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Social media management: Choose measures of success on Instagram

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Abstract

This study aims to demonstrate the different results of particular methods applied for answering the same research question. By conducting field study, Instagram marketing communication of higher education institutions is empirically investigated. This study provides insights into measures of user engagement on Instagram and to shed the lights on their differences by applying these metrics on real data. The results demonstrate that a) liking and commenting should be studied as separate constructs; b) the level of granularity chosen is important in evaluating Instagram marketing communication; c) control variables should not be neglected in evaluating Instagram marketing communication; d) likes(comments)-to-followers ratio is not appropriate variable to measure user engagement; e) including quasi-moderators to conceptual frameworks should be considered based on literature review. Thus, the contribution of this research is two-fold. On a theoretical level, it enhances the existing knowledge base on Instagram user engagement and construct operationalisation appropriate for studying user engagement. On a practical level, the findings from this study could guide evaluation of marketing and communication strategies for brands that employ Instagram as part of their digital marketing mix.

1. Introduction

The advent of the digital age has ushered in transformative shifts in how organizations communicate with their target audiences. Specifically, the proliferation of social media platforms has not only democratized information dissemination but also strategically redefined marketing paradigms. This has led to an increased usage of social media platforms as strategic marketing tools to engage consumers (Schultz, 2017). Among these platforms, Instagram stands out for its visually rich interface (Ting et al., 2015) and has thus emerged as a complex yet potent tool for marketers. According to Voorveld (2019), Instagram marketing represents a fertile ground for academic investigation, opening up avenues for research that could have profound implications for both theory and practice.

Consumer engagement is a fundamental construct for evaluating the effectiveness of social media marketing (see Schivinski et al., 2016; Lee et al., 2018; Aydin, 2020). As recent studies suggest (see Deng et al., 2023; Tafesse & Dayan, 2023; Tafesse & Wood, 2023), user engagement remains a focus of academic attention today. Despite the growing body of literature on user engagement with brand posts on social media (see Moro et al., 2016; Lee et al., 2018; Karpinska-Krakowiak & Modlinski, 2020), there are still substantial gaps in understanding the intricacies of engagement measurement and its influencing factors, specifically on Instagram. Deng et al. (2023) conducted a systematic review of literature, presenting an integrative framework that identifies key predictors of consumer engagement with brand posts on social media platforms. While their investigation offered noteworthy insights, it also unveiled a lack of Instagram-focused research, with only 12 out of 82 studies addressing this area. In addition, though current literature provides insights into operationalizing the construct of user engagement, there remains a void concerning the precise ways to study these variables and its predictors.

In response to this gap, this study aims to demonstrate the different results of particular methods applied for answering the same research question. By conducting field study, Instagram marketing communication of higher education institutions is empirically investigated. This study provides insights into measures of user engagement on Instagram and to shed the lights on their differences by applying these metrics on real data. Thus, the contribution of this research is two-fold. On a theoretical level, it enhances the existing knowledge base on Instagram user engagement and construct operationalisation appropriate for studying user engagement. On a practical level, the findings from this study could guide evaluation of marketing and communication strategies for brands that employ Instagram as part of their digital marketing mix.

2. Engagement

Engagement represents reactions of consumers or users on social media platforms. The terminologies utilized in the academic literature are varied; some refer to it as 'user engagement', while others call it 'social media engagement' or 'consumer engagement'. Despite the differences in terminology, the focus remains on the same underlying concept of gauging audience interaction with a post or social media account. The term user engagement will be used in the following text.

Numerous scholars, including De Vries et al. (2012), Peters et al. (2013), Schivinski et al. (2016), and Lee et al. (2018), universally concur that user engagement serves as an essential construct for evaluating the effectiveness of social media marketing. For Instagram, key measures of user engagement include views, likes, comments, and shares. These metrics can be accessed by an influencer or a brand through their profile, providing insight into the interaction between their content and the audience. However, among these metrics, only likes and comments are publicly accessible, posing limitations to external analysis. Given these considerations, conducting field studies (see Aydin, 2020; Devereux et al., 2020) provides an appropriate methodological approach for investigating user engagement, as it allows for in-depth, real-world exploration of the complex interplay between users, brands, and content within the social media landscape.

Case:

The higher education sector, acknowledged as dynamic and fiercely competitive (Chapleo & O'Sullivan, 2017), has found it imperative to adopt business-like practices and procedures (Gunina et al., 2019), with a focus on effective branding and marketing communication. As is the case with many organizations across industries, higher education institutions (HEIs) have leveraged social media as an indispensable marketing tool (Momen et al., 2019). However, merely establishing an online presence is insufficient (Bélanger et al., 2014; Carrillo-Durán & García, 2020). Universities are urged to create and publish content that is not only relevant but also appealing to their target audience (Sandvig, 2016).

Vividness, or media richness (see e.g. Shahbaznezhad et al., 2021), is related to perception and, according to Coyle and Thorson (2001) and De Vries et al. (2012), the degree to which a post or media message can stimulate different senses. According to Steuer (1992) and Fortin and Dholakia (2005), vividness reflects the breadth of the message, i.e., the amount of sensory stimuli (e.g., colour), and the depth of the message, i.e., quality and resolution. According to De Vries et al. (2012), a certain level of vividness can be achieved by *incorporating dynamic animations, colours or images into the message. According to the media richness theory introduced by Daft and Lengel (1986), the higher the level of media richness, the higher the effectiveness of the communication.*

Colour, being a vital element of marketing communication (Gunina et al., 2017), significantly contributes to attracting consumer attention (Labrecque & Milne, 2012) and enhancing brand recognition (Bottomley & Doyle, 2006). Colour also plays a pivotal role in shaping consumer behaviour, evoking varied emotional responses and affecting their motivations (Aslam, 2006; Page et al., 2012). Understanding colour psychology can significantly differentiate a company from its competitors, enhance brand awareness, and more effectively target their specific audience (Singh, 2006; Labrecque & Milne, 2012). For instance, Yu et al. (2020) investigated colours in tourists' destination-related Instagram posts and found their impact on liking and commenting. In this context, social media managers must carefully select colour schemes to optimize consumer appeal and engagement. Thus, this empirical study seeks to answer the research question:

- *RQ1: How do colours used in Instagram content influence user engagement with brand posts?*

2.1. Likes and Comments

Instagram's likes and comments serve as primary metrics for quantifying user engagement. Since likes and comments reflect user interaction with a particular post, they thus are invaluable in evaluating content's effectiveness (Devereux et al., 2020; Bonilla-Quijada et al., 2020; Rietveld et al., 2020). However, it's critical to understand that these metrics embody distinct aspects of user engagement and thus should be analysed separately.

Firstly, sentiment differs significantly between these two metrics. Instagram likes typically express positive engagement: enjoyment, support, amusement, appreciation, recognition, or may confirm importance of the content (Lowe-Calverley & Grieve, 2018). On the contrary, as Markowitz-Elfassi et al. (2019) highlight, commenting does not necessarily denote positive attitudes. Comments can embody either positive or negative sentiments, and may instead be used to ridicule, ignite disputes, or contradict a post's content.

Secondly, the degree of user involvement varies between likes and comments. A 'like' on Instagram generally signifies a relatively low level of involvement, indicating a certain degree of interest or approval, but necessitating minimal effort or deliberation. However, comments represent a higher level of involvement, requiring users to articulate their thoughts, pay more attention and contribute intentionally to the discourse (Markowitz-Elfassi et al., 2019).

Thirdly, likes and comments may relate to different ways of stimuli processing. Dual-processing theory conceptualised in the Elaboration Likelihood Model (Petty & Cacioppo, 1986), which may be utilised in studies focused on user engagement (see Hughes et al., 2019; Dolan et al., 2019) explains this distinction. Rational content or posts that are particularly informative undergo detailed processing via the individual's central route, resulting in high involvement, e.g., commenting. Conversely, emotional content or visually appealing posts processed via the peripheral route result in a less conscious, more impulsive form of engagement, typically manifesting as likes. According to Kim and Yang (2017), liking represents affectively driven behaviour. Following this theory, particular post or content may earn more likes, but less comments, or vice versa.

Fourth, investigating the relationship between likes and comments enables a deeper, more comprehensive engagement analysis. For instance, De Vries et al. (2012) demonstrate that positive comments on brand posts correlate with the number of likes and comments, while negative comments do not positively relate to the number of likes. Thus, likes and comments should be treated as separate variables for a comprehensive understanding of Instagram engagement.

***Case**:*

Based on this theoretical background, the following hypotheses are proposed:

- *H1a: Image colour influences Instagram post liking (number of likes).*
- *H2a: Image colour influences Instagram post commenting (number of comments).*

3. Granularity

An essential aspect of data analysis in social media research is granularity—the level of detail or depth of the analysis (Cohen et al., 2017). Selecting an appropriate granularity level enables precise measurement and meaningful analysis. For instance, absolute numbers of likes or comments are particularly indicative when the unit of study is a post, i.e., the granularity level is high. While investigating the influence of specific visual cues on engagement, posts with a studied cue are compared to posts lacking this cue. In this case, it is expected that a post containing the studied cue would gain more likes and/or comments. However, such a simple test of differences would be reliable only if all posts were posted in the same time period by the same communicator (creator, influencer, or brand).

For example, a direct comparison of two posts (and the absolute numbers of likes they gain) — one with a particular visual cue from Influencer A and another without this cue from Influencer B — can be misleading. Any discrepancy may be attributed to varied audience sizes rather than the effect of the visual cue. Therefore, studies analysing data from multiple Instagram accounts often employ relative numbers, such as the ratio of likes (or comments) per post to the number of followers.

***Case*:**

In this context, the following hypotheses were proposed:

- *H1b: Image colour influences Instagram post liking (likes to followers ratio).*
- *H2b: Image colour influences Instagram post commenting (comments to followers ratio).*

However, such an approach is not precise, as incorporating further metrics into the dependent variable decreases the testimonial ability of the analysis. The results of such analysis must be interpreted with caution. Thus, to take communicator characteristics (e.g., influencer’s sex, sector, audience size) into account and to isolate their potential influence, some studies (see Tafesse & Wood, 2021) incorporate control variables into their research framework (for more details on control variables, see the next section).

Furthermore, time introduces an additional dimension of complexity in the analysis of social media engagement. As the number of likes and comments are cumulative metrics, older posts are likely to gather more of these engagements than newer ones. As a result, comparing an older post with a newer one, even if they originate from the same influencer, based solely on absolute numbers of likes or comments can lead to skewed results. The difference in engagement between these two posts may be attributed to the difference in the post's lifetime, as new likes and comments may accrue over time. Additionally, temporal considerations are also pertinent due to evolving Instagram algorithms (McWilliams, 2020; Mosseri, 2021; Mosseri, 2023). Posts from different timeframes—for instance, 2015 and 2021—cannot be validly compared on engagement metrics alone. The number of Instagram users is ever-growing, and the platform's modifications over time could impact the visibility and engagement of posts, even when the posts are from the same brand and its follower count remains consistent.

Although this underscores the potential influence of a post's age on user engagement, it is not always necessary to integrate this into the analysis as a control variable. As the numbers of likes and comments grow logarithmically over time, the inflow of these interactions tends to plateau once posts reach a certain age (e.g., a month after publication). Eger et al. (2021) ensured the stability of their engagement metrics by collecting data repeatedly with a time gap of two months (May and July 2019). They observed minimal divergence in datasets, affirming the diminishing effect of post age on engagement. This suggests that the time since publication may have limited implications for analyses conducted several months after the most recent post.

When analysing the influence of posting frequency on user engagement, different granularity levels may be applied. If the unit is a post, frequency may be measured by the time from the previous post and to the subsequent one, or, in other words, as a top position (see Schultz, 2017). Alternatively, a time period, such as a month or a week, may be the unit of analysis, with frequency measured as the number of posts per period. Here, the dependent variable becomes the average number of likes or comments per post within the specific time period.

When conducting research at the organisational level (e.g., brands within a specific industry), user engagement may be measured as the average number of likes (or comments) per post for a particular brand within a specified timeframe. Here, factors like sentiment or level of user involvement might hold less relevance, leading researchers to employ the engagement rate or engagement score as more suitable engagement metrics (see, e.g., Eger et al., 2021). As Deng et al. (2023) indicated, methods to calculate engagement scores vary; while some aggregate all types of engagement (e.g., Aydin, 2020), others attribute different weights to various types of user interactions (e.g., Karpinska-Krakowiak & Modlinski, 2020). Typically, these metrics are calculated in proportion to the number of followers (Eger et al., 2021), facilitating an unbiased comparison across various brands or influencers.

To demonstrate the potential difference between research at the organisational level of granularity and post level of granularity, the independent variable was adjusted from image colour to the colour scheme utilised by HEIs on Instagram. As mentioned earlier, Instagram post liking and commenting must be measured as the average number of likes and comments per post, respectively.

***Case*:**

Therefore, the following hypotheses were proposed:

- *H1c: The colour scheme utilised by HEIs on Instagram influences Instagram post liking (average number of likes per post).*
- *H2c: The colour scheme utilised by HEIs on Instagram influences Instagram post commenting (average number of comments per post).*

A common modification to these engagement metrics involves logarithmisation, as used in some studies (see Tafesse & Dayan, 2023). This mathematical transformation aids in normalising skewed data, turning multiplicative or exponential relationships into additive ones, and equalising variance in datasets where variance increases with the mean. Notably, interpreting results from statistical models with a log-transformed dependent variable necessitates a translation back to the original scale, as coefficients represent the percentage change in the dependent variable per unit change in the independent variable.

4. Control variables

The bandwagon theory, introduced by Henshel and Johnston (1987) offers insight into the dynamic nature of user engagement. According to this theory, the number of followers serves as a form of social validation, stimulating further user engagement (Fu & Sim, 2011). The more followers a creator has, the more likely other users are to engage with their content. Users tend to evaluate and judge a profile based on the number of followers, aligning with the bandwagon effect (Metzger & Flanagin, 2013; De Vries, 2019). Lillqvist and Louhiala-Salminen (2014) further propose that a larger audience on social media platforms motivates users to engage more. Hence, it points out the direct influence of the number of followers on user engagement.

Delineating the factors that influence engagement, the role of the communicator—whether a creator, influencer, or brand—emerges as significant. If a study aims to primarily focus beyond the communicator's influence, these characteristics should be introduced as control variables. The definition of control variables, however, varies across disciplines. Some resources refer to control variables as constants—conditions unchanged throughout the research (ceteris paribus). In social media research employing field study, a control variable represents any variable that directly influences the dependent variables and at the same time is independent yet not the primary focus of the study (Babin & Zikmund, 2015) with no specific hypothesis concerning the relationship between control and dependent variables.

Control variables may be either categorical or numerical. For the purposes of regression analysis, the application of dummy variables offers a useful tool for representing categorical data in binary form (Allen, 2004). For example, when considering geographical region (e.g., CZ, SK, PL) as a categorical control variable, dummy variables can be employed. Thus, each country should be coded accordingly, where '1' meaning membership and '0' absence in a group, with one country serving as the default category.

Complementing this approach, covariates are the further important statistical tool. A common misconception, which appears in some studies, is considering covariates as any control variable. In fact, covariates are continuous control variables (Duignan, 2016). In the context of social media research, the absolute number of followers could serve as a covariate. However, using the absolute number of followers, communicators may be categorised into mega-influencers (over 1 million followers), macro-influencers (100,000 to 1,000,000 followers), micro-influencers (10,000 to 100,000 followers), and nano-influencers (fewer than 10,000 followers). These categories can further be transformed into dummy variables.

***Case**:*

Here, the following hypotheses were proposed (see Figure 1):

- *H1d: Image colour influences Instagram post liking (number of likes).*
- *H2d: Image colour influences Instagram post commenting (number of comments).*

Although hypotheses H1d and H2d are similar to hypotheses H1a and H2a, they are intentionally named differently to compare results incorporated a control variable into conceptual framework.

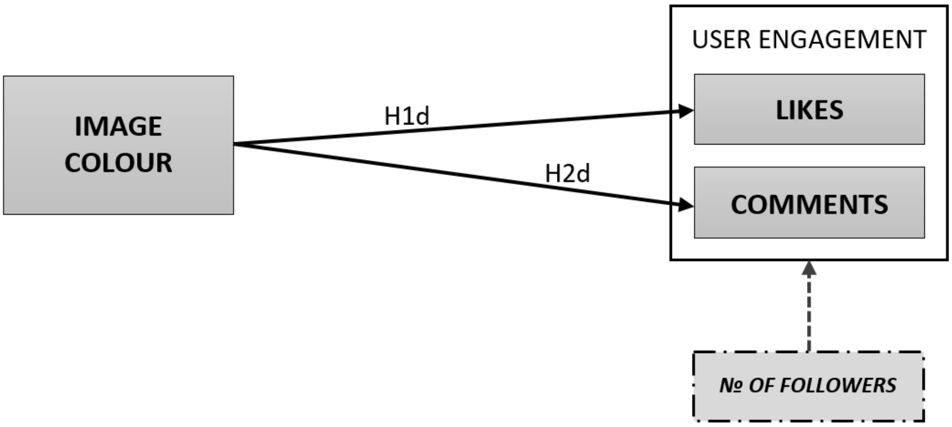

Figure 1. Conceptual framework D

Source: own processing based on literature review

4.1. Quasi-moderators

When investigating the intricate interplay between variables in social media management, moderators can offer valuable insights.

For instance, if a study were to explore how a visual cue, e.g., an emotional appeal, of Instagram content influences user engagement, the unit of analysis would be the Instagram post. As mentioned before, it's crucial to remember that comparing posts from multiple influencers, even within the same sector, using absolute values may not be appropriate. Imagine a scenario where posts of each influencer were analysed separately. Suppose the results show that emotional appeals influence user engagement, as measured by likes, but the strength of this influence varies among influencers. In this case, the communicator—whether a creator, influencer, or brand—may serve as a moderator. This suggests that variables describing the communicator (e.g., number of followers) impact the relationship between the independent variable (emotional appeal) and the dependent variable (user engagement).

As Eisend and Kuss (2019) suggest, moderators can explain the variation in effect size, illuminating conditions under which the relationship between variables strengthens or weakens. Thus, moderating effect of communicator characteristics may explain the fact that difference found in separate analysis. Though, researchers must also pay attention to their moderators' effect sizes and interpret it carefully, particularly when effect sizes are modest (Söderlund, 2023).

Furthermore, as Söderlund (2023) highlighted, incorporating moderators into a study should be well-grounded and supported by existing literature. In the context of user engagement research, proposing the moderating effect of the communicator is justified, given numerous previous studies exploring these effects (see Deng et al., 2023). The number of followers, which characterizes an Instagram account of a specific brand or influencer (creator), is an illustrative example of such a moderator (see Tafesse & Dayan, 2023).

Case*:*

Hence, the following hypotheses were proposed (see Figure 2):

- *H1e: Image colour influences Instagram post liking (number of likes).*
- *H2e: Image colour influences Instagram post commenting (number of comments).*
- *H3e: Number of followers moderates the influence of image colour on Instagram post liking (number of likes) and Instagram post commenting (number of comments).*

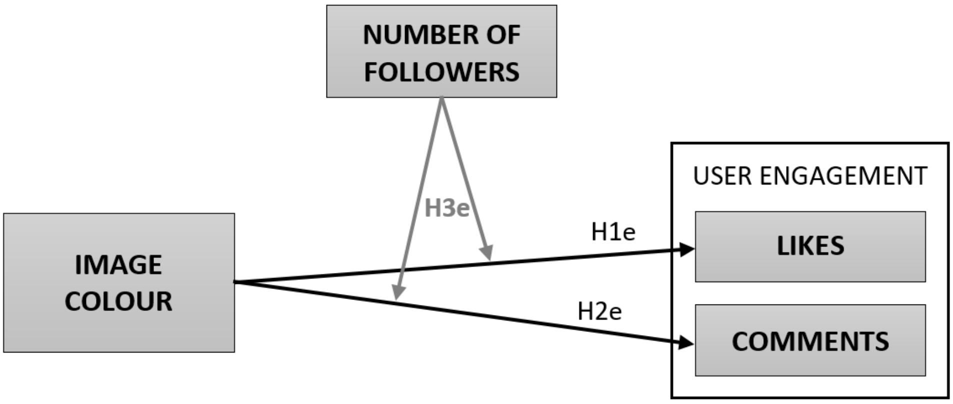

Figure 2. Conceptual framework E

Source: own processing based on literature review

Finally, it is noteworthy that some moderators, according to Söderlund (2023), may appear to be quasi-moderators. According to Sharma et al. (1981), quasi-moderators are variables influencing the relationship between independent and dependent variables (as a moderator), and at the same time correlates with either the independent (as a covariate) or dependent variable, or both. As mentioned before, the number of followers can directly affect user engagement, and may also moderate the relationship between stimuli and user engagement. Therefore, in the research, the number of followers could be treated as a quasi-moderator, providing a nuanced perspective on user engagement in Instagram marketing.

