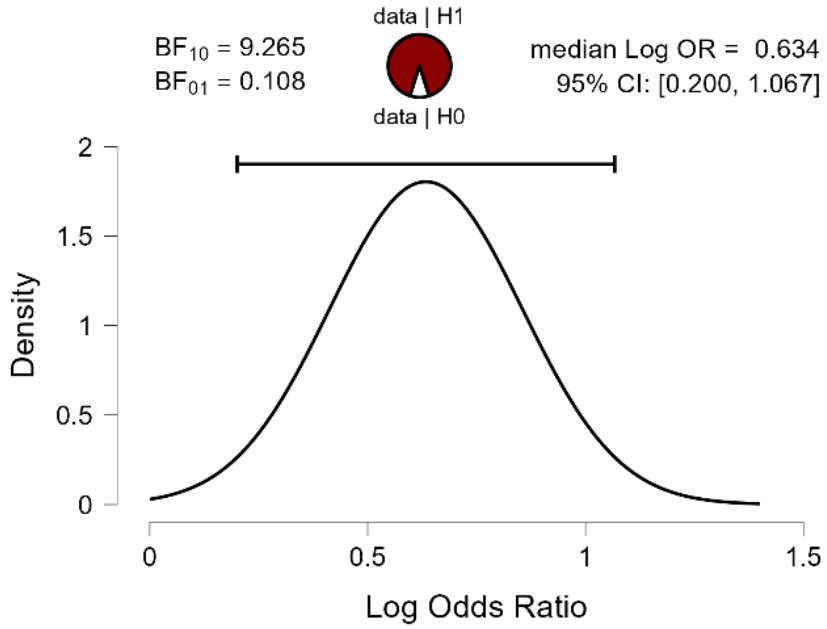
Table 5 Log odds ratio

		95% Credible Interval	
Advisor Age	**Log Odds Ratio**	**Lower**	**Upper**
Between 36 years and 50 years	0.634	0.200	1.067
Between 18 years and 25 years	1.857	0.897	2.818
Between 26 years and 35 years	0.723	0.150	1.296
More than 50 years	0.337	-0.097	0.771
Total	0.369	0.146	0.591

Below are the distribution graphs of the Log Odds Ratio in a Bayesian hypothesis test for each age range.

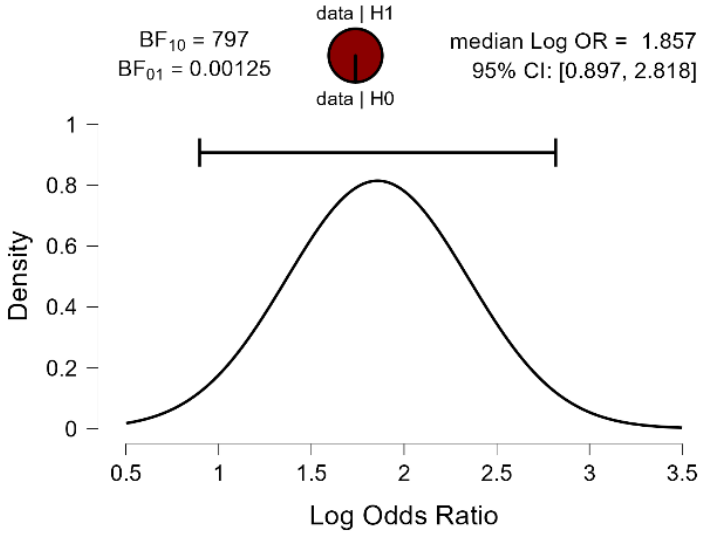
In Figure 1 it can be seen that the BF_{10} = 9.265 shows support for the alternative hypothesis in which there is a relationship between gender and the type of associate when compared with the null hypothesis, in which this relationship does not exist or is inverse, on the other hand, the BF_{01} of 0.108 is less than 1, concluding that the data are approximately 0.108 times more probable under the null hypothesis than under the alternative hypothesis, with a central value of 0.634.

Figure 1 Age of the advisor = Between 36 years to 50 years - GENDER - TYPE OF ADVISOR