Case*:*

Ultimately, the following hypotheses were proposed (see Figure 3):

- *H1f: Image colour influences Instagram post liking (number of likes).*
- *H2f: Image colour influences Instagram post commenting (number of comments).*
- *H3f: Number of followers moderates the influence of image colour on Instagram post liking (number of likes) and Instagram post commenting (number of comments).*
- *H4: Number of followers influences Instagram post liking (number of likes) and Instagram post commenting (number of comments).*

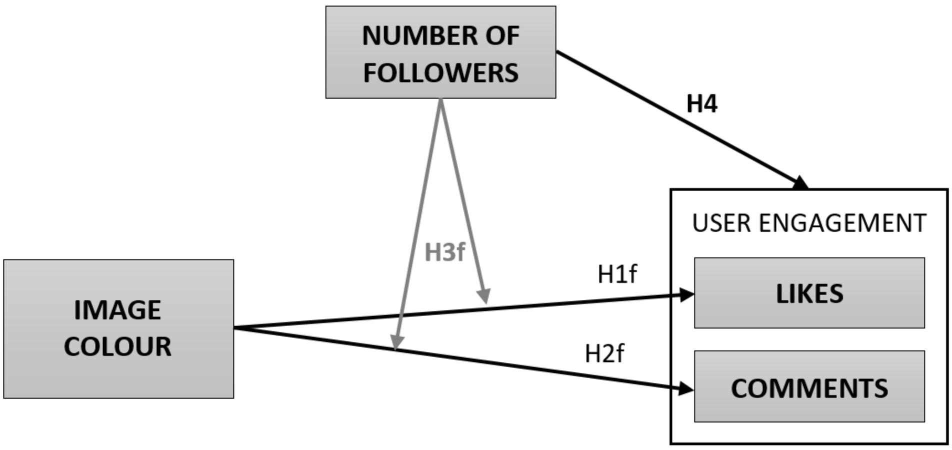

Figure 3. Conceptual framework F

Source: own processing based on literature review

5. Data and methods

This study adopted a thorough approach to collect data from the Instagram profiles of private HEIs in the Czech Republic. From a total of 27 private HEIs in the Czech Republic (Ministry of Education, 2023), the sample included data on 24 HEIs which had public Instagram profiles at the term of data collection. Data extraction of Instagram posts from private HEIs published in year 2022 was accomplished via a custom Python script and a tool known as Instaloader v4.9.6 (GitHub, 2023), a specialized tool designed for mining Instagram data, leading to the successful collection of metadata and images from the selected HEIs on May 26, 2023. The resulting dataset contained 591 observations, with each observation corresponding to a single Instagram post. The repeat data collection was conducted in July 2023, approximately two months after the initial data collection. Reliability, or the degree of agreement between independent observations (May and July 2023), was analysed using Kendall's Tau correlation coefficient.

Google Cloud Vision API was utilized in the Python script to perform a detailed analysis of the dominant colours in the images. The resulting information, such as the image filename, RGB values, dominance score, and normalized RGB values of the dominant colour, was then added to the dataset. Each image was processed sequentially, with the Vision API examining their attributes. The dominant colour for each image was determined based on the colour score provided by the API, after which the corresponding RGB values and scores were extracted. To facilitate comparability, these values were normalized to a range between 0 and 1. During the data pre-processing stage, the RGB colour values were converted into the HCL colour model, where L is lightness, C-Chroma represents the purity or intensity of colour and H-Hue represents the value (from 0° to 360°, see Yu et al., 2020) on the colour wheel. The final variables in the dataset are presented in Table 1.

Table 1. Dataset variables

Variable	Variable Type	Data Type
Instagram post identification number	ID Categorical	Nominal
Instagram profile name	ID Categorical	Nominal
Number of likes on a post	Continuous, dependent	Numeric
Number of comments on a post	Continuous, dependent	Numeric
Hue	Continuous, predictor	Numeric
Chroma	Continuous, predictor	Numeric
Lightness	Continuous, predictor	Numeric
Number of followers on profile	Continuous, covariate/moderator	Numeric

Source: own processing

After removal of observations with missing data for one or more variables, the final sample included 310 observations.

In order to assess the impact of image colour characteristics on Instagram engagement metrics, multiple Linear Mixed-Effects Models (LMMs) and linear regression models were employed (Hayes, 2017). The colour attributes considered were lightness, chroma, and hue. All continuous variables were standardized to have a mean of 0 and a standard deviation of 1 for comparability. Two key dependent variables, namely the number of likes and the number of comments received on posts, were analysed. Additionally, several models incorporated follower count as a control or moderating variable to account for its potential influence. For LMMs, maximum likelihood estimation was used for model fitting, and 'username' was included as a random effect to control for individual differences across accounts. Significance levels were set at the conventional 0.05 threshold.

6. Findings

6.1. Impact of image colour on engagement

H1a. The results from the model revealed a significant influence of lightness on the number of likes an Instagram post received ($\beta = -1.0195$, $p = 0.0281$). This indicates that posts with higher lightness tended to receive fewer likes. The effects of chroma ($\beta = -0.6345$, $p = 0.1259$) and hue ($\beta = -0.1327$, $p = 0.3360$) on the number of likes were not statistically significant. Thus, among the examined colour attributes, only lightness had a significant impact on the number of likes an Instagram post received.

H2a. The model for the number of comments did not reveal any significant influence of the colour attributes. The p-values for lightness (β = -0.001095, p = 0.799), chroma (β = -0.001851, p = 0.629), and hue (β = 0.000369, p = 0.766) were all above the conventional 0.05 threshold for significance, suggesting that the colour of an Instagram post did not significantly affect the number of comments it received.

In summary, the findings indicate that while lightness significantly influenced the number of likes an Instagram post received, none of the examined colour attributes significantly influenced the number of comments.

6.2. Impact of image colour on engagement, using ratio

H1b. The model was fitted to the likes-to-followers ratio data, with lightness, chroma, and hue as predictors and username as a random effect. Lightness had a nearly significant effect on the likes-to-followers ratio (β = -0.0012, p = 0.0747), suggesting a trend for posts with higher lightness to have a lower likes-to-followers ratio, although this effect did not reach conventional levels of significance. Neither chroma (β = -0.00073, p = 0.2271) nor hue (β = -0.00018, p = 0.3784) had a significant effect on the likes-to-followers ratio.

H2b. The model for the comments-to-followers ratio indicated that only the intercept was significant (β = 0.00027, p = 0.046). None of the colour attributes significantly influenced the comments-to-followers ratio: lightness (β = -0.00000011, p = 0.940), chroma (β = -0.0000011, p = 0.397), and hue (β = -0.000000019, p = 0.964).

In summary, the results suggest that while there was a trend for lightness to negatively impact the likes-to-followers ratio, none of the colour attributes had a significant impact on the comments-to-followers ratio.

6.3. Impact of colour scheme of HEI on engagement

For H1c, the model (average likes as a function of average hue, lightness, and chroma) did not show any significant effects. The p-values for the estimated coefficients of average hue (β = -4.733, p = 0.519), lightness (β = 3.025, p = 0.956), and chroma (β = 19.325, p = 0.682) were all above the common significance threshold of 0.05, indicating that these variables did not have a statistically significant impact on the average number of likes per post.

For H2c, the model (average comments as a function of average hue, lightness, and chroma) yielded different results. While average hue did not significantly predict the average number of comments per post (β = -0.0068, p = 0.1962), both average lightness (β = -0.1029, p = 0.0303) and chroma (β = -0.0919, p = 0.0263) had significant effects. This suggests that the lightness and chroma of the colour scheme used by HEIs on Instagram do influence the average number of comments received per post. Specifically, for each unit increase in lightness and chroma, the average number of comments decreased by about 0.10 and 0.09, respectively.

In summary, these results indicate that while the colour scheme (measured in terms of hue, lightness, and chroma) used by HEIs on Instagram does not appear to significantly influence the average number of likes per post, it does have a significant impact on the average number of comments, with lightness and chroma showing significant negative associations.

6.4. Impact of image colour on engagement, with control variable

For H1d, lightness was significantly negatively associated with the number of likes (β = -30.682, p = 0.0286), indicating that posts with greater lightness tend to receive fewer likes, assuming all other variables remain constant. The other predictors, chroma, hue, and followers, did not significantly influence the number of likes at the 0.05 level.

For H2d, the standardized followers variable was the only significant predictor (β = 0.43018, p = 0.01497). This result suggests that accounts with more followers tend to receive more comments on their posts, assuming all other variables remain constant. The colour characteristics, lightness, chroma, and hue, did not significantly influence the number of comments at the 0.05 level.

In both models, significant variability in the intercept was observed across usernames, indicating that differences between users significantly influenced the number of likes and comments received. This is evidenced by the significant variance components for the username random effect in both models.

6.5. Impact of image colour on engagement, with moderator

H1e. The model revealed a significant effect of lightness on likes (β = -30.658, p = 0.0288), indicating that as lightness increases, the number of likes tends to decrease. The effects of chroma (β = -20.581, p = 0.1282) and hue (β = -14.184, p = 0.3417) on likes were not statistically significant.

H2e. None of the colour variables (lightness, chroma, and hue) significantly predicted the number of comments (β = -0.03147, p = 0.8087; β = -0.05800, p = 0.6430; β = 0.04616, p = 0.7316).

H3e. Regarding the number of likes, the model revealed a significant interaction between lightness and the number of followers ($\beta = 29.910$, $p = 0.0336$), suggesting that the influence of image lightness on likes varies depending on the number of followers. The interactions between followers and the other two colour variables (chroma and hue) were not statistically significant.

Concerning the number of comments, none of the interaction terms (lightness × followers, chroma × followers, hue × followers) were statistically significant, suggesting that the number of followers does not moderate the relationship between image colour and the number of comments.

6.6. Impact of image colour on engagement, with quasi-moderator

For H1f, the results revealed a significant influence of lightness on the number of likes, as the standardized coefficient was negative ($\beta = -30.658$, $p = 0.0288$), suggesting that darker images were associated with higher liking. However, no significant relationship was found between chroma or hue and the number of likes (chroma: $\beta = -20.581$, $p = 0.1282$; hue: $\beta = -14.184$, $p = 0.3417$). Hence, H1f was partially supported.

For H2f, none of the colour attributes – lightness, chroma, or hue – had a significant impact on the number of comments (lightness: $\beta = -0.03147$, $p = 0.8087$; chroma: $\beta = -0.05800$, $p = 0.6430$; hue: $\beta = 0.04616$, $p = 0.7316$). Consequently, H2f was not supported.

For H3f, we found a significant interaction between lightness and follower count for post liking ($\beta = 29.910$, $p = 0.0336$). This implies that the effect of image lightness on likes was more pronounced for Instagram accounts with higher follower counts, thus partially supporting H3f. However, the interaction effects of chroma and hue with follower count were not significant, and no significant moderation effect of follower count was found for post commenting.

For H4 the data did not support a significant direct effect of follower count on the number of likes ($\beta = -34.696$, $p = 0.818$). However, there was a significant effect on the number of comments ($\beta = 0.4203$, $p = 0.016$), indicating that accounts with higher follower counts were associated with a higher number of comments.

6.7. Summary

Overall, for liking predictors, two hypotheses were supported (H1a and H1d), three hypotheses were partially supported (H1b, H1e and H1f) and one hypothesis was not supported (H1c, see Table 2). For commenting predictors, one hypothesis was supported (H2c) and five hypotheses were not supported (H2a, H2b, H2d, H2e and H2f). Moderating effect of the number of followers was partially confirmed (see H3e and H3f) and the direct influence of the number of followers on liking and commenting was partially confirmed (see H4).

Table 2. Summary of findings

Hypothesis	Outcome	Details
H1a	Supported	Lightness significantly influenced the number of likes, while chroma and hue did not.
H2a	Not Supported	None of the colour attributes significantly influenced the number of comments.
H1b	Partially Supported	Lightness had a nearly significant effect on the likes-to-followers ratio, but chroma and hue did not.
H2b	Not Supported	None of the colour attributes significantly influenced the comments-to-followers ratio.
H1c	Not Supported	The colour scheme used by HEIs on Instagram did not significantly influence the average number of likes per post.
H2c	Supported	The lightness and chroma of the colour scheme used by HEIs significantly influenced the average number of comments per post.
H1d	Supported	Lightness had a significant negative association with the number of likes, while chroma and hue did not.
H2d	Not Supported	None of the colour attributes significantly influenced the number of comments.
H1e	Partially Supported	Lightness significantly influenced the number of likes, while chroma and hue did not.
H2e	Not Supported	None of the colour attributes significantly influenced the number of comments.
H3e	Partially Supported	The number of followers moderated the influence of lightness on the number of likes, but not on the number of comments.
H1f	Partially Supported	Lightness significantly influenced the number of likes, while chroma and hue did not.
H2f	Not Supported	None of the colour attributes significantly influenced the number of comments.
H3f	Partially Supported	The interaction between lightness and follower count significantly influenced the number of likes, but not comments.
H4	Partially Supported	Follower count had a significant direct effect on the number of comments, but not on the number of likes.

Source: own processing

7. Discussion and conclusions

In the case of private HEIs, the influence of Instagram image colour on user engagement was studied. It was found, that lightness of Instagram post significantly influenced liking (H1a), but not commenting (H2a). It refers to the fact that **liking and commenting have different nature**, since likes and comments represent different levels of user involvement, where liking, as Markowitz-Elfassi et al. (2019) argue, requires less attention and commitment. Moreover, these findings are consistent with dual-processing theory and the Elaboration Likelihood Model of persuasion (see Petty & Cacioppo, 1986). Liking corresponds to affectively driven behaviour (Kim & Yang, 2017), less conscious and more impulsive type of engagement, so peripheral cues such as lightness have a greater influence on it. On the other hand, commenting requires a greater level of commitment, a greater level of involvement, more attention, and complex user responses (Markowitz-Elfassi et al., 2019), so commenting may depend more on the informativeness of the content than on colour.

Also, it is important to pay attention to **control variables**. In the model without the number of followers, lightness of Instagram post indicates a significant negative impact on post liking (for H1a, $\beta = -1.0195$, $p = 0.0281$). When using the number of followers as a control variable (or covariate), the negative impact of lightness on post liking is strong (for H1d, $\beta = -30.682$, $p = 0.0286$). It shows, that neglecting control variables may lead to the biased results, where the influence of predictor may be underestimated or overestimated.

Some studies, instead of using the number of followers as a control variable, deploy **likes(or comments)-to-followers ratio**. However, it does not bring the same results. In the model deploying the ratio of likes to the number of followers, lightness completely lost its significance (for H1b, $\beta = -0.0012$, $p = 0.0747$). It highlights the sad fact, that construct validity of liking operationalised and measured as likes(or comments)-to-followers ratio is low. Such indexes or ratios, according to its nature, give us information on what portion of followers (or employees/customers/acquisitions) liked (or commented) an Instagram post. But, as Lillqvist and Louhiala-Salminen (2014) mentioned, public Instagram profiles are visible for any user on Instagram, not only followers. Moreover, with dynamically changing Instagram algorithms (McWilliams, 2020; Mosseri, 2021; Mosseri, 2023), followers may simply not be exposed to the post at all, but non-followers would be. Thus, the simple fraction of number of likes (or comments) by the number of followers has nothing to do with message effectiveness. The size of fan base (or audience/organisation/customer base) is important in marketing communication research, as it may influence the engagement, and must be treated as a predictor, or a control variable, or a (quasi)moderator, but should not be included as a part of dependent variable.

Model operating with a number of followers as a **quasi-moderator** shows that lightness negatively influences Instagram post liking (for H1f, $\beta = -30.658$, $p = 0.0288$), and this influence is moderated by the number of followers (for H3f, $\beta = 29.910$, $p = 0.0336$). Firstly, it means that lightness has different effect on engagement on different levels of Instagram profile popularity. When the number of followers is low, the negative effect of high lightness on liking is more pronounced. With a high number of followers, the negative effect of lightness on liking is suppressed. Found moderating effect of the followers' number supports the integrative framework of Deng et al. (2023), which proposes the number of followers moderates the influence of different aspects of social media marketing on user engagement. Secondly, since the direct influence of the number of followers on liking was not significant (for H4, $p = 0.818$), the number of followers is a traditional moderator, but not quasi-moderator (as defined by Sharma et al., 1981). Thirdly, this could not be found if the model used likes(comments)-to-followers ratio as a dependent variable.

In a regression model with moderator, moderator is always incorporated in a formula as a part of interaction (predictorColour × moderatorFollowers), but also as a control or dummy variable. Thus, the results of model with a moderator and a quasi-moderator are the same (see, e.g., H1e and H1f; H3e and H3f). The difference is in the focus and emphasis of a study. In the conceptual framework F (with a quasi-moderator), H4 is formulated for the influence of the number of followers on engagement, so this possible influence is studied and discussed. On the other side, the influence of the number of followers on engagement is out of the focus in the conceptual framework E.Moreover, the findings demonstrate, that **granularity** (see Cohen et al., 2017) of research is extremely important. It was found that lightness of an Instagram post significantly influenced liking of this post (H1a), but the effect of the average lightness value of Instagram post published by particular HEI on average number of likes per post (H1c) was not confirmed. Moreover, while the lightness and chroma of an Instagram post do not show significant influence on commenting (H2a), the results show, that the average lightness and chroma value of Instagram post published by particular HEI significantly influenced the average number of comments per post (H2c). Overall, the same construct of colour was studied and the same construct of user engagement, but within the different levels of granularity the opposite results were obtained. It cannot be judged, what way (and what results) are right, cause both levels of granularity may be applied, but they refer to the different purposes of measurement.

7.1. Theoretical contribution

By examining the constructs of liking and commenting separately, this research emphasizes that effects of Instagram post attributes (such as colour) on liking and commenting differ. These findings deepen our understanding of Instagram user engagement in terms of dual-processing theory and the Elaboration Likelihood Model (see Petty & Cacioppo, 1986). The findings of this research suggest that liking and commenting on Instagram posts should not be examined unitarily as a simple sum, nor as items of formula for calculating an index or ratio of user engagement.

Also, the findings of this study extend the state of knowledge in the sense that it highlights a salient bias occurs when likes(comments)-to-followers ratio is used for measuring user engagement and/or Instagram post effectiveness. By demonstrating the significant difference in the results of different approaches to user engagement operationalisation, this research contributes to the academic debate (see Dolan et al., 2019; Markowitz-Elfassi et al., 2019; Deng et al., 2023) on social media management and marketing communication effectiveness.

In this study, the effects of Instagram image colour on liking and commenting on were analysed at two levels of granularity. By putting emphasis on the discrepancy of the same constructs on engagement at different levels of granularity, this research highlights the importance of granularity in marketing and social media research. While evaluating the effects of Instagram marketing communication, an appropriate level of granularity should be chosen by researchers and practitioners with caution, because it may lead to the biased results.

7.2. Practical implications

The results of this research shed light on the fact that liking and commenting on Instagram posts depends on different aspects and to varying degrees. Although increasing Instagram user engagement may sound like a specific goal of Instagram marketing communications, it needs to be clarified whether the goal is to increase liking or commenting on Instagram posts. And depending on this, a different approach to communication strategies is needed, where, for liking increase, social media managers should work with the colour of Instagram post. However, if marketers or social media managers are aiming for a particular (e.g. future) Instagram post to reach a higher number of comments, then it is advisable to pay attention to factors other than image colour. In line with the Elaboration Likelihood Model (see Petty & Cacioppo, 1986), the rational or informative content of an Instagram post would play a more significant role here. Thus, for these two different purposes, the different post characteristics should have different weights in managerial decision-making.

Moreover, this study demonstrates that likes(comments)-to-followers ratio is not appropriate variable to measure user engagement and control variables should not be neglected in evaluating Instagram marketing communication. Using the ratio of number of likes(comments) to the number of followers may lead to the biased results, hide the possible moderating effects. Without using control variables, ostensible effects may be found, and these effects may be under- or overestimated.

From a practical perspective, it further highlights that the effects of Instagram post attributes on user engagement vary at different levels of granularity. This implies that when developing Instagram communication strategies and content plans, marketers and social media managers should be clear about whether the purpose is to increase engagement for a particular Instagram post, i.e. to increase the effectiveness of a marketing message or campaign, where the characteristics of individual posts need to be worked with. On the other side, is the purpose is to increase the average user engagement on the brand's Instagram profile, they should carefully set up a longer-term Instagram communication strategy for this purpose. Thus, the granularity level is essential not only for evaluating the effects of marketing communication, but also fort managerial decision-making and planning.

7.3. Limitations and future research

The main research limitations arise from the research design and the methods of data collection. As it was not possible in terms of research extent and technical feasibility to conduct a longitudinal study and obtain data on the values change (number of likes, comments, and followers) on specific Instagram profiles over time, values of all variables represent the status as of the date of data collection. For more accurate analyses, follow-up studies could obtain longitudinal data on user engagement and Instagram profile popularity, i.e., changing numbers of followers, likes, and comments a month, year or decade.

The construct of colour was operationalised (following the approach of Yu et al., 2020) as three variables: lightness, chroma and hue. However, hue was treated as a continuous variable with values from 0° to 360° in this case. Thus, future studies should focus on the differences in results obtained from the different ways of employing a variable in user engagement research and discuss the consequences of using continuous and categorical variables in analysis.

References

Allen, M. P. (2004). *Understanding Regression Analysis*. Springer Science.

Aslam, M. M. (2006). Are you selling the right colour? A cross-cultural review of colour as a marketing cue. *Journal of Marketing Communications, 12*(1), 15-30.

Aydin, G. (2020). Social media engagement and organic post effectiveness: A roadmap for increasing the effectiveness of social media use in hospitality industry. *Journal of Hospitality Marketing & Management, 29*(1), 1–21.

Babin, B. J., & Zikmund, W. G. (2015). *Exploring Marketing Research*. Cengage Learning.

Bélanger, C. H., Bali, S., & Longden, B. (2014). How Canadian universities use social media to brand themselves. *Tertiary Education and Management, 20*(1), 14-29.

Bottomley, P. A., & Doyle, J. R. (2006). The interactive effects of colors and products on perceptions of brand logo appropriateness. *Marketing Theory, 6*(1), 63-83.

Carrillo-Durán, M. V., & García, M. G. (2020). Exploring the need for stakeholders' engagement through social networking sites to build the reputation of higher education organisations. *Higher Education Quarterly, 74*(4), 442-457.

Chapleo, C., & O'Sullivan, H. (2017). Contemporary thought in higher education marketing. *Journal of Marketing for Higher Education, 27*(2), 159–161.

Cohen, L., Manion, L., & Morrison, K. (2017). *Research Methods in Education*. Routledge.

Coyle, J. R. &Thorson E. (2001). The Effects of Progressive Levels of Interactivity and Vividness in Web Marketing Sites. *Journal of Advertising, 30*(3), 65-77.

Daft, R. L., & Lengel, R. H. (1986). Organizational information requirements, media richness and structural design. *Management Science, 32*(5), 554-571.

Bonilla-Quijada, M.D.R., Perea, E., del Olmo, J. L., & Corrons, A. (2020). Insights into user engagement on social media: Case study of a higher education institution. *Journal of Marketing for Higher Education, 30*(1), 145-160.

Deng, Q., Hine, M. J., Ji, S., & Wang, Y. (2023). What Makes Brand Social Media Posts Engaging? An Integrative Framework and Future Research Agenda. *Journal of Internet Commerce, 22*(1), 1-39.

Devereux, E., Grimmer, L., & Grimmer, M. (2020). Consumer engagement on social media: Evidence from small retailers. *Journal of Consumer Behaviour, 19*(2), 151-159.

De Vries, E. L. (2019). When more likes is not better: the consequences of high and low likes-to-followers ratios for perceived account credibility and social media marketing effectiveness. *Marketing Letters, 30*(3-4), 275-291.

De Vries, L., Gensler, S., & Leeflang, P. S. (2012). Popularity of brand posts on brand fan pages: An investigation of the effects of social media marketing. *Journal of Interactive Marketing, 26*(2), 83-91.

Dolan, R., Conduit, J., Frethey-Bentham, C., Fahy, J., & Goodman, S. (2019). Social media engagement behavior: A framework for engaging customers through social media content. *European Journal of Marketing, 53*(10), 2213-2243.

Duignan, J. (2016). *A Dictionary of Business Research Methods*. Oxford University Press.

Eger, L., Egerová, D., Tomczyk, L., Krystoň, M., & Czeglédi, C. (2021). Facebook for Public Relations in the higher education field: a study from four countries Czechia, Slovakia, Poland and Hungary. *Journal of Marketing for Higher Education, 31*(2), 240-260.

Eisend, M., & Kuss, A. (2019). *Research Methodology in Marketing: Theory Development, Empirical Approaches and Philosophy of Science Considerations*. Springer.

Fortin, D. R., & Dholakia, R. R. (2005). Interactivity and vividness effects on social presence and involvement with a web-based advertisement. *Journal of Business Research, 58*(3), 387-396.

Fu, W. W., & Sim, C. C. (2011). Aggregate bandwagon effect on online videos' viewership: Value uncertainty, popularity cues, and heuristics. *Journal of the American Society for Information Science and Technology, 62*(12), 2382-2395.

GitHub (2023). Instaloader. *GitHub, Inc.* Retrieved May 28, 2023, from https://github.com/instaloader/instaloader

Gunina, D., Kincl, T., & Suldova, S. (2017). Usage of Colors in TV Commercials: Cross-Industry Analysis of Mass Media Communications. *Communications-Scientific Letters of the University of Zilina, 19*(4), 64-71.

Gunina, D., Komárková, L., & Přibyl, V. (2019). How to attract university applicants: exploring tertiary education advertising patterns in the Czech Republic. *Tertiary Education and Management, 25*(4), 349-366.

Henshel, R. L., & Johnston, W. (1987). The emergence of bandwagon effects: A theory. *Sociological Quarterly, 28*(4), 493-511.

Hayes, A. F. (2017). *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*. Guilford publications.

Hughes, C., Swaminathan, V., & Brooks, G. (2019). Driving brand engagement through online social influencers: An empirical investigation of sponsored blogging campaigns. *Journal of Marketing, 83*(5), 78-96.

Karpinska-Krakowiak, M., & Modlinski, A. (2020). Popularity of branded content in social media. *Journal of Computer Information Systems, 60*(4), 309–15.

Kim, C., & Yang, S. U. (2017). Like, comment, and share on Facebook: How each behavior differs from the other. *Public Relations Review, 43*(2), 441-449.

Labrecque, L. I., & Milne, G. R. (2012). Exciting red and competent blue: the importance of color in marketing. *Journal of the Academy of Marketing Science, 40*, 711-727.

Lee, D., Hosanagar, K., & Nair, H. (2018). Advertising content and consumer engagement on social media: Evidence from Facebook. *Management Science, 64*(11), 5105–5131.

Lillqvist, E., & Louhiala-Salminen, L. (2014). Facing Facebook: Impression management strategies in company–consumer interactions. *Journal of Business and Technical Communication, 28*(1), 3-30.

Lowe-Calverley, E., & Grieve, R. (2018). Thumbs up: A thematic analysis of image-based posting and liking behaviour on social media. *Telematics and Informatics, 35*(7), 1900-1913.

Markowitz-Elfassi, D., Yarchi, M., & Samuel-Azran, T. (2019). Share, comment, but do not like: The effect of politicians' facial attractiveness on audience engagement on Facebook. *Online Information Review, 43*(5), 743-759.

McWilliams, J. (2020). Instagram Algorithm & How It Works. *Appspire New*. Retrieved May 30, 2023, from https://appspire.me/instagram-algorithm-how-it-works/

Metzger, M. J., & Flanagin, A. J. (2013). Credibility and trust of information in online environments: The use of cognitive heuristics. *Journal of Pragmatics, 59*, 210-220.

Ministry of Education (2023). The list of universities. *Ministerstvo školství, mládeže a tělovýchovy*. Retrieved May 9, 2023, from http://www.msmt.cz/vzdelavani/vysoke-skolstvi/prehled-vysokych-skol-v-cr-3

Momen, M. A., Sultana, S., & Haque, A. A. (2019). *Web-based marketing communication to develop brand image and brand equity of higher educational institutions*. Global Knowledge, Memory and Communication.

Moro, S., Rita, P., & Vala, B. (2016). Predicting social media performance metrics and evaluation of the impact on brand building: A data mining approach. *Journal of Business Research, 69*(9), 3341-3351.

Mosseri, A. (2021). Shedding More Light on How Instagram Works. *Instagram from Meta*. Retrieved May 30, 2023, from https://about.instagram.com/blog/announcements/shedding-more-light-on-how-instagram-works

Mosseri, A. (2023). Instagram Ranking Explained. *Instagram from Meta*. Retrieved June 3, 2023, from https://about.instagram.com/blog/announcements/instagram-ranking-explained/

Page, T., Thorsteinsson, G., & Ha, J. G. (2012). Using colours to alter consumer behaviour and product success. *International Journal of Contents, 8*(1), 69-73.

Petty, R., & Cacioppo, J. (1986). The Elaboration Likelihood Model of Persuasion. *Advances in Experimental Social Psychology, 19*(12), 123-205.

Peters, K., Chen, Y., Kaplan, A. M., Ognibeni, B., & Pauwels, K. (2013). Social media metrics—A framework and guidelines for managing social media. *Journal of Interactive Marketing, 27*(4), 281-298.

Rietveld, R., van Dolen, W., Mazloom, M., & Worring, M. (2020). What You Feel, Is What You Like Influence of Message Appeals on Customer Engagement on Instagram. *Journal of Interactive Marketing, 49*(1), 20-53.

Sandvig, J. C. (2016). The role of social media in college recruiting. *International Journal of Web Based Communities, 12*(1), 23-34.

Schivinski, B., Christodoulides, G., & Dabrowski, D. (2016). Measuring consumers' engagement with brand-related social-media content: Development and validation of a scale that identifies levels of social-media engagement with brands. *Journal of Advertising Research, 56*(1), 64-80.

Schultz, C. D. (2017). Proposing to your fans: Which brand post characteristics drive consumer engagement activities on social media brand pages? *Electronic Commerce Research and Applications, 26*, 23-34.

Singh, S. (2006). Impact of color on marketing. *Management Decision, 44*(6), 783-789.

Shahbaznezhad, H., Dolan, R., & Rashidirad, M. (2021). The role of social media content format and platform in users' engagement behavior. *Journal of Interactive Marketing, 53*(1), 47-65.

Sharma, S., Durand, R. M., & Gur-Arie, O. (1981). Identification and analysis of moderator variables. *Journal of Marketing Research, 18*(3), 291-300.

Söderlund, M. (2023). Moderator variables in consumer research: A call for caution. *Journal of Retailing and Consumer Services, 73,* 103352.

Steuer, J. (1992). Defining Virtual Reality: Dimensions Determining Telepresence. *Journal of Communication, 42*(4), 73-93.

Tafesse, W., & Dayan, M. (2023). Content creators' participation in the creator economy: Examining the effect of creators' content sharing frequency on user engagement behavior on digital platforms. *Journal of Retailing and Consumer Services, 73,* 103357.

Tafesse, W., & Wood, B. P. (2021). Followers' engagement with Instagram influencers: The role of influencers' content and engagement strategy. *Journal of Retailing and Consumer Services, 58,* 102303.

Ting, H., Ming, W. W. P., de Run, E. C., & Choo, S. L. Y. (2015). Beliefs about the use of Instagram: An exploratory study. *International Journal of Business and Innovation, 2*(2), 15-31.

Vaughan, G. M., & Hogg, M. A. (2013). *Social Psychology*. Pearson Higher Education AU.

Voorveld, H.A. (2019). Brand communication in social media: A research agenda. *Journal of Advertising, 48*(1), 14-26.

Yu, C. (2015). An empirical study of how the personality of lecturers affects the quality of their lectures. *Journal of Further and Higher Education*, *39*(3), 375-396.

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Nature conservation-based tourism management

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Abstract

Every state creates new opportunities by protecting its natural resources, both through maintaining the quality of human life and creating new economic opportunities. Since the first stages of life, human beings have mercilessly slaughtered nature and, have suffered widespread damage when it comes to today. This painful experience has made people start to tend to abandon their negative actions. The problem of the research is to look at the overall management possibilities with the conservation and protection of nature, while the subject of the research focuses on the possibilities of tourism management by preserving nature. The goal of the research scientifically explains the management of tourism that will be friendly to nature. The authors used analytical and hypothetical-deductive methods. The research contributes to the improvement of the achievement of goals of sustainable local socio-economic and tourism development based on Sustainable Development Goals (SDGs).

1. Introduction

In the life of human beings, protection, conservation, and sustainability are considered together, and the sources of problems are solved with this triple word. The living environment must be suitable for life to exist. This conformity can achieve by meeting the demands of human beings (Aslam, 2020). In this, we have to deal with natural resources.

Natural resources are natural assets found in the natural environment and made available to human beings. These are general resources such as fossil fuels (*coal, oil, and natural gas*), mines (*gold, silver, copper, and iron*), water, forests, agricultural lands, and animals. The existence of these resources, which are perfectly compatible with life, leads human beings to quality and healthy life. Conservation of natural resources is vital for the sustainability of the environment and the well-being of people. These resources include water, air, soil, forests, seas, minerals, fossil fuels, and biodiversity. The following steps can affect to protect and conserve natural resources:

1. *Use of renewable resources*: Renewable resources are constantly renewable and inexhaustible. These sources include solar energy, wind energy, hydroelectric energy, biomass, and geothermal energy. The use of renewable resources contributes to the conservation of natural resources and the sustainability of the environment.
2. *Sustainable agricultural practices*: Agriculture is an important user of natural resources. Sustainable farming practices preserve the fertility of the soil, conserve water resources, prevent erosion, and increase biodiversity. These practices include organic farming, agroforestry, soil management, and biodiversity conservation.
3. *Environmentally friendly energy sources*: Fossil fuels have an important place in the use of natural resources. However, the use of these resources leads to air and water pollution, climate change, and other environmental problems. Environmentally friendly energy sources can replace fossil fuels and contribute to environmental protection.
4. *Waste management*: Wastes are associated with the use of natural resources and may cause pollution of the environment. Waste management practices include waste reduction, recycling, and disposal. Proper management of waste contributes to the protection of the environment and the sustainability of the use of natural resources.
5. *Conservation of biological diversity*: Biodiversity is one of the most important components of natural resources. Conservation of biodiversity is achieved by protecting habitats, protecting species, and protecting ecosystems. Biodiversity must be protected in sectors such as agriculture, fisheries, forestry, and tourism.

Various methods and policies can be used to protect and conserve natural resources. Some of them can list as follows:

1. *Sustainable use*: Natural resources should use sustainable. This means using natural resources in a way that ensures their conservation in the future.
2. *Investing in renewable resources*: Investing in renewable resources is one of the best ways to conserve natural resources. This increases the sustainability of natural resources by reducing the use of fossil fuels.
3. *Education*: It is important to inform and educate society about the protection and protection of natural resources. In this way, people understand the value of natural resources and the importance of protecting them.
4. *Recycling*: Recycling is important for the conservation of natural resources. Recycling waste helps conserve natural resources by reducing their consumption.
5. *Laws and regulations*: Environmental regulations are important for the protection and conservation of natural resources. These regulations were created to ensure the sustainable use of natural resources.

In addition to these methods, many different policies and practices can use to protect and conserve natural resources. The important thing is that society, governments, and businesses work in cooperation for the sustainable use of natural resources. Sustainable use of natural resources prevents the depletion of resources and offers the opportunity to use them for future generations. For this, the environment and natural life should be protected during the use of natural resources. Human beings cannot do this alone. This happens with effective environmental policies. These policies ensure the protection of the environment while supporting the sustainable use of resources.

Our world is confronted with the effect of technology every day. This can sometimes be positive and sometimes negative. Undoubtedly, positive technological developments prevent the depletion of resources by providing more efficient use of natural resources. It is important to raise awareness in society about the protection and care of natural resources. When society understands the value and importance of protecting natural resources, it takes action for the sustainable use of resources. For this purpose, cooperation and partnerships are established. These partnerships can be established between businesses, governments, local communities, and non-governmental organizations supported by academia, research and development institutions, financial organizations, and media.

2. Literature Review and Development Hypothesis

Protected areas are recognizable for their natural values, “aesthetic beauty, landscapes, and waterscapes that inspire the arts, humanities, and literature” (Verschuuren et al., 2021, p.8). Laarman and Durst (1987) were the first that defined nature-oriented tourism proceeding from education, recreation, and adventure as special elements related to tourism. Nature resource deterioration, increasing road accidents, disturbing animals in their habitats, and various other problems can cause by nature-based tourism development (Liddle, 1997) and at the same time, this form of tourism is “effective in promoting the protection and management of natural areas for long-term sustainable economic development” (Namazov, 2021, p. 9). Spreading awareness among society about the conservation and protection of nature is the duty of each individual (Sengwar, 2015). Tourism can contribute to each of the seventeen SDGs but it especially targets the following three goals (Tourism and the Sustainable Development Goals, 2015):

- Goal 8 - *Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all* meaning that tourism is one of the managing forces of global economic growth, providing 1 in 11 jobs worldwide, giving access to respectable job opportunities particularly to youth and women.
- Goal 12 - *Ensure sustainable consumption and production patterns* focusing on the development and implementation of tools that monitor the sustainable development impacts for sustainable tourism, which creates jobs, and promotes local culture and products.
- Goal 14 - *Conserve and sustainably use the oceans, seas, and marine resources for sustainable development* keeping the healthy marine ecosystems and promoting a blue economy through becoming the tourism development a component of Integrated Coastal Zone Management.

With a consistent, organized, and enterprising approach to the SDGs and effective relationships with the stakeholders, the tourism and hospitality industry are the leading players in the achievement of the SDGs (Jones et al., 2017). According to the survey conducted by the UN Global Compact Network Spain and the World Tourism Organization, among the challenges in the tourism sector concerning SDGs implementation is the environment (United Nations Global Compact Network Spain | World Tourism Organization, 2016). Since tourism can generate impacts on ecosystems, the efficient management of resources and support measures against climate change have to be promoted (United Nations Global Compact Network Spain | World Tourism Organization, 2016). Management related to environmental impact and environmental quality and environmental marketing activities contribute to increasing the destination’s environmental competitiveness (Mihalič, 1999; Milojković & Milojković, 2022, Trišić et al., 2023). By managing the relationship between visitors’ needs and environmental impacts, the degradation of nature resources caused by the development of tourism can be on an ecologically acceptable level (Wolf et al., 2019; Milojković et al., 2023a). Just the adaptive management of the relationship between visitors’ needs and environmental impacts can contribute to the right estimate of destination carrying capacity (Cole, 2019). “The shift from environmental education to education for sustainable development –2005-2014 is the United Nations Decade of Education for Sustainable Development – has even further confused the identity of environmental education and its placement in the curriculum” (Gough & Gough, 2010, pp.5-6). The objective of the United Nations was to embed the sustainable development concept in education on the global level. According to Bernard Hérodin and Peter Zühlsdorff claimed that “to understand the complexity of environmental issues is a path to sustainable development”, the concept of sustainable development, as a process of social change, should be integrated into the education processes all over the world (PRO EUROPE, 2005, p.4). Based on Kanté’s (2004) statement that “environmental damage, which represents a financial loss for the rich, is a much more serious matter for the poor, leading to the loss of their livelihood”, it means that investment in the protection of the environment can contribute to the reduction of poverty. Individual lifestyles of the richest countries in the world are associated with the extension of CO_2 emissions and “in the more equal rich countries, people on average consume less, produce less waste and emit less carbon”, which means that equality is better for the environment (Dorling, 2017). The social-economic environment consists of the economic systems and the social structures that impact the distribution of resources, money, and power in a community and around the world and shape how communities and individuals can gain the resources needed to meet their basic human needs (CHE, 2023). Socio-economic opportunities in a certain location can be achieved by implementing strategic tourism planning and development through systemic and systematic destination management (Milojković, et al., 2023b).

3. Research Methodology

For the analysis of nature conservation-based development opportunities, three hypotheses were set:

- *The awareness of society about the protection and care of natural resources contributes to taking action for the sustainable use of resources.*
- *Environmental education programs have an important role in sustainable tourism partnership development and conservation of natural resources.*
- *Management of the relationship between visitors' needs and environmental impacts contributes to nature conservation-based tourism development.*

The research methodology includes analytical and hypothetical-deductive methods, and the application of a content analysis method that implied an extensive analysis of the literature and good examples of international practice in the field of sustainable development, sustainable tourism, and protection and conservation of natural resources. The research analyses the interdependence of factors of nature conservation-based tourism development by getting the results and proposing recommendations.

4. Findings and Discussion

Tourism gains in the conservation of natural resources

Human beings can create many opportunities for life by acting jointly in the protection and protection of natural environments. One of them is undoubtedly tourism. Sustainable tourism aims to leave a healthy environment for future generations by preserving the sustainability of these resources while carrying out tourism activities using natural resources. Therefore, sustainable tourism development on protected natural resources is important to maintain environmental, social, and economic sustainability. Conservation of natural resources includes ensuring the long-term sustainability of tourism activities in terms of economic, social, and environmental aspects. The following principles should consider for sustainable tourism development in protected natural resources: tourism activities in protected natural areas should continue without disturbing the natural ecosystem of the area.

Conservation of biological diversity and natural ecosystems should be a central component of tourism planning. This is based on social and cultural compatibility. Sustainable tourism in protected natural resources should also include the preservation of local communities and cultural values. The involvement of local people, contribution to the local economy, and preservation of local cultural heritage are important parts of sustainable tourism development. Interacting between different cultures and communities helps develop social and cultural cohesion. This is important for understanding and respecting the different behaviors, beliefs, and values of different cultures and communities. Social and cultural compatibility is the feeling of comfort and acceptance of a person or a community in another culture or social environment. This is an essential ability to interact between different cultures and communities.

It should ensure that the local people benefit from tourism activities fairly and equitably. If an activity does not provide economic sustainability, it cannot be efficient. Tourism activities should create benefits for the local economy, support local businesses, and encourage local employment. Tourism income must be distributed equitably to the local economy. Tourism activities should aim to minimize environmental impacts in the use of natural resources, water, energy, and waste management (Bertan, 2009). Water and energy conservation, waste reduction, and recycling practices should be part of sustainable tourism development in protected natural resources. All this can only achieve with effective and field-oriented training.

Ensuring sustainability of natural resources

Economic sustainability is a concept that aims to use natural resources efficiently, manage production and consumption processes without harming the environment, and support the long-term economic well-being of society. Economic sustainability can be achieved in the following ways:

1. *Productivity increase*: Productivity increase means the ability to produce more products or services using fewer resources. This is important to increase economic sustainability because less resource use lowers costs and increases profitability.
2. *Low-carbon production*: Low-carbon production is a method designed to manage the production process without harming the environment. This reduces the use of fossil fuels and reduces the carbon footprint, reducing the impact on the environment (Sun et al., 2021).