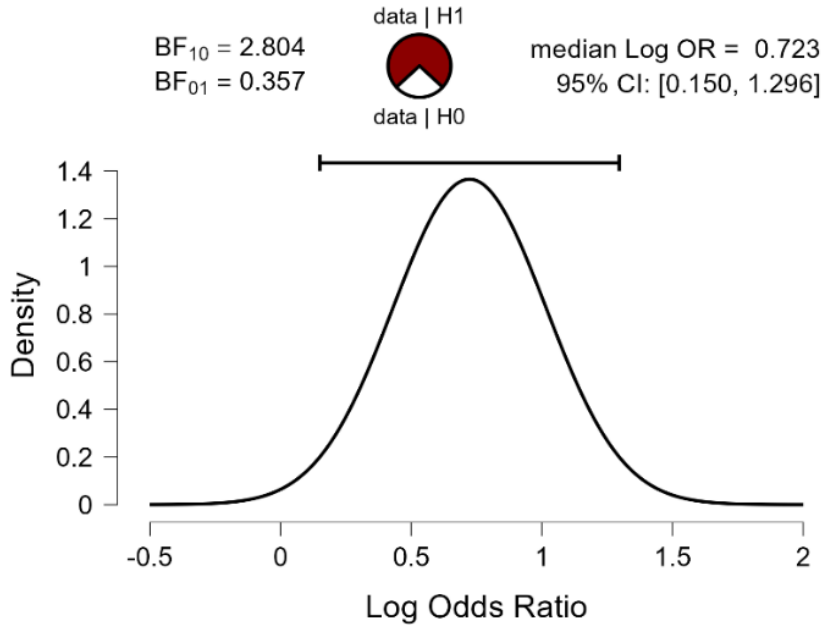
In Figure 2 it can be seen that the BF_{10} = 797 shows strong support for the alternative hypothesis when compared with the null hypothesis, on the other hand, the BF_{01} of 0.00125 is less than 1, concluding that the data are very far away 0.00125 times, being more probable under the null hypothesis than under the alternative hypothesis, with a central value of 1.857.

Figure 2 Age of the advisor = Between 18 years to 25 years - GENDER - TYPE OF ADVISOR



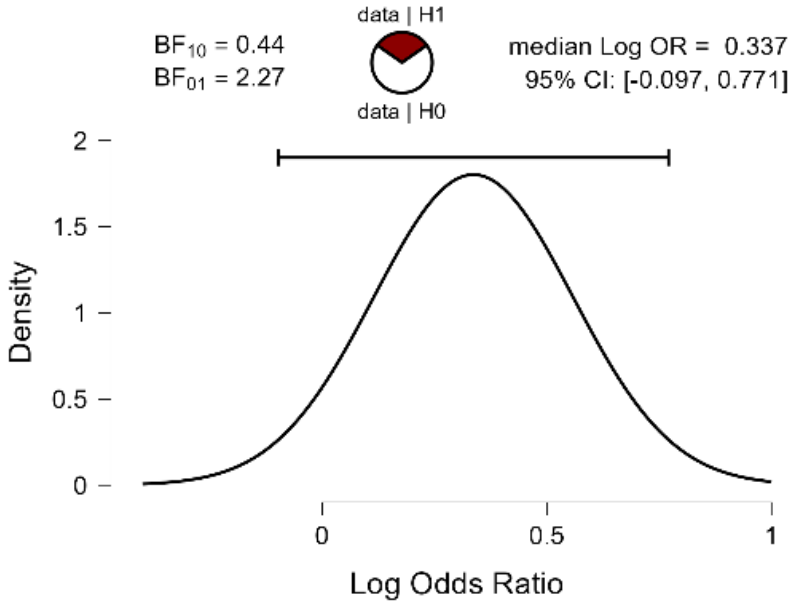
In Figure 3 it can be seen that the BF_{10} = 2.804 shows support for the alternative hypothesis: relationship between gender and type of associate when compared with the null hypothesis; on the other hand, the BF_{01} of 0.357 is less than 1, concluding that the data are approximately 0.108 times more likely under the null hypothesis than under the alternative hypothesis, with a central value of 0.723.

Figure 3 Age of the advisor = Between 26 years to 35 years - GENDER - TYPE OF ADVISOR



In Figure 4, it can be concluded that for the range of more than 50 years, the BF_{10} = 0.44 does not show support for the alternative hypothesis: relationship between gender and type of partner when compared with the null hypothesis, on the other hand, the BF_{01} of 2.27 greater than 1, concludes that the data are approximately 2.27 times less probable under the null hypothesis than under the alternative hypothesis, with a central value of 0.771.

Figure 4 **Age of the advisor = More than 50 years - GENDER - TYPE OF ADVISOR**



Conclusions

Although it is true, consulting as an extension agent of Higher Education Institutions is broad and has practical implications of relevance in fields such as the world of entrepreneurship, even today, gaps persist in research that from a broad base of knowledge opportunities, covering an endless number of options that from various methodologies would provide new perspectives for decision-making in consulting, as well as potential practices in order to give an accurate reading of entrepreneurs and businessmen who can be impacted in ways as diverse as they are positive in which processes reduce their inaccuracies and increase the organizaitons profits through innovation and technology transfer. However, the source of knowledge cannot be simply relegated to an actor; it must transcend the academy, which is its natural source, towards the Company and the State, not only within the internal heart of these institutions but beyond, in a scenario that involves interested parties in comprehensive training processes in which the appropriation of knowledge for students and teachers is significantly strengthened.