3. *Green technologies*: Green technologies are technological innovations for a sustainable future. These technologies can be used in renewable energy sources, energy efficiency, waste management, water management, and many more.
4. *Long-term planning*: Long-term planning is a critical factor for increasing economic sustainability. A sustainable future is difficult to achieve without the long-term goals and strategies of businesses, societies, and governments.
5. *Innovation*: Innovation can increase economic sustainability through the discovery and implementation of new ideas. Innovative products, services, and business models can foster economic growth and align with the environmental and social factors necessary to achieve a sustainable future (Callaghan et al., 2021) (Gülhan, 2016) (Smith et al., 2001).

Reducing environmental impacts is critical for the protection of natural resources and a sustainable future. To this end, the following methods can be effective:

1. *Use of renewable energy sources*: The use of fossil fuels harms the environment and causes global climate change. Renewable energy sources can help reduce these negative effects. Renewable energy sources such as solar, wind, hydroelectric, and biomass provide environmentally friendly energy production.
2. *Waste management*: Managing waste effectively can help reduce environmental impacts. The amount of waste can be reduced by using methods such as waste reduction, recycling, composting, and landfilling.
3. *Energy efficiency*: Energy efficiency reduces energy use and can help reduce environmental impacts. By using energy-efficient lighting and appliances in businesses and homes, they can lower their energy bills and protect the environment.
4. *Sustainable agriculture*: Sustainable farming practices can use to reduce the environmental impacts of agriculture. Agricultural activities can be made less harmful to the environment by methods such as reducing the use of chemical fertilizers and pesticides, doing organic farming, protecting the soil, and using water resources effectively.
5. *Transport*: Transport is a major source of environmental impacts. Environmental impacts can be reduced by using fewer vehicles, choosing public transport, cycling, or walking. By using electric or hybrid vehicles, transportation that is less harmful to the environment can be achieved.

These and similar methods can help reduce environmental impacts and contribute to a sustainable future by protecting natural resources. Education and awareness play an important role in a sustainable future (Akbar et al., 2017). People must be conscious and aware of the environment for the protection of natural resources and sustainable tourism development.

Education and awareness play an important role for a sustainable future. For people is necessary to be conscious and aware of the environment for the protection of natural resources and sustainable tourism development. The following steps can be used to increase education and awareness:

1. *Education*: Providing environmental education in schools and the community can make people aware of the environment. In schools, lessons about sustainable development can give; students can inform about the protection of natural resources and environmental problems. Educational events in businesses and public spaces can also be organized.
2. *Awareness*: Awareness means that people are conscious of the environment and sensitive to the protection of natural resources. This can be achieved through awareness-raising campaigns, social media, and other means of communication involving large segments of society. For example, informative posters and brochures on environmentally friendly behaviors can be prepared.
3. *Sharing good practices*: Sharing good practices for sustainable tourism development can raise people's awareness. For example, sharing the work and certification process of the hotels that have obtained sustainable tourism certification can help other businesses in the tourism sector to take a step toward sustainable tourism.
4. *Participation*: Community participation is important for the protection of natural resources and sustainable tourism development. By holding public events and meetings, people can express their views and share their opinions on these issues. Thus, social awareness of sustainable tourism can create. This confirms the first hypothesis.

The role of education in the conservation of natural resources and the development of sustainable tourism

Education plays an important role in sustainable tourism partnership development and the conservation of natural resources. Environmental education programs can organize for target audiences, stakeholders in the tourism sector, and local communities (Akbar et al., 2017). These programs may cover topics such as the importance of natural resources, their protection, sustainable tourism practices, waste management, energy efficiency, and water conservation. Training can take place through schools, universities, tourism businesses, and local communities. In another way, awareness campaigns can be organized to inform the public about the protection of natural resources and sustainable tourism practices. Messages for target audiences can be disseminated by using different communication channels such as media, social media, brochures, and posters. On the other hand, local communities should be actively informed about the conservation of natural resources and sustainable tourism practices and should be included in the training. It should be ensured that local people understand the importance of natural resources and contribute to tourism activities. In addition, sustainable tourism projects that take local knowledge, experience, and cultural values into account can be developed by involving local communities in the decision processes. Stakeholders in the tourism sector should receive training on the conservation of natural resources and sustainable tourism practices. Hotel operators, tour guides, tour operators, travel agencies, and other tourism stakeholders can be trained to protect natural resources and adopt sustainable tourism practices. Developing certification and ethical standards in the tourism industry, providing tourism stakeholders with protection of natural resources, and sustainable tourism practices, are one of the applied methods. This confirms the second hypothesis.

The role of management in nature conservation-based tourism development

The precondition of management in nature conservation-based tourism development is the building of trust and mutual appreciation between stakeholders in the destination (Verschuuren et al., 2021). The role of management is to raise the awareness of environmental and cultural values amongst the community and their relevance to destination management organization including its role in recovering biodiversity and conserving natural and social values. Destination Management Organizations should be closely linked with environmental and cultural institutions (Štetić and Šimčević, 2017). The application of the cluster development concept in the tourist destination, managed by the destination management organization, will enable the synergy of actions of the public, private, and educational research and development sectors, with the support of financial organizations and the media (Milojković, 2013). Destination management organization, as a cluster management organization, can contribute to nature conservation through planning, organization, leading, control, monitoring, evaluation, regulatory measures, funding, awareness raising, environmental protection, conservation and restoration of biological diversity, and sustainable use of natural resources (Suniu, 2003; Milojković, 2013). In the first phase of management - planning the development of a tourist destination, it is necessary to incorporate activities that will contribute to achieving SDGs, primarily the growth of the employment rate especially among youth and women; the promotion of local culture and products; monitor the sustainable development impacts for sustainable tourism; and keep the healthy ecosystems and promoting a green economy. According to Milojković et al. (2023a, p.1) management of tourism “should take into account the differences that exist concerning indoor and outdoor activities between tourists of gender, age, marital status, number of children, education, work status, and annual personal investment for tourist travel and vacation”. “Management should develop activities based on natural values, well-being packages, tourist-guided mountains, countryside, and urban easy and medium walking trails strongly focusing on existing and potential users of walking tours” (Milojković et al., 2023a, p.15). Management of the relationship between visitors’ needs and environmental impacts can contribute to nature conservation-based tourism development. This confirms the third hypothesis.

5. Conclusion

The destroyed nature does not become rapidly healthy; it is not an easy and cheap process. It takes time and a huge investment, actually more time and funds than it was used during nature resources exploitation. It almost looks like the underground and above the ground have taken their share of this destruction. As a result, every field has started conserving. There is a desire to apply sustainable development concepts in every sectoral area. The protection and sustainable use of natural resources is very important for the sustainability of the tourism sector. Natural resources provide an important attraction and resource for tourism activities. Therefore, increasing tourism by protecting and using natural resources sustainably can provide benefits both in terms of environment and economy. Conservation of natural resources in an area can increase the attractiveness of the area and increase the motivation of tourists to come to the area. Protected natural areas can enable tourists to become acquainted with their natural beauty, diversity of local flora and fauna, and environmentally friendly tourism activities.

However, the sustainable use of natural resources is also important for the continuity of tourism activities. For example, intense tourism activities on natural resources may disrupt the natural balance of the region and cause environmental pollution. Therefore, priority should be given to the conservation and sustainable use of natural resources during tourism activities.

Increasing tourism by preserving and using natural resources sustainably is also important for the economic development of the region. Tourism activities can increase employment in the region, create a market for local producers and contribute to the local economy. The United Nations adopted seventeen main goals for sustainable tourism in 2015 (The Sustainable Development Agenda, 2023). The World tourism organization has a leading role to achieve the 2030 Agenda for Sustainable Development and its Sustainable Development Goals which are focused on poverty reduction, health, education, and the environment until 2023 (The WTO and the Sustainable Development Goals, 2023). These will help illustrate how sustainable tourism can provide a solution to some of the global challenges facing the industry today.

As a result, the conservation and sustainable use of natural resources is important for the sustainability of tourism. Sustainable use and conservation of natural resources to increase tourism can provide environmental, social, and economic benefits.

Only by increasing the awareness and knowledge of society about protection and natural resource conservation, actions for the sustainable use of resources will be realised. Environmental education programs are drivers for sustainable tourism development and natural resource protection. Partnership collaboration between various stakeholders from public, private, and academic sectors in the destination is a key to success for responsible and sustainable tourism destination management. The management of the relationship between visitors' needs and the environment is important for nature conservation-based tourism development. Respecting the SDGs in the tourism and hospitality industry is possible for destinations and stakeholders whose development and growth are based on the strategic management approach. Authors highly recommend the implementation of the concept of cluster development, as an integral and innovative tool for local economic development, for achieving harmony between visitors', stakeholders', and nature' needs.

References

Akbar, J., Tanveer, S., Khan, M.N., Naeem, A. (2017) Role of facilities available and un-available in attracting of tourist in Swat Valley Pakistan. *J Landsc Ecol* 10(1):5–19.

Aslam, A.M. (2020) Intertemporal relationship between tourism demand and environmental quality in Sri Lanka. *Test Eng Manage* 82 (January-February):17841–17856.

Bertan, S. (2009) Tourism impacts on environment: the case of Pamukkale. *Anatolia: Turizm Araştırmaları Dergisi*. 20(2):204-214.

Callaghan, A., McCombe, G., Harrold, A., McMeel, C., Mills, G., Moore-Cherry, N., Cullen, W. (2021) The impact of green spaces on mental health in urban settings: a scoping review. *J Ment Health* 30(2):179–193.

CHE, *Socioeconomic environment*. Retrieved from https://www.healthandenvironment.org/environmental-health/environmental-risks/socioeconomic-environment (accessed on 28 July 2023).

Cole, D.N. (2019). The Relationship between Amount of Visitor Use and Environmental Impacts. Contributing paper. *Prepared for the Interagency Visitor Use Management Council*. Edition One. Retrieved from https://visitorusemanagement.nps.gov/Content/documents/Contributing%20Paper_Environmental%20Impacts_Visitor%20Capacity_Edition%201.pdf (accessed on 17 June 2023).

Dorling, D. (2017). The rich, poor and the earth. *New Internationalist*. Retrieved from https://newint.org/features/2017/07/01-equality-environment (accessed on 17 June 2023).

Gough, A. and Gough N. (2010). Environmental education. In Kridel, Craig (Ed.), *The SAGE Encyclopedia of Curriculum Studies. New York: Sage Publications.*

Gülhan D. (2016) In the context of sustainable tourism; an evaluation about the possibility of the agro-industrial tourism and oleo-tourism in Birgi settlement. *Social Sciences*. 11(2):116-132.

Jones P., Hillier D., Comfort D. (2017). The Sustainable Development Goals and the Tourism and Hospitality Industry. *Athens Journal of Tourism* 4(1): 7-18.

Kanté, B. (2004). The Environment, the Wealth of the Poor?. Poverty & Environment Times, 2.

Laarman, J. G., Durst, P. B. (1987). Nature travel in the tropics. *Journal of Forestry*, 85(5):43–46.

Liddle, M. (1997) Recreation Ecology: The Ecological Impact of Outdoor Recreation and Ecotourism. *Chapman and Hall*: London, UK.

Mihalič, T. (1999). Environmental management of a tourist destination. A factor of tourism competitiveness. *Tourism Management*, 21 (2000): 65-78.

Milojković, D. The Cluster Concept for Sustainable Development in Transition and Post-Conflict Balkan Countries", In Proceedings of the International Scientific Conference "THE GLOBAL ECONOMIC CRISIS AND THE FUTURE OF EUROPEAN INTEGRATION", University of Nis, Faculty of Economics, Nis, Serbia, 2013. Retrieved from http://isc2013.ekonomskifakultet.rs/ISCpdfs/ISC2013-21.pdf

Milojković, D., Milojković, H. Improving the competitiveness of urban tourism destinations through the smart cities concept. In Proceedings of the SITCON 2022 Singidunum University International Scientific Conference "Tourism destination competitiveness – current challenges and future perspectives", Belgrade, Serbia, October 2022. DOI: 10.15308/Sitcon-2022-71-77

Milojković, D., Nikolić, M., Milojković, H. (2023a). Walking tourism management based on tourists' needs for indoor and outdoor activities in the function of sustainable local economic development. *RSEP* 8(2):1-18.

Milojković, D., Nikolić, M., Milojković, K. (2023b). The development of countryside walking tourism in the time of the post-covid crisis, *Ekonomika poljoprivrede*, Vol. LXX, No. 1, pp. 131 - 144, https://doi.org/10.59267/ekoPolj2301131M

Namazov, R. (2021). The role of nature-based tourism. The case of Azerbaijan. *Uppsala Universitet, Campus Gotland,* Visb: 1-43.

PRO EUROPE. (2005). *Environmental education – the path of sustainable development*. Retrieved from https://www.pro-e.org/files/environmental_education.pdf (accessed on 17 June 2023).

Semgwar, B. (2015). Society awareness as a strategy for conservation of natural resources. *International Journal of Research,* 3(9):1-4

Smith, M.D., Krannich, R.S., Hunter, L.M. (2001) Growth, decline, stability, and disruption: a longitudinal analysis of social well-being in four western rural communities. *Rural Sociol* 66(3):425–450.

Štetić, S., & Šimičević, D. (2017). *Menadžment turističke destinacije.* Beograd, Srbija: Visoka turistička škola strukovnih studija Beograd. [*in English*: Štetić, S., & Šimičević, D. (2017). *Tourist destination management*. High School of Tourism Vocational Studies Belgrade, Belgrade].

Sun, Y., Yesilada, F., Andlib, Z., Ajaz, T. (2021) The role of eco-innovation and globalization towards carbon neutrality in the USA. *J Environ Manag* 299:11356.

Sunlu, U. Environmental impacts of tourism. Camarda, D., Grassini, L., Eds. In Local resources and global trades: Environments and agriculture in the Mediterranean region. Bari: CIHEAM, 2003. pp. 263-270 (Options Méditerranéennes: Série A. Séminaires Méditerranéens; n. 57) Retrieved from https://om.ciheam.org/om/pdf/a57/04001977.pdf (accessed on 26 June 2023).

The Sustainable Development Agenda. Retrieved from https://www.un.org/sustainabledevelopment/development-agenda-retired/ (accessed on 26 June 2023).

The WTO and the Sustainable Development Goals. Retrieved from https://www.wto.org/english/thewto_e/coher_e/sdgs_e/sdgs_e.htm (accessed on 26 June 2023).

Tourism and the Sustainable Development Goals. Retrieved from https://www.e-unwto.org/doi/pdf/10.18111/9789284417254 (accessed on 5 July 2023).

Trišić, I., Nechita, F., Milojković, D., Štetić, D. (2023). Sustainable Tourism in Protected Areas—Application of the Prism of Sustainability Model. *Sustainability*, 2023, 15, 5148. https://doi.org/ 10.3390/su15065148

United Nations Global Compact Network Spain | World Tourism Organization (2016). *The tourism sector and the Sustainable Development Goals – Responsible tourism, a global commitment.* Retrieved from https://webunwto.s3-eu-west-1.amazonaws.com/imported_images/47326/turismo_responsable_omt_acc.pdf (accessed on 6 July 2023).

Verschuuren, B., Mallarach, J.M., Bernbaum, E., Spoon, J., Brown, S., Borde, R., Brown, J., Calamia, M., Mitchell, N., Infield, M., Lee, E. (2021). Cultural and spiritual significance of nature. Guidance for protected and conserved area governance and management. Groves, C., Ed. Publisher: IUCN: Gland, Switzerland, Series No. 32, pp. 1-108. https://doi.org/10.2305/IUCN.CH.2021.PAG.32.en

Wolf, I.D., Croft, D.B., Green, R. (2019). Nature conservation and nature-based tourism: a paradox. *Environments* 6(9):104.

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A new type of database for tourism business modernization

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Abstract

The aim of the paper is to develop a new type of mystical-historical and landmark database construction model based on the example of Georgia. The construction of such a database will contribute to the offer of a new type of competitive tourist product in the international tourist market, the further internationalization of tourism and the deepening of cultural and economic relations between countries. The most important results of the construction of the united database of mystical-historical and landmarks of Georgia will be the creation of a convenient system for managing electronic information about the tourist attractions of Georgia, which, in turn, will contribute to the elimination of problems in the field of tourism in the country and the creation of a tourist center of international importance here.

1. Introduction

The spatial planning of Georgia includes the spatial planning of the territorial sea (waters) of Georgia and the special economic zone of Georgia. These plans envisage the formation of an artificial environment within the mentioned zones, the creation of a special environment protection regime, the allocation of territories for the implementation of aquaculture, tourism development and scientific research (Law of Georgia, 2018).

The international tourism market is developing at a fast pace and occupies the third place in the world economy - after the oil production and machine building industries. Therefore, the tourism business plays an important role in the economic development of the modern world. Therefore, in the long-term perspective of the Georgian government's economic development policy, one of the most important directions is the full use of the country's tourism potential. In the long-term perspective of the Georgian government's economic development policy, one of the most important directions is the full use of the country's tourism potential. Tourism is a complex field, which is due to the fact that the tourist product is created as a result of complex cooperation of many fields. Therefore, in order to solve the problems faced by the field of tourism in Georgia, we consider it expedient to take another concrete step, which will be directed towards the perfection of the automated management of this field. From this point of view, the paper proposes a model for the creation of a convenient system for managing electronic information about the tourist attractions of Georgia - a unified database of mystical-historical and landmarks of Georgia.

2. Materials and methods

In the creation of the paper, the generally established principle of creating databases is used; Systematic historical-mystical information obtained from various Internet materials, works of Georgian and foreign scientists. Logical and comparative analysis. The paper presents a model for building a unified database of mystical-historical and landmarks of Georgia, which is implemented on the analogy of the working principle of volumetric integral schemes.

3. Results and discussion

The country's natural landscapes, geopolitical location, history, level of cultural development and intellectual potential undoubtedly create an opportunity to create a tourist center of not only regional, but also international significance in Georgia.

To achieve this goal, it is necessary to:

1. Offering a new type of competitive tourist product in the international tourist market, an innovative approach to solving the problem;

2. Activation of result-oriented advertising-marketing activities;

3. Raising the quality of service, bringing the quality of service and the price of the tourist product into line with each other.

From this point of view, we consider it appropriate to create a unified database of mystical-historical and landmarks of Georgia, which, like all databases, should consist of two parts: an informational part and a management program.

The information part of the database, in turn, should be composed of two sub-bases. In the first of them (mystical-historical subbase) - mystical-historical information about Georgia will be preserved, starting from the prehistoric age (from the separation of the Caucasus region from the Tethys Ocean, dinosaurs living in the territory of Georgia, and Zezva and Mzia of Dmanisi) (Grimbly, S., 2000).

In order to attract more tourists and simplify advertising-marketing activity, we consider it expedient to present the history of Georgia in the mystical-historical sub-base against the background of the events developed in those countries or regions, which, in the relevant period, influenced the current processes in Georgia. In addition, in order to orient the tours to the tourists of a specific country/region, parallels should be drawn between the events developed in Georgia and the corresponding - target - country. From this point of view, the history of Georgia will be spread over time and space - the events developed in the religious-spiritual, state-political, socio-economic life of the country will be discussed in the global context.

The content of human history is determined to a significant extent by the process of interaction between cultures and civilizations, which includes both vertical and horizontal dimensions of history - spanning time and space. From this point of view, in the mystical-historical sub-base of the informational part of the main base, Georgian civilization will be considered as a border civilization - a kind of synthesis of Eastern-Western civilizations, Eastern-Western Christianity. It will be considered as the core in which the ideas and principles that, later, from the Renaissance and Enlightenment eras, brought unprecedented success to the Western European countries, were born and in certain aspects were even realized (Allen, J.P., 2015). In the last period, interest in spectacles (shows) is growing. With this in mind, the tours should include elements of the show, and in the end the individual tours will turn into one whole show. Therefore, it is appropriate to include both Georgian and foreign myths, legends and stories in the mystical-historical sub-base, which on the one hand will enrich the tour in terms of content, and on the other hand will simplify the inclusion of show elements and concerts corresponding to the theme.

One of the main skills that the created database should have is the expansion of the events developed in Georgia in time and space. One of the possible models for the realization of this goal is presented as follows:

Along with the Greek myths related to Georgia ("Prometheus", "Phrix and Hela", "Argonauts"), information on legendary or vanished civilizations (Glamuria, Atlantis, Hyperboria...) should be included in the mystical-historical subbase.

The development of the situation in Georgia, Greece and Persia should be considered in accordance with the dynamics of the development of the situation. What follows are the campaigns of Alexander the Great, the importance of which is widely known. In relation to Georgia, the role that this event played in the first formation of the country as a unified state will be highlighted. After that, the prerequisites for the origin of Christianity, the influence of Semitic and Eastern (especially Mithraism) currents will be brought forward. The process of establishment of Christianity in Georgia and throughout Europe will be presented. According to the Georgian tradition, St. Nino, the enlightener of Georgia, was the daughter of St. Zebulon, a follower of the French Christian religion, and the cousin of the great martyr St. George. Therefore, special attention will be paid to the establishment of Christianity in France and Greece (Gliyniadaki, et.al., 2022).

The origin and development of Eastern beliefs and philosophical currents (Zoroastrianism, Mithraism, Buddhism, Kampucheanism) should be considered in the same background.

The humane principles and values on which not only peaceful coexistence, but also coexistence and harmonious development of all peoples can be based will be put forward.

King Vakhtang Gorgasal made a great effort to establish Christianity in Georgia and create Christian ideology as a determinant of national identity. His personality should be considered as one of the main actors of the war between Byzantium and Persia and the Persian campaign in India. Parallels will be drawn between Vakhtang Gorgasal and the legendary King Arthur.

After that, the focus will be on the rise of Arabia, the origin of the Islamic religion, its common roots with the Christian and Semitic religions (such as the Abrahamic religions). The conquest of Spain by the Arabs will be discussed in parallel with the conquest of Georgia. Against the background of the wars of liberation, the battle of the Georgian princes and the Spanish Sid Compeadoris will be discussed parallel to each other.

During this period, the Turko-Seljuk hordes strengthened, they harassed the Byzantine Empire and started the crusades. It will be discussed what role these campaigns played in the consolidation and strengthening of Georgia and the participation of Georgians in ensuring the safety of the crusaders. A special place will be devoted to the relationship between Georgians and Templars, what united them both in spiritual and military aspects. Obviously, in parallel with this, the crusades and the situation in the countries that participated in it will be discussed.

Legends about Davit Agmashenebeli, King Tamar, Talpliers, Presbyter Johannes, Wolfgang von Eschenbach's "Partsifal", Maurice Drewon's "Cursed Kings", legends about Richard Lomgul, Egyptian Sultan Saladin, etc. will be used (Rowe, P., 2009).

Along with this will be the display of the chivalric spirit among European kings, the influence of parallels between the codes of the knight and the samurai.

The age of Georgia was followed by the destructive invasions of the Chinggi period, not only for Georgia. The largest empire was created, which included Eastern Georgia, but the West remained independent. After the fall of mighty Georgia, the positions of the crusaders were also shaken, since they no longer had the strong gate that would protect them from the east. After the fall of Byzantium, when the Ottoman Empire started wars of conquest in Europe, and in Moscow the monk Philofane developed the postulate of "Moscow - the third Rome", the histories of Georgia and Europe were highly intertwined. A mystical historical sub-base compiled in such a manner, in principle, it will be a reflection of the processes taking place in Georgia on the events developed in the world, and vice versa, a reflection of the events taking place in the world on the processes taking place in Georgia. But it will be practically impossible to use it in the tourism business without its management algorithm.

The management of the combined database of mystical information and landmarks should be based on the analogy of the working principle of a multi-cascade volumetric integral scheme - information is processed in each sub-base or cascade, then this processed information is combined, again undergoes a certain transformation and is delivered to the user. The base should take into account the possibility of its expansion, both by adding information about a new country (creating a new cascade) and filling in information within an already existing cascade.In the landmarks sub-database, information about the maximum possible number of landmarks and places will be preserved.

Based on the above, the mystical-historical sub-base should be divided into several sections (cascade). Each cascade should contain information about a specific country. In order to establish compliance, the information inside the cascade will be divided into blocks, and each block will correspond to its several index codes, the first index will be the identifier of the cascade (country), the second - the era, the third - the content identifier. It is through these indexes that the information will be organized. The cascade of Georgia, unlike the cascades of other countries, will have one additional index, according to which it will be identified with which landmark this or that event (block) is connected. In order to improve the quality of service, it is advisable to create training centers. Establishment of healthy competition, which pushes the companies and personnel employed in this field to continuous improvement of their qualifications and continuous renewal of the work area.

We are far from the opinion that the personnel employed in the field of tourism will be able to absorb all the information provided. The main thing is that he acquires the necessary skills, one of the main skills, in our opinion, should be the ability to work with the "United Database of Mystical-Historical and Landmarks".

The ability to work with this database will allow a specialist working in the tourism business to:

1. To properly prepare for each specific tour - to receive and process the necessary information;

2. to develop and prepare tours focused on visitors of a specific foreign country and/or region;

3. to properly conduct an advertising campaign focused on a specific foreign country and/or region;

4. To present a single, monolithic history of tourist tours of the specific region(s) of Georgia or the entire country, which, in turn, will simplify the advertising campaign, the inclusion of spectacular or entertaining elements in it, and make the tour much more interesting and attractive in terms of content and spectacle;

5. To develop new types of tourist activities, new products for the tourist market.

Another positive side of the created combined database of mystical-historical and sights is that through the combination of the blocks included in the cascade of the mystical-historical sub-base of Georgia and the sights included in the sightseeing sub-database, it is possible to adapt tours with the same content for different regions of the country. For example, to link the comprehensive tour of the prerequisites and introduction of Christianity to Mtskheta - Svetitskhovli Cathedral (where Christ's robe rests) and the Monastery of the Cross (which is erected on Golgotha in Mtskheta); In Imereti - Katskhs - where, according to Georgian tradition, the dome church of Katskhs is associated with the tomb of Christ, and the column of Katskhs - with Golgotha), in Samegrelo - the Monastery of the Virgin Mary of Khobi (where the robe of the Most Holy Virgin Mary rested before the establishment of the Soviet government) and the Church of the Savior in Zugdidi (https://hardshopmarket.ru/ka/salon-treatments/mif-o-zolotom-rune-realnost/).

Also, different regions of the country can be connected to the Templars: Kartli - Didgori, where the decisive battle of Georgians against the Muslim coalition took place, in which the Crusaders took part (the Templars made up the largest majority of them); Svaneti - from where the Templars could take their charter and Pshav-Khevsureti - where it is possible to be the resting place of the Templars according to a mystical representation.

The combination of the blocks included in the Georgian cascade of the mystical-historical sub-base and the sights included in the sub-base of values will also make it possible to include the same landmark in tours that differ from each other in terms of content. This, in turn, will contribute not only to the influx of new tourists, but also to the repeated visits of the same tourist.

4. Conclusion

Thus, the construction of a unified database of mystical-historical and landmarks based on the above principle and its implementation in the tourism business will contribute to:

1. To offer a new type of competitive tourist product in the international tourist market;

2. activation of result-oriented advertising-marketing activity;

3. to increase the quality of service;

4. cultural development in the country;

5. The growth of foreign investments coming into the country (hotels, children's camps, treatment and rehabilitation centers, productions...), the deepening of cultural and economic relations of Georgia with foreign countries.

Finally, it should be noted that according to the structure of the database proposed in the paper, correspondences can be established between the corresponding cascades of all countries, or it is possible to move from one era to another within the same cascade. Based on all that has been said, the base created within the framework of the project can be considered as the basis of a kind of "spatio-temporal machine" that will allow the user to "travel" in time not only in real, but also in mystical space.

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References

Law of Georgia, Code of Spatial Planning, Architectural and Construction Activities of Georgia. 3213-RS. 20/07/2018

Grimbly, Shona (2000). *Encyclopedia of the Ancient World*. Taylor & Francis. p. 216. ISBN 978-1-57958-281-4. The earliest written literature dates from about 2600 BC, when the Sumerians started to write down their long epic poems.

James P. Allen (2015). Middle Egyptian Literature: Eight Literary Works of the Middle Kingdom. Cambridge University Press. ISBN 978-1-107-08743-9.

Katerina Glyniadaki, Estelle Brun, Joseph Downing, Nefeli Romanou (2022). "Securitisation and tsos: a comparative study of france and greece". doi: 10.13140/RG.2.2.26762.95685

Paul Rowe, "Building Coptic Civil Society: Christian Groups and the State in Mubarak's Egypt," *Middle Eastern Studies*, Volume 45, Issue 1, 2009, page 120.

https://hardshopmarket.ru/ka/salon-treatments/mif-o-zolotom-rune-realnost/

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Study of entrepreneurial intention and its influencing factors among researchers: A case study of Algerian researchers

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Abstract

This study aimed to assess the entrepreneurial intention of Algerian researchers in creating academic spin-offs. A survey involving 230 researchers from various national universities and research centers, revealed limited interest in entrepreneurship. Key factors influencing this inclination are desirability, feasibility, and opportunity perception, despite their low levels in the sample. To promote the establishment of such ventures, a comprehensive framework covering legislative, cultural, and financial aspects is crucial to enhance universities' capacity in forming spin-offs.

1. Introduction

According to modern economic theories, a nation's development is closely related to its scientific and technological capabilities. The competitiveness of a country is showcased through the excellence of its products in the market, and these products are the direct outcomes of scientific research and technological innovation. As a result, numerous universities are now placing emphasis on transforming their research efforts into profitable enterprises, making substantial contributions to economic growth and development. One notable strategy in this regard is the establishment of subsidiary companies affiliated with the university, which serves as an important mechanism to enhance efficiency in this process.

Therefore, universities aiming to emphasize economic and regional development should concentrate on the valorization and commercialization of the outcomes of scientific research. While creations of enterprises stemming from universities—academic spin-offs—constitute a less frequent phenomenon than other mechanisms such as research contracts, consultations by researchers with businesses, collaborative projects and patent applications, the positive effects of these enterprise creations are recognized as highly significant.

Algeria has a significant number of universities, research centers, and training institutions, producing a wide range of graduates in various scientific and technical fields each year. Nevertheless, it's evident that the effort to turn research outcomes into practical applications remains relatively low and limited. There is a clear political orientation towards enhancing and supporting Start-up enterprises in Algeria, which explains the emphasis on promoting and fostering innovation. This is visible through various initiatives aimed at encouraging innovation within academia, such as activating university-affiliated business incubators and various scientific events and programs that promote entrepreneurship and innovation, such as Resolution 1275 regarding startup certification. Moreover, this orientation extends to the economic sector by incentivizing open innovation strategies that revolve around granting substantial tax exemptions for institutions that exploit scientific research services and benefiting from the innovative solutions it offers to them.

This aspect has led us to genuinely seek to identify the factors influencing entrepreneurial intention among researchers through a sample of researchers from various national universities and research centers affiliated with the Ministry of Higher Education and Scientific Research, focusing on the following problematic:

Is there a strong entrepreneurial intention among university researchers? To address this problem, we will also attempt to identify the factors that may influence the formation of this entrepreneurial intention through the exploration of the following questions:

- Does the entrepreneurial intention of Algerian researchers vary according to their level of entrepreneurial desirability?
- Does the entrepreneurial intention of Algerian researchers vary based on their perception of entrepreneurial feasibility?
- Does the entrepreneurial intention of Algerian researchers vary based on their perception of entrepreneurial opportunities in their environment?
- Does affiliation with a research institution (university, research center, or other) influence entrepreneurial intention?
- Do Socio-demographic variables have an influence on determining the entrepreneurial intention of Algerian researchers?

General Hypothesis and Subsidiary Hypotheses: Our review of multiple studies in this field and the study of well-established theories have led us to develop the following hypotheses:

- The first hypothesis: The main hypothesis: Algerian researchers have a strong entrepreneurial intention.
- The second hypothesis: Entrepreneurial intention among Algerian researchers depends on their perception of the desirability of starting a business.
- The third hypothesis: Entrepreneurial intention among Algerian researchers depends on their perception of the feasibility of starting a business.
- The fourth hypothesis: Entrepreneurial intention among Algerian researchers depends on their perception of opportunities in their environment.
- The fifth hypothesis: Affiliation with a research institution (university, research center, or other) influences entrepreneurial intention.

- The sixth hypothesis: Socio-demographic variables influence the entrepreneurial intention of Algerian researchers.

In this context, our work holds significance in finding ways to encourage entrepreneurship among a group that is not naturally inclined toward it: higher education researchers. Although the link between intention and action may not be immediate or certain, it plays an important role in predicting the potential for entrepreneurship within the academic realm.

Theoretically, the article draws upon social psychology theories, notably Ajzen's Theory of Planned Behavior (1991) and the Entrepreneurial Event Formation Model (Sokol and Shapero, 1982). Empirically, we have opted to employ a questionnaire developed based on the conducted literature review and existing models, targeting a sample of Algerian researchers.

To effectively conduct our study, the present article is structured as follows: firstly, it outlines the theoretical framework within the current state of research on entrepreneurial intention. Secondly, the study outlines the research methodology, presents the findings, offers a discussion, and finally, suggests recommendations to promote the creation of academic spin-offs within the Algerian context.

2. Academic Spin-offs: A Strategy for Enhancing the Worth of Scientific Research Outputs

The valorization of scientific research is not a novel concept; it is an anticipated outcome of scientific research endeavors and one of the three core functions of universities: education, research, and community service. The valorization of scientific research can be conceived in multiple ways, notably through patent registration. The latter can be sold, offered as equity in companies, or licensed to other firms for utilization. Lastly, the exploitation of research findings can extend to the establishment of enterprises by the researchers themselves, which forms the focal point of our study.

Numerous nations have shown a deep interest the domain of scientific research valorization, primarily because of its key role in fostering economic progress. Simultaneously, they acknowledged the need to preserve the intellectual and material rights of researchers. As a result, many countries have introduced legal frameworks over time to facilitate the process of research valorization. These frameworks are designed to enable the economic utilization of research outcomes while at the same time maintaining and securing the rights and responsibilities of all involved parties: researchers, research institutions, and those who benefit from the research.

The United States of America has been a pacesetter in tackling this issue, most notably through the implementation of the Bayh-Dole Act in 1980. This law establishes a framework for collaboration among the research community, industry, and state and local governments, with a strong emphasis on the role of scientific research valorization in driving economic growth and innovation. Later on, this approach has been adopted by numerous countries, echoing the model of France’s Innovation and Research Law which was enacted in 1999 (The Law on Innovation and Research of July 12, 1999).

2.1 The principal of leveraging scientific research outputs for economic gain:

The valorization of scientific research results indicates adding value to research outcomes, creating a value of utilization for these results so that they do not remain solely for academic purposes (social valorization) and also creating exchange value through the commercialization of these results, which means the economic exploitation of these outcomes (economic valorization). Thus, According to Duranton, the concept of research valorization involves "enhancing, transferring, and efficiently managing activities and methods aimed at creating more economic value from academic knowledge and skills, and thus making research outcomes, knowledge, and competencies usable and marketable" (Boukheddimi, 2020).

In essence, valorization strives to effectively present and potentially commercialize the expertise and knowledge of researchers, along with the results of their scientific research projects (Battache et al., 2021). This materialization is achieved through various means such as patents, technology transfer, publications, know-how, licensing, and the establishment of academic spin-offs.

2.2 The importance of valorizing scientific research:

Valorizing the outcomes of scientific research primarily contributes to promoting innovation and consequently entrepreneurship, especially for startup enterprises that rely on them to achieve economic diversification and economic development, as the promotion of research outcomes is an important factor in driving economic dynamism.

- Promotes the transfer of technologies from public research to the economy and the creation of highly innovative companies with significant growth potential, such as startups.

- Numerous scientific research outcomes have made substantial contributions to addressing pressing national issues. For many countries, research conducted in universities plays an exceedingly crucial role in the national development strategy (Minh et al.,2022).
- The adoption of new technologies can enhance productivity, and innovation makes processes more efficient, allowing companies to offer higher-quality goods and services.
- Investments in research and development (R&D) and innovation enhance production capacity and support overall growth. R&D expenditure drives growth through its positive impact on innovation and total factor productivity.
- Establishing effective partnerships between research organizations and companies.
- Encouraging venture capital firms and other supportive institutions to establish themselves in geographical areas where universities are present, and thereby contributing to local economic growth.

2.3 The fundamental essence of spin-offs:

The academic spin-off is a means of economically valorizing work originating from university research. The term "academic spin-off" originated in the United States in the late 1970s, referring to spontaneous and independent companies emerging from universities or university laboratories in California and Boston. Subsequently, from the 1980s onwards, the concept proliferated across Europe and to take root in other countries worldwide (Pilar Pérez-Hernández, 2021).

The academic spin-off is a company that originates from the university and ultimately facilitates the commercialization, valorization, and exploitation of scientific knowledge for commercial and economic purposes. Therefore, it can be agreed upon to outline four criteria for designating a company as an academic spin-off:

- The originality and capability of the entrepreneur should be affiliated with the university research authority.
- Exploiting research results and transitioning them from their academic nature to their economic and industrial potential.
- Involvement of the university in supporting and guiding the spin-off creation process.
- The path of transforming scientific innovation into a business should be directly linked to the university.

Viewed from the researcher's standpoint, the establishment of a company is generally the most distant mode of valorization from their own scientific practice. Indeed, the university entrepreneur must possess a desire to create a business and be capable of reconciling the often disparate dynamics, objectives, and demands of the researcher's life with the business world (Emin, 2003). In simpler terms, the researcher must hold an entrepreneurial intention, a topic to be explored in the succeeding section.

2.4 The Factors Influencing the Valorization of Scientific Research, Especially in Establishing spin-offs

2.4.1 Macro Environment:

Governments of various countries, acknowledging the value and importance of knowledge and the commercialization of research in fueling economic development, have implemented policies in this regard. Changes have been introduced in university regulations, with a greater focus on academic patents and the issuance of licenses. This has created a favorable environment for university entrepreneurship (Hernández et al., 2021). As an example, the Bayh-Dole Act in the United States has been subsequently adopted in more than 20 countries worldwide.

One of the objectives of these laws is to manage the hybrid phase between the researcher's status and the entrepreneur's status. Their primary aim is to provide a legal framework that grants ownership rights of scientific research outcomes to universities, regardless of their source of funding, and simplifies procedures for the commercialization of university technology. This has created a conductive environment for university entrepreneurship and enabled leading universities to develop strategies to connect with their surroundings.

In addition to the legislative factor, numerous decisive factors are involved in the creation and promotion of spin-offs, such as environmental networks and contacts, supportive programs and financial infrastructure, the type of technology, intellectual property, founder characteristics, internal regulations, conflicts of interest, and management skills (Pilar Pérez-Hernández, 2021).

2.4.2 University

Universities play a fundamental role in the advancement of the nation. "Universities are not only agents of scientific progress and knowledge dissemination, but also a driving force for economic development through the exploitation of research outcomes." They are also regarded as a significant and diverse "reservoir" of future entrepreneurs and/or researchers (Jaziri & Paturel, 2010). The research and innovation conducted within universities address technological gaps; it stimulates investment, strengthens international trade and bolsters exports, and contributes to a vibrant economy. These university research activities also train a highly skilled and inventive workforce that forms the foundation of a successful knowledge-based economy.

The valorization of knowledge derived from research is no longer seen as a linear process but rather as a process based on multidirectional interactions among various different parties involved in the regional innovation system, where university incubators can play a role as facilitators of this engagement.

2.4.3 Cooperation Model:

Creating a spin-off is a highly significant endeavor that shifts the university's mindset from academia to enterprise, effectively tackling industry requirements through the transfer of technology from the academic realm to the industrial sector. To foster spin-off initiatives, universities have implemented organizational frameworks and protocols, including facilitating access to laboratory spaces, research equipment, skilled workforce, specialized facilities, and expert guidance. An illustrative example is Stanford University in Silicon Valley (Minh et al., 2022).

2.4.4 Investors

In the beginning, despite the significant growth potential stemming from the exploitation of inventions and technology transfer that generates high profits, spin-offs may encounter challenges in acquiring business capital. Furthermore, obtaining loans from banks and credit institutions proves to be difficult for them due to limited collateral and business documentation. Venture capital funds have invested in numerous manufacturing industries and achieved remarkable business outcomes in developed countries. Venture capital has established a business partnership model with SMEs. In addition to capital investment, these funds offer mentoring, industry networking, and business growth support. This model has actively contributed to providing capital for the development of highly profitable technology enterprises in the United States, such as Apple, Amazon, Alphabet (Google), Microsoft, Facebook,…etc.

2.5 Current Status of Research Valorization and Spin-off Creation in Algeria:

Algeria has approximately 54 universities and over 40 national schools. In the scientific research network, there are 6 agencies, 19 centers, 12 units, 124 National Research Program (PNR) projects, 28 State Public Scientific and Technological Establishment (EPST) projects, 4 research subsidiaries, 1661 laboratories, and around 40,500 educators (as of 2021), with nearly 47% holding the rank of professors (MESRS, 2022).

Recently, Algeria has shown an increasing interest in the valorization of scientific research, as part of the promotion of emerging institutions, which must inevitably be founded on enhancing innovation and scientific research. This has led to the economic valorization of public research results being perceived as a measure of prudent and responsible management of the nation's collective heritage.

2.5.1 The Legal Framework for Establishing Spin-offs

Currently, there is no specific legal framework for establishing incubators and accelerators, despite Algeria's overall efforts in research valorization. In this context, we can mention the following possibilities:

- A government employee can be affiliated with a company (up to a maximum of 30% ownership) without being its manager.
- Furthermore, a teacher can pursue a profitable activity within their area of expertise (as per executive decree 11-397 dated December 4, 2011).
- However, a new law exists concerning workers in a general manner. This is the law no. 22-16 amending the law no. 90-11 of April 21, 1990, regarding labor relations, signed on July 20, 2022 (Official Gazette no. 49, 2022, pp. 10-11), which now grants workers the right to an unpaid leave for entrepreneurial activities once during their professional career. They also have the option to opt for part-time work (for a period of up to one year, which can exceptionally be extended by an additional 6 months).
- While this law seems motivating, it doesn't necessarily adapt well to the specific case of a researcher who requires more support in managing the overlapping phase between their role as a government employee and that of an entrepreneur. They need to maintain a continuous connection with both the academic and

economic spheres to continue their research valorization process. Moreover, we believe that a duration ranging from one year to two and a half years might not be sufficient to adequately assess the success or failure of a spin-off, and to ultimately decide whether to return to the academic environment or not.