Regarding the results obtained from the data, methodology and data processing in the first part, it was found that the alternative hypothesis (H1) is accepted: "There is a significant association between the variables Gender and Type of Adviser, in terms of the contingency table, initially a greater participation of the female gender is found in the entrepreneurial category, thus reinforcing the hypothesis and its evaluation via Chi-Squared. In addition, and using the Bayesian contingency table, the categories of Gender, Type of Adviser and four Age Ranges converged: between 36 years to 50 years, between 18 years to 25 years, between 26 years to 35 years and over 50 years in which revalidate the entrepreneurial vocation of the female category, however, the Bayes Factor 10 indicates the independence between the age of the advisee and their gender, while the Logarithm of the Odds Ratio quantified the strength of the relationship between variables for a 95% credibility for the interval that in the majority of age ranges demonstrated the existence of some relationship between Gender and Type of Advisee, in which the range between 18 years and 25 years draws powerful attention, which observes that the BF_{10} = 797 and BF_{01} of 0.00125 with the log center value of 1.857.

Finally, the study determined that there is a relationship or association between the variables Gender and Type of Adviser, in which the female category is an entrepreneur and the male category tends more to be an entrepreneur, likewise and although it is true, there is independence, Age ranges are provided in which Gender and Type of Advisor present a relationship.

References

1. Álvarez Contreras, D.E. & Jiménez Lyons, K.A. (2020). La consultoría y asesoría: aliada estratégica para el fortalecimiento empresarial de las mipymes en Colombia. Tendencias, 21(1), 252-271. https://doi.org/10.22267/rtend.202101.136
2. Alvear - Pájaro, R. (2022). Importancia de los consultorios empresariales en Instituciones de Educación Superior. Revista Científica Profundidad Construyendo Futuro, 17(17), 62–75. https://doi.org/10.22463/24221783.3826
3. Bianchini, S., Lissoni, F., Pezzoni, M. & Zirulia, L. (2016) The economics of research, consulting, and teaching quality: theory and evidence from a technical university, Economics of Innovation and New Technology, 25:7, 668-691, DOI: 10.1080/10438599.2015.1114340
4. Bodas Freitas, I.M., Geuna, A. & Rossi, F. (2013). Finding the right partners: Institutional and personal modes of governance of university–industry interactions, Research Policy, Volume 42, Issue 1, 2013, Pages 50-62, ISSN 0048-7333, https://doi.org/10.1016/j.respol.2012.06.007
5. Dane (2022). Encuesta de Micronegocios (EMICRON). I Trimestre de 2022. Boletín Técnico. Obtenido en: https://www.dane.gov.co/files/investigaciones/boletines/ech/micro/bol-micronegocios-I2022.pdf
6. Guerrero, M.I., Zapata, M.I. & Zapata, L.C. (2021). Estructuración de un consultorio empresarial para la competitividad organizacional como unidad académico-administrativa. Tecnológico de Antioquía, institución universitaria. Recuperado de: https://www.redalyc.org/journal/5518/551872420005/html/

7. Moraes, G.H.S.M., Iizuka, E.S., Rocha, A.K.L. & Diaféria, A.M. (2022). Junior enterprise and entrepreneurial behavior in Brazil. Innovation and Management Review, 19(2), pp. 156–172
8. Morales, G.L.O., Aguilar, J.C.R. & Morales, K.Y.L. Culture as an obstacle for entrepreneurship. J Innov Entrep 11, 46 (2022). https://doi.org/10.1186/s13731-022-00230-7
9. Muscio, A., Quaglione, D. & Vallanti, G. (2013). Does government funding complement or substitute private research funding to universities?, Research Policy, Volume 42, Issue 1, 2013, Pages 63-75, ISSN 0048-7333, https://doi.org/10.1016/j.respol.2012.04.010
10. Nogales Ballesteros, L. S. & Goyzueta Rivera, S. I. (2021). Factores que influyen en la apertura a las Tic y capacidad de innovación en pymes de Cochabamba del sector industrial. Revista Investigación y Negocios, 14(23), 16-31. Epub 30 de junio de 2021.https://doi.org/10.38147/invneg.v14i23.125
11. Rentocchini, F., D'Este, Manjarrés-Henríquez, L. & Grimaldi, R. (2014). The relationship between academic consulting and research performance: Evidence from five Spanish universities, International Journal of Industrial Organization, Volume 32, 2014, Pages 70-83, ISSN 0167-7187, https://doi.org/10.1016/j.ijindorg.2013.11.001
12. Sellke T, Bayarri MJ, Berger JO. (2001). Calibration of p values for testing precise null hypotheses. Am Stat 2001; 55:62-71.
13. Universidad Colegio Mayor de Cundinamarca (2021). Unicolmayor. Recuperado el 16 de enero de 2022: https://portalold.unicolmayor.edu.co/portal/index.php?idcategoria=24779
14. Vásquez Reyes, Edgar Fernando. (2021). Factores críticos para la adopción de las TIC en micro y pequeñas empresas industriales. Industrial Data, 24(2), 273-292. Epub 31 de diciembre de 2021.https://dx.doi.org/10.15381/idata.v24i2.20736
15. Zúñiga, C. (2007). Propuesta de un modelo de consultorio empresarial para la facultad de ciencias de la administración de la universidad del valle. Valle del Cauca, Colombia.