2.5.2 Challenges and Obstacles in Establishing Spin-offs in Algeria

- Limited budget allocated to scientific research, not exceeding 0.53% of the GDP (in 2017), of which approximately 90% of this budget is allocated to salaries (World Bank, 2021). In fact, 57 billion Algerian Dinar (DZD) was spent between 2015 and 2021, averaging over 8 billion DZD per year, whereas global R&D expenses amounted to around 7 billion dollars, with about ten countries concentrating 80% of the expenditures (UNESCO, 2022).
- Another notable observation arising from the level and averages of new high school graduates is the predominance of fields in the humanities and social sciences, to the detriment of fields in science and technology which could potentially be sources of innovation and research patents for commercialization. In fact, the humanities and social sciences (HSS) account for about 60% of the 1.6 million students in Algeria (2021) (Le Soir d'Algérie newspaper, 2022). These fields are not able to produce research outcomes for commercialization to the same extent as other domains (such as computer science, engineering, natural sciences, agriculture … etc), which are better aligned with the conditions for the emergence of the knowledge-based economy.
- Additionally, we can highlight the limited synergy between universities and businesses, where the government seeks to compensate through tax exemptions for economic enterprises that embrace open innovation strategies in collaboration with the research milieu.
- **Limited entrepreneurial culture among researchers:** In this context, the government relies on university incubators to support project initiators, including researchers, in successfully executing their endeavors. This approach also simplifies their interactions with diverse entities such as funding sources and administrative bodies.
- When it comes to funding the establishment of spin-offs, there are no dedicated mechanisms for direct financing of research valorization, particularly for spin-off creation, unlike in other types of businesses such as micro, small, and medium-sized enterprises, like the ANADE (formerly ANSEJ 1996). For these reasons, the FNR (National Fund for Scientific Research and Technological Development) operates within university incubators to provide funding for certain services, such as patenting fees and prototyping.
- **Ministerial Decree No. 1275:** Designed to outline the process for students, educators, and universities, facilitated through incubators, to simplify the establishment of startups. This facilitates the acquisition of a secondary startup degree or innovation patent following the feasibility study of their business projects. This follows a series of attentive training and guidance provided by university incubators. This decree has ignited a notable shift towards entrepreneurial pathways within the university setting.

3. Entrepreneurial Intention

Intention is often regarded as a strong predictor of activity. In entrepreneurship, intention pertains to an individual's judgments regarding the probability of establishing their own business.

3.1 Definition of Entrepreneurial Intention

Intention can be understood as a gauge of the effort an individual is prepared to invest in carrying out an observed behavior. Bird (1988, 1989, 1992) defines intention as "a cognitive state that guides attention (which, in turn, influences both experience and action) towards a specific objective, such as the creation of a new enterprise, and the means to achieve it." In this light, intention marks the transition from a mere recognition of entrepreneurship as a potential action to a mental representation of setting up a business as a desirable but as a pending future endeavor. In a similar vein, Ajzen suggests that "intentions serve as indicators of one's willingness to try, reflecting the effort one is willing to invest in adopting a particular behavior" (Emin, 2003).

Indeed, intentions are indicative of a mental state oriented towards action to achieve a specific goal (such as starting a business in the case of entrepreneurial intention). Thus, intentions reflect a genuine motivation for action, a psychological drive towards action, and even a determination that can propel an individual from contemplation to concrete implementation.

3.2 Factors Influencing Entrepreneurial Intention

Intention arises from the needs, values, habits, and beliefs of the individual (the entrepreneur). Therefore, entrepreneurial intention is the outcome of various diverse external and/or internal forces that stimulate incentives towards pursuing alternative actions (the choice between an entrepreneurial career and being an employee in a public service position). These forces either reinforce or weaken the intention to establish a business.

- **Personality Traits:** For instance, an individual inclined towards action is more likely to actualize their intentions compared to someone with a contemplative orientation. The former focuses on actions that can transition the present state into a future one. Furthermore, traits like initiative, risk-taking, and adaptability contribute to a higher likelihood of entrepreneurial intention, as opposed to individuals drawn to stability.
- **Timing:** Beyond personal qualities, intentions might not materialize due to changes over time. The longer it takes between expressing an intention and acting on it, the more likely unforeseen events can alter intentions, increasing the risk of not following through. Age and job status play a significant role in entrepreneurial intentions.
- **External Forces:** External factors can alter entrepreneurial intentions, like the emergence of a new business opportunity or the establishment of a new legal framework, for instance.

3.3 Universally Acknowledged Concepts of Entrepreneurial Intent

Several approaches have followed one another in explaining entrepreneurial intention. However, two main theories are prominent in this context:

Shapero and Sokol's (1982) Entrepreneurial Event Theory: It explains entrepreneurial intention through two primary variables - perceived desirability and perceived feasibility.

Ajzen's (1991) Theory of Planned Behavior: It explains intention through three key variables - attitudes toward the behavior, subjective norms, and perceptions of behavioral control.

3.3.1 The Entrepreneurial Event Model (Shapero, 1982)

Shapero's model is undoubtedly one of the most well-known entrepreneurship models. Its purpose is to explain the entrepreneurial event, which means studying the factors that explain the choice of entrepreneurship over other career paths. This model highlights the significance of the social system and cultural values in perceiving the desirability and feasibility of entrepreneurship. In essence, the entrepreneurial event results from four categories of factors (Koubaa & Sahib Eddine, 2012).

- Firstly, an explanatory context of entrepreneurial action refers to negative shifts (such as job loss, divorce...), intermediate situations (like obtaining a degree...), and positive shifts (such as inheritance...).
- Next, the factors of perceived desirability stem from an individual's value system, shaped by the influence of social and cultural variables, notably those within the family and from parents, even from close acquaintances. Previous experiences, failures, or even successes in various endeavors are factors that amplify perceptions of desirability.
- Then, the factors of perceived feasibility of entrepreneurial action (based on the perception of supportive resources and assistance, such as availability of funding, information, training, education, etc) arise from the cultural, political, economic, and social environment.
- Lastly, the formation of entrepreneurial intention involves the psychological disposition of the individual towards entrepreneurship (the propensity for action).

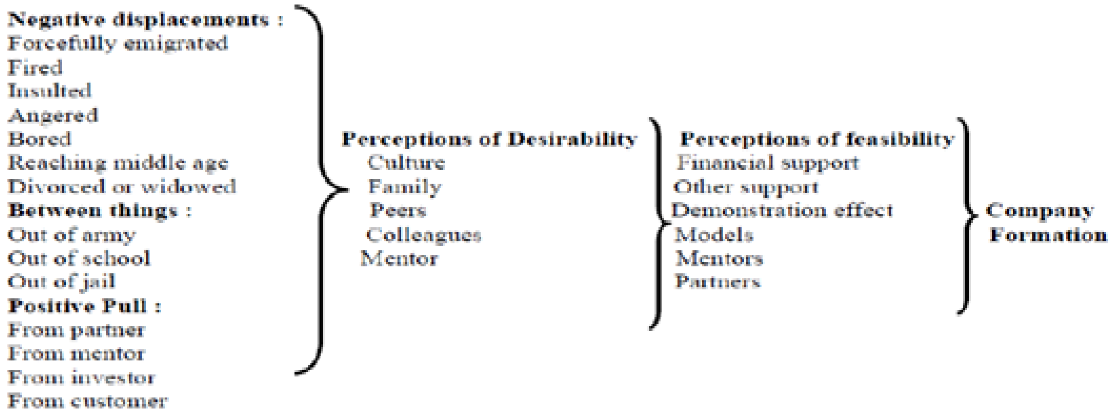

Figure 1. Entrepreneurial Event Formation Model (Shapero, 1982)

Source: (Koubaa & Sahib Eddine, 2012, p. 4).

These variables must work together and interact with each other to lead to the entrepreneurial event.

3.3.2 Theory of Planned Behavior (Ajzen, 1991)

According to this model, any intentional behavior can be predicted by the intention to engage in a specific behavior.

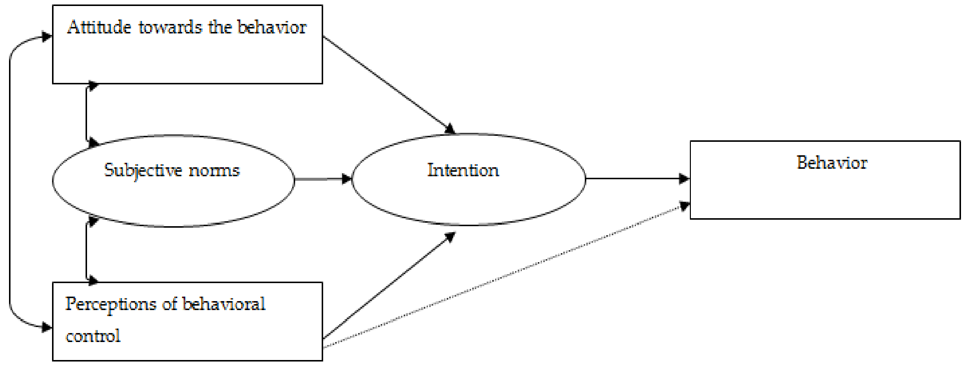

Figure 2: Planned Behavior Model (Ajzen, 1991)

Source: (Boisson, Chollet, & Emin, Determinants of Entrepreneurial Intention Among Students: An Empirical Test, 2009, p. 31)

In Ajzen's (1991) Theory of Planned Behavior model, intention is at the core of the reasoning and explains behavior through three key variables influencing intention:

- Attitudes toward the behavior refer to the extent of favorable or unfavorable evaluation that an individual holds regarding the desired behavior.
- Subjective norms arise from the individual's perceptions of their social context and the influences exerted by people close to them (family and friends).
- Perceived behavioral control highlights the significance of constraints and challenges in translating intention into actual behavior, such as perceptions of resource availability, opportunities, anticipated obstacles, and required skills.

Our findings reveal that attitudes toward the behavior and perceptions of social norms contribute to the appeal of the behavior and can be related to the concept of desirability used by Shapero and Sokol (1982). As for the perception of targeted behavioral control, it can be aligned with the concepts of feasibility by Shapero and Sokol metioned earlier (Boisson et al., 2009).

3.3.3 Synthesis of Intentions Models by Krueger and Carsrud (1993):

Krueger and Carsrud (1993) were the first to apply Ajzen's model to the field of entrepreneurship by combining it with Shapero and Sokol's model. The model proposed by Krueger and Carsrud essentially consists of the following (Wang, 2010):

- **Perceptions of desirability of the action:** Formed through the influence of social and cultural factors (the individual's value system). This variable encompasses both the attitude towards the action and the perceived social norm as proposed by Ajzen (1991).
- **Perceptions of feasibility of the action:** This pertains to the availability of financial, human, and technical resources. This concept is akin to Ajzen's (1991) notion of perceived control.
- **Propensity for action:** This element is related to the notion of external trigger (shifts) in the model by Shapero and Sokol. This perception of action reflects the psychological component of intentions, assumed to have a moderating effect on the relationships between desirability and feasibility, and intention (Shapero, 1984, cited by Krueger, 1993).

3.3.4 Constructing Our Model of Entrepreneurial Intent Among Higher Education Researchers in Algeria

Based on the various theories and models mentioned earlier, the intention to start a business is assumed to depend on three fundamental elements: the perceived appeal of entrepreneurship and the degree of incentive perceived in the social environment, which we will consolidate into a single variable referred to as "desirability to undertake"; the individual's confidence in their ability to successfully navigate the entrepreneurial process, reflecting our second variable, "feasibility to undertake"; and finally, we introduce the variable of perceived business opportunity, as in practice, the first two variables will only influence intention if the individual perceives a business opportunity worthy of pursuit by creating a new entity: a company.

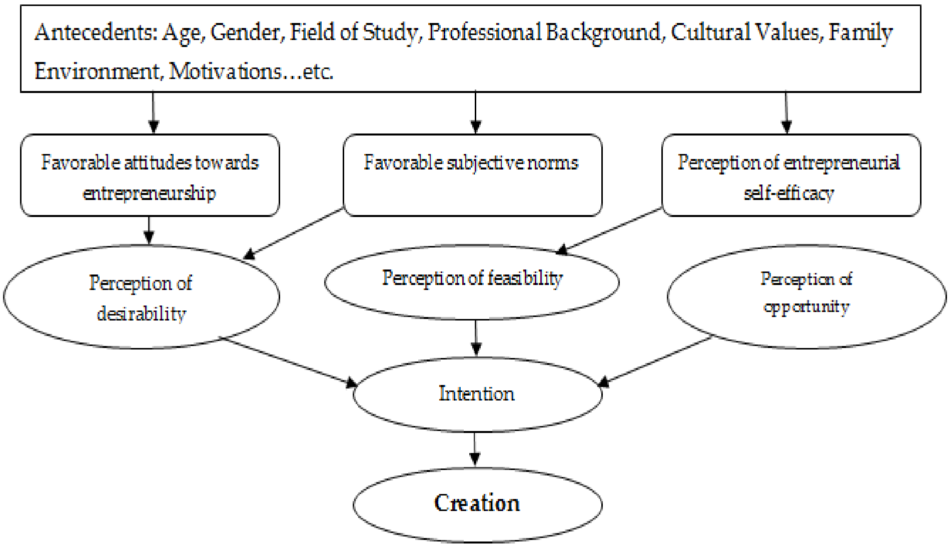

Figure 3: Adapted Intention Model for Researchers

Source: Adapted by the author from (Branche, 2009, p. 05)

3.3.5 Variables Employed for Assessing Entrepreneurial Aspiration Among Algerian Higher Education Researchers:

We have chosen three primary variables that are related to the intention to initiate a business based on the outcomes of scientific research. These variables include the assessment of desirability, the evaluation of feasibility, and the recognition of a business opportunity.

- **Views on Desirability:** Desirability indicates the level of attraction an individual feels toward initiating a business. This aspect comprises of three key dimensions:

Affirmative mindsets for Entrepreneurial Endeavors: It reflects the extent to which an individual evaluates this creation positively or negatively. It involves the belief that the results of entrepreneurial actions will be looked upon as desirable. In fact, this outlook on entrepreneurship is largely influenced by one's personality traits.

Competencies: This relates to the degree to which an individual is ready to utilize their resources, including knowledge, skills, and attitudes, in order to successfully complete a task or handle a complex or unfamiliar situation (De Miribel J., Sido X., 2019).

Affirmative Social Expectations: This concept pertains to the belief that the outputs of entrepreneurial actions will be seen as socially favorable. It is associated with how an individual views the level of acceptance of this behavior within their surroundings.

- **Perceptions of Feasibility:** Feasibility refers to an individual's recognition of their confidence in effectively executing the establishment of an enterprise. Put differently, it concerns the individual's assessment of the obstacles they must surmount, the essential and necessary competencies, and the accessibility of resources needed to translate their intentions into concrete action.

Indeed, the perception of feasibility is interconnected with various elements, most notably, the concept of entrepreneurial self-efficacy which encompasses an individual's self-perception, convictions, and evaluations of their competencies and motivations to successfully engage in the actions required for creating an enterprise. (Verzat, 2012). It is not about their skills, but rather their beliefs that can foster their interest in entrepreneurship, motivating them to set goals, take action, pursue performance, and determine their learning needs.

- **Perceptions of Opportunity:** The desirability and feasibility of initiating a business are fundamental elements, although they alone are insufficient. To initiate entrepreneurial endeavors, potential entrepreneurs must secure the necessary resources at the right time and in the right location (Chortani, 2011). Environments that provide unconstrained access to these resources and facilitate their acquisition offer significant advantages when contemplating engagement and embarking on their projects. In this particular setting, the backing provided by public and semi-public institutions through their administrative, fiscal, legislative, and regulatory actions, including the operations of academic institutions, personnel management guidelines, and intellectual property rights regulations, can either ease or impede the practicality of launching a business.
- **Sociodemographic Dimension:** In addition to the variables mentioned above, we will also take into account the following elements for our empirical study: family and immediate environment, level of education and skills, academic fields of study, professional and entrepreneurial experiences, psychological profile, gender, experience, and age.

4. Methodological Framework and results of the Practical Study

This empirical study is based on the variables derived from the models presented in our theoretical section, highlighting the antecedents of entrepreneurial intention: perceived entrepreneurial desirability, perceived entrepreneurial feasibility, and perception of business opportunities.

4.1 Choice of Research Methodology

We have chosen an analytical methodology to analyze the perceptions of researchers, focusing on the following elements:

- **Population and Study Sample:** Our population comprises researchers from various universities and research centers at the national level, excluding those from the Humanities and Social Sciences fields. We limited the category of 'researchers' to include professors, doctoral students, PhD holders and researchers in research centers. To access the research sample, we opted for sending emails to the researchers' professional email addresses, as well as through social media.
- The representativeness of our sample will be evaluated at two levels: representativeness in relation to the study population and representativeness in relation to the sampling frame. For the first level, we believe it has been achieved. There are no official statistics that determine the number of researchers in Algeria holding a doctorate, as well as professors and researchers in research centers. According to the available data, the total number of university professors in Algeria exceeds 57,000 professors of all categories. Based on these estimates and according to (Krejcie & Morgan, 1970), for a known population size of 1000000 observations, a representative sample would be 384 observations (Bukhari, 2022). As for the second level, we will ensure the diversification of our sample in terms of the variety of scientific disciplines and the status of respondents, as detailed in the descriptive analysis of the sample.
- **Data Collection:** The data collection process relied on a questionnaire constructed based on the literature review and existing models. Initially, the questionnaire was administered to two experts to validate its content. Subsequently, we employed various methods to administer the questionnaire to researchers at the national level. This included face-to-face interactions, as well as sending the questionnaire via email and through social media platforms like Messenger, where we created a URL link to the questionnaire using Google Forms. In total, over 350 questionnaires were distributed or administered between October and December 2022. However, we selected and deemed 230 responses as usable for analysis to address our research problem, resulting in a response rate of 65.71%, which we find quite satisfactory.

- **Analytical Method:** We carefully examined, encoded, and transformed the gathered questionnaires into a database, using the responses obtained via the Google Forms questionnaire link (questionnaire link, 2023). Following this, we carried out statistical analyses with SPSS software (Statistical Package for the Social Sciences) version 25. Our analytical procedures encompassed the computation of frequencies, means, the execution of the Friedman analysis of variance test, as well as correlation examinations among variables and mean comparison tests (ANOVA). These analytical techniques enabled us to extract meaningful insights and draw conclusions from the data we collected.

4.2 Survey Preparation and Evaluation**:**

We created our questionnaire with a set of 16 questions encompassing various formats, such as closed-ended single-choice and multiple-choice questions. This comprehensive approach was chosen to investigate the aspirations of researchers in regard to entrepreneurship and their inclination to embark on business ventures.

- **The sections and aspects of the survey:** The survey encompasses six fundamental axes.

- **First axis:** Researchers' socio-demographic information: This primary axis is focused on gaining insights into the background of researchers. It encompasses personal attributes (such as gender and age), and their professional trajectory (including position and years dedicated to research), in addition to their prior engagement with entrepreneurship.
- **Second axis:** The entrepreneurial aspirations of researchers: This serves as the dependent variable in our study and is gauged by the researcher's decision to apply their research findings or the skills acquired from their research in entrepreneurial pursuits.
- **Third axis:** Attraction to entrepreneurship: To assess this aspect, we examined the researcher's personality traits, entrepreneurial skills, and their favorable subjective views on entrepreneurship. This axis was quantified and evaluated using a set of 17 items that required “yes/no” responses.
- **Fourth axis:** Practicality of entrepreneurship: To evaluate this dimension, we examined the indicators associated with the researcher's belief in their entrepreneurial self-efficacy, covering entrepreneurial, managerial, commercial, and marketing skills. A total of 10 items were provided for respondents to answer with a ‘’yes’’ or ‘’no’’.
- **Fifth axis:** This dimension examines how the researcher perceives the presence of certain elements in their surroundings that could support the process of initiating a business. These elements encompass financial resources, training opportunities, government policies, in addition to support mechanisms. Respondents were given a series of 15 items to express their responses as either “yes” or “no”.

- **Content Integrity and Dependability:** We carried out a pre-survey evaluation of our questionnaires, presenting them for evaluation by experts in the field of entrepreneurship. This was imperative to guarantee that the questions were comprehensible to the respondents, which will lead to meaningful and valuable responses, and to ascertain that the questions encompassed all the aspects of the research. Moreover, the questionnaires went through multiple revisions before arriving at their final form.

According to (Perrien et al., 1984), reliability can be defined as "the extent to which the research instruments consistently assess the construct under investigation" (Labair et al., 2017). We calculated Cronbach's Alpha Coefficient, which assesses the internal consistency of a multi-item scale by examining the correlations among its items, and obtained a value of 0.881. This result surpasses the 0.6 threshold, affirming the dependability of our research tool, which gives us certainty that respondents in this study not only understood the questions but made sense of them and responded coherently.

Table 1: Reliability Statistics

	Cronbach's Alpha	Number of items
Axis of desirability	0,774	17
Axis of feasibility	0.801	10
Axis of opportunity perception	0.835	15
All the axes	0.881	42

Source: Results obtained from the empirical data analysis using SPSS Version 25

4.3 Descriptive analysis of the sample and data collection

In this section, we present the results obtained during our empirical study:

4.3.1 **Respondents' Profile:**

The following figure and table summarize the socio-demographic characteristics of our sample:

Table 2: Socio-demographic Characteristics of the Sample

Gender	N	%	**Age**	N	%	**Field of Research**	N	%
Male	119	51,7	Under 25 years old	14	6,1	Physics	38	16,5
Female	111	48,3	From 26 to 30 years old	47	20,4	Chemistry	22	9,6
Total	**230**	**100,0**	From 31 to 35 years old	40	17,4	Life Sciences	37	16,1
Professional Status	N	%	From 36 to 40 years old	48	20,9	Earth Sciences	19	8,3
Teacher-Researcher	97	42,2	From 41 to 45 years old	35	15,2	Agricultural Sciences	19	8,3
PhD holder without permanent employment	9	3,9	From 46 to 50 years old	21	9,1	Medical Sciences	5	2,2
PhD Student	82	35,7	51 years and older	25	10,9	Technical Sciences	66	28,7
Researcher	42	18,3				Economic and Management Sciences	21	9,1
Total	**230**	**100,0**	**Total**	**230**	**100,0**	others	3	1,3
						Total	**230**	**100,0**

Source: Results obtained from the empirical data analysis using SPSS Version 25

Institution of Affiliation: We can see that our sample is diverse in terms of individuals' affiliation, with 79.13% of individuals belonging to a university and 20.87% belonging to research centers. We find this distribution logical, as the community of researchers in universities is much larger than that in research centers. Meanwhile, we note that the largest percentage of sample individuals belongs to the University of Boumerdes, given our work in this university, which encouraged us to obtain as many responses as possible compared to other institutions. However, we consider the sample to be diverse, as it included several universities and research centers at the national level:

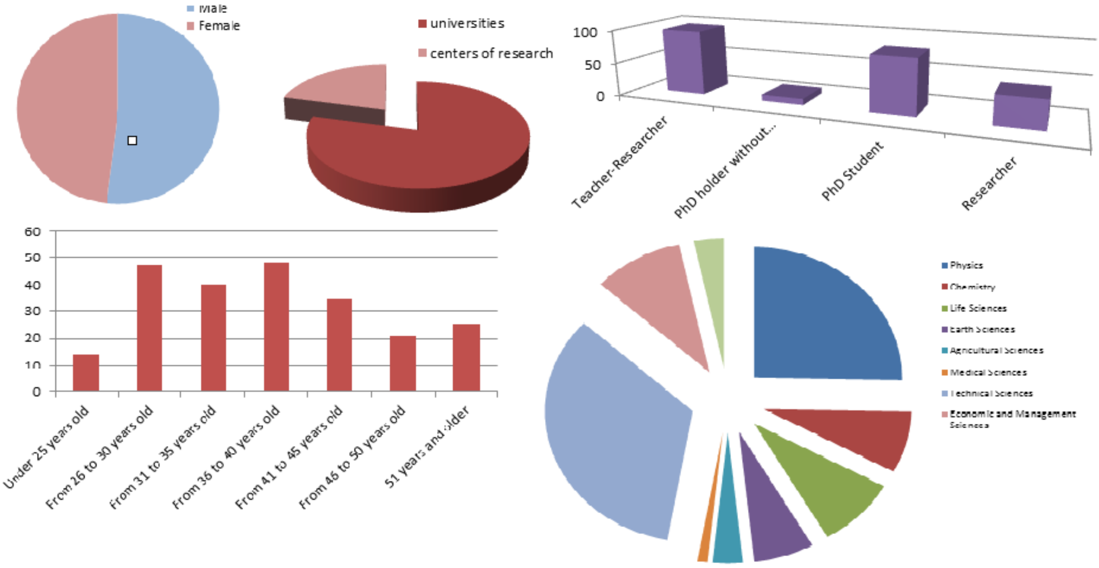

Figure 4: Sociodemographic Characteristics of the Sample

Source: Results obtained from the empirical data analysis using SPSS Version 25

- **Gender distribution analysis:** Our sample is distributed between 51.7% males and 48.3% females. This distribution is somewhat balanced between genders.
- **Age group assessment:** As indicated in the table above, our sample exhibits a notable range of age groups. Nevertheless, it is evident that the majority falls within the younger demographic, with an approximation of 80% of respondents under the age of 45. This observation implies that our sample has a high likelihood of considering entrepreneurial pursuits.
- **As per research area:** The sample under scrutiny exhibits a considerable diversity, allowing for an effective representation of our study population. The data indicate significant representation in the fields of technological sciences (28.7%), physical sciences (16.5%), and life sciences (16.1%), with economic sciences contributing 9.1%. This broad range of diversity will provides us with the opportunity to investigate whether affiliation with a particular research field influences decisions related to research valorization, mainly in the context of spin-off creation.
- **As per occupational position:** The examined sample characterized by a substantial representation of teacher-researchers, making up 42.2% of the sample. They are followed by doctoral students at 35.7% and researchers at 18.3%, with unemployed PhD holders comprising only 5.7%. The distribution mirrors the profile of our population, which is mainly concentrated in university environments and research institutions.

4.3.2 Entrepreneurial experience of the respondents:

Considering that 70.4% of the participants are in permanent positions, among which more than half (59.6%) belong to the same sector as their scientific research, and possess an average of 4 years of experience. Nonetheless, only 42.2% of the respondents affirm having expertise in business management, and merely 23.5% have practical experience in initiating or overseeing a company. This comprises: Role in company administration; Role in the creation of a business; Engaging in one-on-one consulting or expert roles.

Table 3: Entrepreneurial Experience of the Respondents

Knowledge in business management			**Experience in company creation/management**		
	Frequency	Percentage		Frequency	Percentage
Yes	97	42,2	Yes	54	23,5
No	133	57,8	No	176	76,5

Source: Results obtained from the empirical data analysis using SPSS Version 25

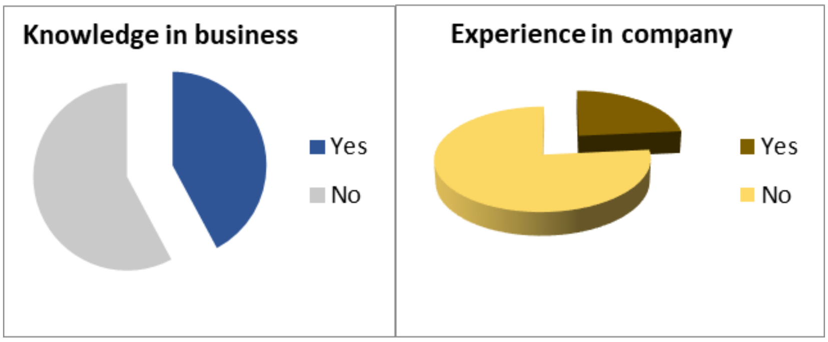

Figure 5: Entrepreneurial Experience of the Respondents

Source: Results obtained from the empirical data analysis using SPSS Version 25

These results demonstrate a certain weakness in terms of research collaborations between scientific research and the socio-economic sector.

4.3.3 Presence of Entrepreneurs in the Respondents' Circle:

In order to gauge the presence of entrepreneurs within the researchers' networks, including self-employed professionals, freelancers, corporate executives, and business initiators whom they seek to emulate, approximately 50.4% of the respondents answered in the affirmative. The next agenda is to investigate and understand whether this factor might shape researchers' motivation for entrepreneurship.

Table 4: Presence of Entrepreneurs in the Respondents' Circles

	Frequency	Percentage
Yes	116	50,4
No	114	49,6
Total	230	100,0

Source: Results obtained from the empirical data analysis using SPSS Version 25

Figure 6: Presence of Entrepreneurs in the Respondents' Circles

Source: Results obtained from the empirical data analysis using SPSS Version 25

4.3.4 Research Valorization:

Before determining the presence of entrepreneurial intention among researchers, we inquired with the respondents about their decision-making if the outcomes of their research lead to commercial exploitation. According to the obtained responses, %15.65 of the sample indicated that they would take no action (36 out of 230 observations). As for the remaining respondents, they provided multiple options, the most frequently mentioned ones are as follows:

- Establish a business to capitalize on their research findings
- Proceed with filing a patent for the invention
- Contact other companies to leverage their research results (mentioned 27 times).

And to a lesser degree:

- Contact research valorization mechanisms such as CATI.

In this regard, we can conclude that the desire for research valorization within our sample is moderately high.

4.3.5 Measurement of Entrepreneurial Intention:

To assess the intention of individuals to create a research-based venture (a spin-off), we employed a 7-point Likert scale to measure how respondents feel about the possibility of establishing their own organization to commercialize their research findings. The scale ranges from 1 (indicating low likelihood) to 7 (indicating high likelihood). The table below provides a summary of the various responses received. The following table summarizes the various responses obtained:

Table 5: Measurement of Entrepreneurial Intention among Algerian Researchers

	1	2	3	4	5	6	7	Total
Frequency	10	41	22	123	19	6	9	230
Percentage	4,3	17,8	9,6	53,5	8,3	2,6	3,9	100

Source: Results obtained from the empirical data analysis using SPSS Version 25

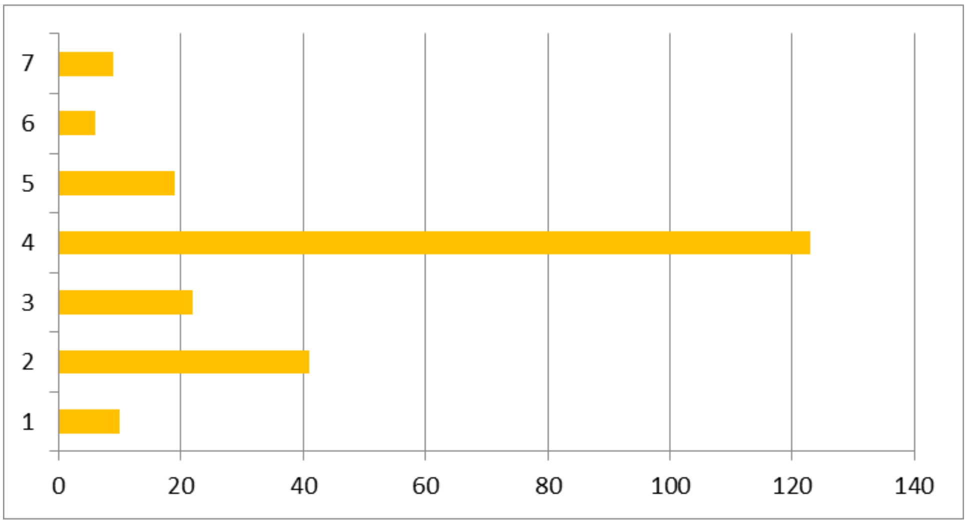

Figure 7: Measurement of Entrepreneurial Intention among Algerian Researchers **Source**: Results obtained from the empirical data analysis using SPSS Version 25

The results obtained are unexpected, especially when comparing them to the results from the previous question. While the sample appeared to lean towards valuing the results of their scientific research in various possible ways, for this sample, there seems to be some hesitation. More than half of the sample, 53.5%, appears neutral by choosing a rating of 4, indicating a moderate likelihood. However, 4.3% unequivocally deny having any entrepreneurial inclination. Based on the cumulative percentages, 31.7% are considered to have no entrepreneurial inclination, while only 14.8% confirm that they have an entrepreneurial inclination.

4.3.6 Measurement of Desirability Perception:

The measurement of the desirability to create a spin-off is based on favorable attitudes towards creation, including researchers' personality traits and professional aspirations (their abilities to take action to start a business), as well as subjective norms favoring entrepreneurship. The analysis of the selected responses yields a low average score of 1.28 (A score less than 1.5 indicates NO, a score above 1.5 indicates YES), indicating a low desirability for spin-off creation. The factors believed to potentially influence the desire to start a business are as follows:

Table 6: Descriptive Statistics of Desirability Perception to Create a Spin-Off

	N	Minimum (No)	Maximum (Yes)	**Average**	**Standard Deviation**	**Result**
desirability	230	1,00	2,00	**1,2826**	**,45125**	**No**
N valid (list)	230					

	Average	Standard deviation	Result
I would be willing to accept the disruption in my professional career that would result from starting a business.	1,66	,474	YES
The fear of failure does not prevent me from undertaking new activities.	1,42	,494	NO
The idea of taking risks does not prevent me from undertaking new activities.	1,40	,491	NO
In general, I prefer to change work habits rather than sticking to a routine.	1,26	,440	NO
I prefer to rely on my intuition when making a significant decision rather than relying on facts.	1,47	,500	NO

I prefer to take initiatives, lead, motivate, and influence others.	1,26	,438	NO
I prefer to be my own boss (to be autonomous and independent).	1,26	,440	NO
I would have preferred to create a company that brings my creativity to life.	1,23	,425	NO
I would have preferred to create a company that values and implements my expertise for the benefit of society.	1,20	,404	NO
I would have preferred to create a company to have compensation based on my commitment.	1,34	,476	NO
I would have preferred to establish a company to broaden my professional experience and/or pursue my research project.	1,20	,401	NO
Personality traits	**1,47**	**,268**	**NO**
Subjective norms favorable to business creation	**1,40**	**,490**	**NO**

Source: Results obtained from the empirical data analysis using SPSS Version 25

- **For personality traits:** Based on the chosen responses, only one out of 11 items yielded an average score greater than 1.50. This is: acceptance of a career change involving a disruption to the professional career due to business creation, with an average of 1.66 and a high standard deviation of 0.474.
- **For favorable subjective norms:** these are the social beliefs related to the perceived degree of encouragement for entrepreneurship in the researcher's social environment. This measurement yielded an average score of 1.40, indicating that the researcher's social environment has little influence on their entrepreneurial orientation.
- **In regard to capabilities for establishing a spin-off**: the outcomes of this assessment similarly indicate a below-average performance, as elaborated in the following table:

Table 7: Descriptive Statistics for the Variable: Spin-Off Creation Aptitudes

	Average	Standard deviation	Result
Opting for an unpaid leave/ time off	1,57	,496	YES
Dedicating a significant portion of your personal savings or contributions from family members and friends	1,44	,497	NO
Seeking financing from savings and financial institutions.	1,50	,501	Neutral
Joining an incubation	1,40	,490	NO
Seeking support and guidance structures (such as ANADE, formerly ANSEJ)	1,44	,497	NO
Aptitudes	**1.46**	**0.295**	**NO**

Source: Results obtained from the empirical data analysis using SPSS Version 25

The highest scoring element relates to taking an unpaid leave, while the one with the lowest score is associated with joining an incubator program. The results suggest that the respondents have personality traits that are less conducive to entrepreneurship, and their capabilities to initiate a business are quite limited, the thing that explains their diminished interest in pursuing an entrepreneurial career. It is evident that Algerian researchers prioritize their perceived professional commitments and show little inclination to shift their focus towards the business dimension of their research.

4.3.6 Measurement of Entrepreneurial Feasibility Perception

The main factor impacting perceived feasibility is shaped by internal factors, particularly individual competencies. This encompasses how researchers view their own effectiveness in the context of entrepreneurship. The findings acquired are presented in the following table:

Table 8: Descriptive Statistics of Perceived Feasibility to Create a Spin-off

	Average	Standard deviation	Result
Entrepreneurial Competencies: Successfully executing, either independently or as part of a team, a business venture creation project.	1,24	,427	NO
Identifying a potential business opportunity	1,32	,466	NO
Developing partnerships, cultivating one's network	1,35	,477	NO
Developing a strategic vision	1,20	,398	NO
Being able to identify potential clients or suppliers	1,33	,470	NO
Managerial competencies (planning, organizing, coordinating, controlling...)	1,23	,419	NO
Human resource management skills	1,41	,493	NO
Commercial and marketing skills (Adapting products to customer demand, Conducting market research, Engaging in negotiations, …)	1,40	,492	NO
Financial management skills and access to funding	1,49	,501	NO
Communication and partnership with various stakeholders	1,34	,474	NO
Feasibility	**1,2587**	**,41193**	**NO**

Source: Results obtained from the empirical data analysis using SPSS Version 25

After assessing this parameter, it became apparent that the mean score across all self-efficacy items was 1.258, failing to reach the 1.5 threshold. To elaborate, the scores were as follows: The scores for strategic vision development (1.20), managerial skills (1.23), and entrepreneurial skills (1.24). The results highlight a prevalent pessimism among the interviewed researchers regarding their abilities to initiate and manage their business endeavors.

4.3.8 **Measurement of opportunity perception:**

The presence of a creation opportunity might act as a pivotal element when it comes to predicting the inclination to launch a spin-off. In accordance with findings from earlier studies, it is apparent that researchers perceive the opportunities in their environment in a pessimistic way, as evidenced by an average score of 1.42 across most items.

Table 9: Descriptive statistics of business opportunity perception

	Average	Standard Deviation	result
In general, the business environment is rather favorable for the establishment of enterprises (legal, fiscal, administrative framework...).	1,59	,493	YES
The resources at your disposal and the opportunities in the environment seem favorable for the success of a business creation project.	1,60	,491	YES
Financial assistance and support are available.	1,69	,463	YES
Having access to support structures and guidance for business creation (e.g. ANADE, formerly ANSEJ, CNAC...).	1,47	,500	NO
Having access to specialized support structures for research valorization (e.g. INAPI, ANVREDET, university incubator...).	1,36	,480	NO
Having an efficient valorization or industrial relations service within my research institution (e.g. CATI).	1,43	,496	NO
Obtaining support from your research organization on industrial property rules and invention patents.	1,34	,476	NO
Obtaining from your research organization intellectual and/or industrial property exploitation contracts.	1,38	,487	NO
The possibility of identifying networks of expertise that can contribute to the successful execution of my projects...	1,29	,453	NO
Identifying and connecting businesses and partners relevant to my project.	1,23	,422	NO
Being encouraged by my laboratory to pursue the economic valorization of my research activities.	1,34	,476	NO
Being supported by my institution (being relieved of certain administrative, pedagogical, and/or scientific tasks; having access to equipment; receiving technical assistance and financial aid...)	1,37	,485	NO
Having access to training programs on business creation and management.	1,24	,430	NO
Having a salary guarantee during the start-up phase of the business until it achieves self-sufficiency.	1,38	,487	NO
Having an unpaid leave to focus on the business creation with the possibility of returning to my position in case of failure.	1,45	,498	NO
Perception of opportunity.	**1,3565**	**,48002**	**NO**

Source: Results obtained from the empirical data analysis using SPSS Version 25

- For items that stand out with high scores, we take into account:
  - Monetary support and assistance are within reach.
  - Entrepreneurial milieu (encompassing legal, fiscal, and administrative aspects).
  - Assets that facilitate the success of a business establishment.
- On the flip side, the least favorable scores are associated with:

- Recognizing and engaging with businesses and partners that are pertinent to my project.
- Having the opportunity to partake in educational initiatives related to business startup and administration.
- The capability to establish links with expertise networks that facilitate the successful completion of my projects..

4.4 Discussion of the results and verification of the hypotheses

- Our analysis was conducted to identify the predictors of entrepreneurial intention among researchers and to examine the differences in entrepreneurial intention based on age, gender, status, research field, and the nature of the organization they are affiliated with (be it a university or research center).
- **The first hypothesis:** The main hypothesis is that Algerian researchers have a strong entrepreneurial intention. Considering the formulation of this hypothesis, which contains only one variable, the entrepreneurial intention, we used univariate analysis based on measures of descriptive statistics, particularly the average, which yielded a score of **3,67** that corresponds to the fourth category of the Likert scale, which means neutral, as illustrated below:

(1) The possibility is not considered.	(2) The probability is extremely weak.	(3) The probability is weak	(4) Neutral	(5) A possible probability	(6) a highly possible probability	(7) I am actively working on it
1-1.85	1.86-2.71	2.72-3.57	3.58-4.43	4.44-5.29	5.30-6.15	6.15-7

This result leads us to conclude that researchers in our sample do not have a strong entrepreneurial intention in the near future. This hesitation among researchers shows that they do not have a strong entrepreneurial orientation, and therefore, we will reject the main hypothesis of our study.

The value of T test is negative (-3,917) and its statistical significance value sig = 0.000, which is greater than the set significance level of 0.1, confirms our result, as shown in the table:

Table 10: One-Sample Test Results

	Average	Standard Deviation
What is the probability that you will create your own enterprise in the near future to capitalize on the outcomes of your scientific research, on a scale from 1 (least likely) to 7 (most likely)?	3,67	1,279

Entrepreneurial intention	Test value = 4					
	t	ddl	Sig. (bilateral)	Average difference	95% Confidence Interval for the Difference	
					Inferior	Superior
	-3,917	229	**,000**	-,330	-,50	-,16

Source: Results obtained from the empirical data analysis using SPSS Version 25

The limited penchant for entrepreneurship among Algerian researchers can be explained by a range of factors, predominantly associated with the pragmatic orientation of their research activities. In this particular context, it is apparent that:

- Divergent values lead to conflicts, as the logic of the academic world contradicts that of the business world.
- Research, in its very essence, leans towards stability and prudence, which are at odds with the dynamic and risk-loving nature of entrepreneurship.

- The decision to leave one's job in favor of launching a business now demands a higher sacrifice, highlighting the complexities associated with being an intermediary. (Emin, 2004).
- A conflict of interest comes to the forefront when there is a lack of career growth opportunities for individuals dedicated to technology transfer. This challenge is particularly striking, especially given that once an invention or innovation is published as an article, it becomes part of the public domain and loses eligibility for patenting by INAPI, the thing that potentially limits the researcher's chances for career progression.

- **The second hypothesis:** This hypothesis argues that the entrepreneurial intent of Algerian researchers is influenced by how they perceive the attractiveness and appeal of starting or venturing into a business. Within this hypothesis, there are two variables, making it necessary to perform a bivariate analysis using the ANOVA test, as it involves both a qualitative and a quantitative variable. A Sig. value of 0.005 was produced, which is below the 0.1 threshold. Given that result, we dismiss the null hypothesis (which suggests no correlation between the two variables) and affirm this hypothesis, revealing that desirability exerts a significant influence on researchers' intentions.

Table 11: ANOVA Test Results Between Desirability and Entrepreneurial Intention.

	Sum of squares	ddl	Mean square	F	Sig.
Intergroups	12,895	1	12,895	8,122	,005
Intragroups	361,992	228	1,588		
Total	374,887	229			

Source: Results obtained from the empirical data analysis using SPSS Version 25

- **The third hypothesis:** Entrepreneurial intention among Algerian researchers depends on their perception of the feasibility of business creation. Much like the hypothesis discussed earlier, we used the ANOVA test, which yielded a Sig. value of 0.006, which is less than 0.1. This leads us to confirm this hypothesis, showing that feasibility has a significant impact on entrepreneurial intention among researchers.

Table 12: ANOVA Test Results Between Feasibility and Entrepreneurial Intention.

	Sum of squares	ddl	Mean square	F	Sig.
Intergroups	16,310	2	8,155	5,163	,006
Intragroups	358,577	227	1,580		
Total	374,887	229			

Source: Results obtained from the empirical data analysis using SPSS Version 25

In fact, the limited interest shown by Algerian researchers in pursuing entrepreneurship can be attributed to their lack of inclination toward entrepreneurship rather than a sense of incapability to achieve it.

- **The fourth hypothesis**: Entrepreneurial intention among Algerian researchers depends on their perception of opportunities in their environment. We also used the ANOVA test, which yielded a Sig. value of 0.069, which is less than 0.1. This leads us to confirm this hypothesis, meaning that the perception of opportunities has a significant effect on entrepreneurial intention among researchers.

Table 13: ANOVA Analysis of Business Opportunity Perception and Its Impact on Entrepreneurial Intention

	Sum of squares	ddl	Mean square	F	Sig.
Intergroups	5,416	1	5,416	3,342	,069
Intragroups	369,471	228	1,620		
Total	374,887	229			

Source: Results obtained from the empirical data analysis using SPSS Version 25

These findings show that personal traits, skills, abilities, self-efficacy perceptions, and perceptions of opportunities have a more significant impact on entrepreneurial intentions. These results align with the theoretical model we proposed regarding the factors that affect researchers' entrepreneurial orientation.

- The fifth hypothesis, which suggests that affiliation with a research institution (university, research center, or the like) influences entrepreneurial orientation, was analyzed using the ANOVA test, which yielded a value of 0.187. This value is greater than the statistical significance threshold of 0.1, indicating the rejection of the hypothesis. Consequently, we conclude that affiliation with a university or research institution does not have a significant impact on entrepreneurial orientation.

Table 13: ANOVA Test Results between the Nature of the Affiliated Institution and Entrepreneurial Intention.

	Sum of squares	ddl	Mean square	F	Sig.
Intergroups	7,863	3	2,621	1,614	,187
Intragroups	367,024	226	1,624		
Total	374,887	229			

Source: Results obtained from the empirical data analysis using SPSS Version 25

- The sixth hypothesis examines the influence of socio-demographic variables on the entrepreneurial orientation of Algerian researchers. Investigating this hypothesis necessitates an examination based on each demographic variable as follows:

  - **Gender-related distinctions in entrepreneurial intent:** Based on our findings, the statistical analysis reveals no significant variation in entrepreneurial intentions among researchers with respect to gender, as indicated by a sig value of 0.159 > 0.1, which affirms that gender does not play a role in influencing entrepreneurial intention.

Table 14: ANOVA Test Results between gender and entrepreneurial intention

ANOVA					
	Sum of squares	ddl	Mean square	F	Sig.
Intergroups	3,258	1	3,258	1,999	,159
Intragroups	371,629	228	1,630		
Total	374,887	229			

Source: Results obtained from the empirical data analysis using SPSS Version 25

  - **Age-related distinctions in entrepreneurial intention**: With a significance level of 0.483 which is greater than 0.1, it can be inferred that age is not a statistically significant factor in shaping entrepreneurial intention.

Table 15: ANOVA Test Results between age and entrepreneurial intention.

	Sum of squares	ddl	Mean square	F	Sig.
Intergroups	9,031	6	1,505	,917	,483
Intragroups	365,856	223	1,641		
Total	374,887	229			

Source: Results obtained from the empirical data analysis using SPSS Version 25

- **Experience-related distinctions are noteworthy:** In our quest to understand whether entrepreneurial intention can be impacted by the number of years a researcher spends at university, we employed an ANOVA test. The results revealed a sig value of 0.096, which is below the 0.1 threshold. This implies a statistically significant variation in entrepreneurial intention across individuals with diverse professional backgrounds and career experiences in our sample.

Table 16: ANOVA Test Results between Professional Experience and Entrepreneurial Intention.

	Sums of squares	ddl	Mean square	F	Sig.
Intergroups	7,672	2	3,836	2,371	,096
Intragroups	367,215	227	1,618		
Total	374,887	229			

Source: Results obtained from the empirical data analysis using SPSS Version 25

- **Familiarity with enterprises:** Although being involved in entrepreneurial activities is favorable for developing entrepreneurial awareness, the results show that entrepreneurial experience have a statistically significant effect (sig value is 0.030 < 0.1).

Table 17: ANOVA Test Results between Entrepreneurial Experience and Entrepreneurial Intention.

	Sum of squares	ddl	Mean square	F	Sig.
Intergroups	7,705	1	7,705	4,784	,030
Intragroups	367,182	228	1,610		
Total	374,887	229			

Source: Results obtained from the empirical data analysis using SPSS Version 25

- **The professional standing of researchers:** Within this framework, it is apparent that unemployed young PhD holders and doctoral students stand out as a population that holds promise for spin-off initiation and development. Taking into account that the academic futures of these researchers are still uncertain, they could be more inclined to explore entrepreneurship in contrast to teaching. Nonetheless, the sig value is 0.187, surpassing the 0.1 threshold, indicating the lack of a statistically significant association between professional status and entrepreneurial intention.

Table 18: ANOVA Test Results between Professional Status and Entrepreneurial Intention.

	Sum of squares	ddl	Mean square	F	Sig.
Intergroups	7,863	3	2,621	1,614	,187
Intragroups	367,024	226	1,624		
Total	374,887	229			

Source: Results obtained from the empirical data analysis using SPSS Version 25

- **The influence of family environment and social context:** The presence of an entrepreneurial role model to imitate could have a more significant impact on researchers. This result is statistically not significant for our sample, confirmed by the sig value of 0.288, which is higher than 0.1.

Table 19: ANOVA Test Results between the Influence of the Environment and Entrepreneurial Intention.

	Sum of squares	ddl	Mean square	F	Sig.
Intergroups	1,856	1	1,856	1,134	,288
Intragroups	373,031	228	1,636		
Total	374,887	229			

Source: Results obtained from the empirical data analysis using SPSS Version 25

These contrasting results show that only professional experience and entrepreneurial expertise have a statistically significant impact on determining the entrepreneurial orientation of Algerian researchers, unlike other variables such as age, gender, and the researcher's nature. This leads us to reject the sixth hypothesis.

In conclusion, Algerian researchers do not display a strong desire to engage in entrepreneurship. Their likelihood of considering entrepreneurship is largely influenced by their perceptions of how feasible and desirable it is, in addition to the available opportunities. Those researchers who are more inclined toward entrepreneurship tend to be younger, male, early in their careers, and do not have stable jobs.

It seems that the researchers in our sample lack entrepreneurial orientation, and rather, they tend to maintain a neutral position when considering such a decision. This can be explained by the low levels across all three dimensions: feasibility, desirability, and perception of opportunity. Interestingly, all three of these dimensions have statistically significant effects on determining entrepreneurial orientation, regardless of age, gender, or the researcher's role (e.g., professor, doctoral student, etc.). It seems that both professional experience in research and entrepreneurial experience are the most influential factors in determining entrepreneurial orientation.

In this context, it becomes apparent how the nature of scientific research contradicts the entrepreneurial nature. And therefore, it is challenging for researchers who are deeply immersed in the research field to transition towards business and entrepreneurship.

5. Conclusion:

To recapitulate, Algeria is committed and highly focused on diminishing economic reliance and attain economic variety. We assert that Algeria is wholeheartedly making determined efforts to reduce its economic dependence and enhance economic variation. The government's efforts are directed at these goals and are pursued through fostering innovation, entrepreneurship, and most notably, emerging businesses in recent years. This is founded on the belief that the accumulation of wealth in a society is a reflection of the dynamism and competitiveness of its industrial foundation.

However, it is important to note that any act of creation starts with a preexisting intention or desire to create. Our study initially examined whether researchers hold this intention, followed by an exploration of the potential determinants that could impact it. The reason we are interested in this group is the heightened economic significance of creating businesses through scientific research, which has led to government support and incentive measures, particularly in the past three years, notably since the inception of the Ministry of Knowledge Economy, Startups and Micro-enterprises.

In this particular setting, our investigation was focused on assessing the level of conviction and enthusiasm among researchers in academic institutions, spanning various universities and research centers to adopted this new approach. We aimed to measure their inclination for venturing into entrepreneurship and their emerging tendency toward starting their own businesses. To reach this goal we carried out an empirical investigation that involved 230 researchers, employing a questionnaire to compile diverse data. The compiled data was subjected to analysis through SPSS (Statistical Package for the Social Sciences) software, version 25.

- **Results of the theoretical study:** In light of the discussions presented in the preceding sections, we can draw the following theoretical findings:

- Intention serves as a predictor of behaviors and factors motivating a researcher's engagement in the entrepreneurial process.
- Moreover, the exploitation of scientific research findings can contribute to the development of new solutions for economic sector challenges, thereby presenting potential business opportunities for researchers.
- Research valorization involves researchers in the economic sector, helping them build personal connections that lead to the establishment of contracts for research outcome exploitation. Ultimately, this facilitates involvement in the creation and management of enterprises.
- Therefore, research valorization directs researchers towards a business and market-oriented approach, rather than solely a technical approach.
- Despite the significant role of Algerian universities in generating and disseminating knowledge, their role in research valorization remains mitigated. Therefore, the government is increasing its engagement in the entrepreneurial ecosystem and its support for entrepreneurship within academia.

- **Empirical Study Results:**

- The key finding from our study of the sample consisting of 230 Algerian researchers is that Algerian researchers exhibit a low level of entrepreneurial inclination. This necessitates a redirection of efforts towards alternative approaches for valorizing and leveraging the outcomes of scientific research. Moreover, to foster the growth of the startup sector, particularly enterprises emerging from it, it is advisable to concentrate on other groups besides researchers, particularly graduate students who may possess a higher entrepreneurial inclination since they do not yet have a clear professional future.
- Algerian researchers show a modest interest in transforming their research findings into entrepreneurial projects. Notably, their eagerness to embark on entrepreneurial ventures seems reserved, as they seem to consider the availability of favorable conditions when making this choice. This implies that they may not be particularly enthusiastic about commencing a business in the immediate or near future.

The limited interest among researchers in pursuing entrepreneurship can be attributed to their lack of attraction to this avenue (low desirability) and a perceived lack of capability to undertake such endeavors (low feasibility), rather than the absence of perceived business opportunities. In other words, the researchers in our sample do not possess the necessary personality traits, skills, and competencies commonly associated with an entrepreneurial profile.

In fact, it appears that many researchers assign significant importance to their profession, which they perceive as a vocation. Their primary focus lies in enhancing their scientific and pedagogical achievements, even at the expense of commercial applications. However, research valorization activities are becoming more widespread, with an increasing emphasis on prioritizing innovation patenting as a primary avenue of focus.

- **Modest participation within the economic sphere:** Industrial relationships are primarily manifested through collaborations between researchers and the business world. Additionally, being engaged in technology transfer activities (less extreme than starting a business) is supposed to be conducive to the development of entrepreneurial awareness. However, fewer than half of our sample have knowledge about businesses (42.2%), and only about 23.5% actually have experience in starting or managing a company.
- **Limited Socio-demographic Impact on Entrepreneurial Aspirations Diversity:** It seems that only knowledge in the field of business and entrepreneurial experience have a statistically significant impact on affecting entrepreneurial intentions among Algerian researchers. Men are more inclined than women to start a business. Meanwhile, gender, age, research field, professional status, do not have a statistically significant effect.
- **Positive Influence of Success Stories:** This refers to the existence of an entrepreneurial role model to be emulated, which has a favorable influence on researchers' entrepreneurial intentions.

- **Recommendations:**

The state of academic spin-off creation in Algeria is underdeveloped and unfulfilled, as it is yet to fully realize its potential. It is evident that the government is committed to propelling entrepreneurship and supporting the emergence of startups within academia. In light of this, we suggest the following measures to fortify and to strengthen the vital role of Algerian universities and the various parties engaged in the advancement and commercialization of research output and academic spin-off formation. The analysis provided above highlights the fact that desirability and feasibility are the chief impediments to researchers' entrepreneurial interest. Consequently, two strategies are recommended to enhance entrepreneurial orientation.

- **In the short term:** it is imperative for the government to create a more efficient national innovation system that ensures the continuous collaboration among universities, research centers, intellectual property protection agencies, valorization agencies, and businesses.
- Encourage the economic sector to collaborate with academia and research centers, this entails bringing entrepreneurs closer to the realms of scientific research. Entrepreneurs have long been recognized as the intermediaries between ideas and clients, in other words, between scientific research and the practical implementation of its outcomes. This can be achieved through fostering activities related to intellectual property protection, raising awareness about its presence and significance, as well as the importance of its material and immaterial exploitation. This can be facilitated through activities such as licensing, selling patents, or personal utilization by researchers themselves.
- Furthermore, it might be worthwhile to broaden the discussion of successful researcher-entrepreneur stories, enhance their dissemination, and to better inform researchers about the fact that starting a business is a means of valorizing research endeavors.
- It is not only necessary to amend the intellectual property law in accordance with the requirements of integration but also to ensure the harmonization of interests among stakeholders in exploiting research results funded by the budget. Furthermore, identifying tax incentives in scientific research, new products, and issuing policies to attract venture capital are essential.
- Considering the difficulty in changing the culture of an environment, it could be relevant to direct efforts towards emphasizing research valorization among individuals who exhibit a more "entrepreneurial" mindset. This particularly applies to young PhD holders, doctoral students, and students at different educational levels.

- **Promote access to entrepreneurship training:** This training should encompass the unique aspects of business creation by a researcher in a formal position, aiming to instill the required skills successfully carry out a company creation project.

- Delving into novel alternative approaches to promote and recompense patent rights, with a particular emphasis on avoiding conflicts between career advancement goals and the commercialization of inventive concepts. This is to render research and involvement in company creation activities compatible in a manner that reduces potential contradictions perceived by researchers between teaching and research endeavors and entrepreneurial activities.
- **In the medium and long term**: Promoting an entrepreneurial culture within the academic environment, emphasizing that the tangible utilization of scientific research is feasible and commendable, fostering initiative, highlighting the role and functions of university interface entities such as incubators, entrepreneurship centers (CATI, career centers, and blue office).
- However, it is evident that the new national regulations, as well as those within each academic institution, will necessitate organizational and institutional modifications that explicitly integrate the culture of entrepreneurship and innovation. This also involves explicit management strategies, alongside adaptations to public policies that foster technological entrepreneurship originating from academia. These measures will solidify the culture of entrepreneurship and innovation, concurrently demanding adjustments to public policies and the creation of a robust industry and markets for technology-based enterprises.
- University administrators should devise a growth plan for their institutions that corresponds with the national development strategy for the innovation system.

- It is important to augment the allocation of budgets for scientific research within universities and to identify pivotal technologies to be pursued in alignment with national competitiveness. This entails establishing units with robust scientific research capabilities.

- Universities should strengthen and reinforce their connections with industry associations to promptly understand innovation requirements. They should also regularly organize thematic activities with industries to collaboratively address challenges emerging from enterprises.
- Creating a legal structure that is well-suited to the distinct shift from being a teacher-researcher to adopting an entrepreneurial role.
- Establish support, guidance, and dedicated funding mechanisms for academic spin-offs.
- Actively raise awareness, motivation, willingness, and skills of researchers to valorize the outcomes of their work and persuade them towards the entrepreneurial path.
- In conclusion, it is vital to steer the Algerian academic community toward embracing the notion of an entrepreneurial university. It is crucial for universities to view scientific research not only as a means of enhancing their reputation but also as a secondary source of income. To achieve this, universities should broaden their connections with businesses, industry associations, provinces, cities, ministries, national programs and projects, in order to address the developmental needs of society.

References

Ait Hatrit, K. (2020). The Role of the Link Between the University and the Business Sector in Valorizing Scientific Research in Algeria Development of Human Resources, 15(2), 38-100.

Battache, A., Becheker, K., & Bellahcene, T. (2021). Valorization of the Results of Scientific Research in Algeria: State of Affairs and Perspectives. Marketing and Business Research Review, 01(01), 90-100.

Bareche, A. (2017, April). Valorization of Research Results. Scientific day of the Laboratory of Microbial Ecology. Algeria: University of Bejaia.

Bellahreche, A. (2007). A Tool for Valorizing Agricultural Scientific Research in Algeria. Master's Thesis in Computer Science, 65. Algeria.

Boisson, J., Chollet, B., & Emin, S. (2009). Determinants of Entrepreneurial Intention Among Students: An empirical test. Management Review, 12(01), 28-51.

Boukheddimi, S. (2020, April). SME and Technological Innovation in Algeria, what perspectives? El' Bahith Journal, 12(02), 135-153.

Branche, B. E. (2009). Formation and Entrepreneurial Spirit Among Students. Research Notebook, 17(04).

Bukhari, S. A. (2022). Sample size determination using Krejcie and Morgan table. Retrieved in 2023, from: https://www.researchgate.net/publication/349118299

Castéran, H. (2017). Chapter 4. Political surveys, technical or demiurge? In F. Dosquet (Ed.), Marketing and political communication (Vol. 02, pp. 183-256). France: EMS Editions.

Chortani, O. (2011). Characteristics of Entrepreneurial Dynamics in Business Incubators in Tunisia. 6th Congress of the Franco-Brazilian Institute of Business Administration. France.

DGRST. (2022). Retrieved from http://www.dgrsdt.dz/fr/brevet

Emin, S. (2004). Entrepreneurship in a university context: Factors of engagement. Entrepreneurship Review, 3(1).

Emin, S. (2003). Intention to Create a Business Among Public Researchers: The French case. Doctoral thesis in Management Sciences. University of Pierre Mendès, Canada.

Hernández, P. P., Calderón, G., & Noriega, E. (2021). Generation of University Spin-off Companies: Challenges from Mexico. Journal of Technology Management & Innovation, 16(01).

Jaziri, R., & Paturel, R. (May 30-31, 2010). "Academic entrepreneurship" or "Acadepreneurship": Toward a Reconfiguration of the "Entrepreneurial University" model. Proceedings of the 9th International Symposium on "Entrepreneurial Practices: Challenges for Innovation and Economic Growth in Algeria". Algiers.

Julien de Miribel, Xavier Sido. (2019). Defining and Recognizing Entrepreneurial Competencies? [Research Report] Rectorate of the Academy of Lille, IDEE.

Koubaa, S., & Sahib Eddine, A. (2012). Entrepreneurial Intention of Students in Morocco: A PLS Analysis of the Method of Structural Equations. 11th International Francophone Congress on Entrepreneurship and SMEs, France.

Labair, S., Graa, A., & Azzine, A. (2017). The effect of Perceived Quality on User Satisfaction With Public Service: The Case of the National Social Security Fund (C.N.A.S). Algerian Journal of Economics and Management, (09).

Le Soir d'Algérie Newspaper. (2022). Consulted on March 7, 2022, retrieved from https://www.lesoirdalgerie.com/contribution/etudier-les-sciences-humaines-et-sociales-une-insertion-difficile-61216

Questionnaire link. (2023). Retrieved from https://docs.google.com/forms/d/e/1FAIpQLSfMNhva7onXpSZkW-1u4fzmlZfWu_gHIYOdF3ABFEtFljNgJw/viewform?usp=sf_link

MESRS. (2022). Consulted on January 7, 2022, Retrieved from https://www.mesrs.dz/index.php/fr/accueil/

Minh, N. D., & Van, T. T. H. (2022). Spin-Off and Commercialization of University Researches. Open Journal of Social Sciences, 10, 256-266. https://doi.org/10.4236/jss.2022.101021

Official Gazette No. 49. (2022, July 20). Law No. 22-16 amending Law No. 90-11 of April 21, 1990, regarding labor relations. Algeria.

Official Gazette. (1999). Law No. 99-587 of July 12, 1999. France.

Pilar Pérez-Hernández, G. C. (2021). Generation of University Spin Off Companies: Challenges from Mexico. (Ed. by Alberto Hurtado University). Journal of Technology Management & Innovation, 16(1).

UNESCO. (2022). Retrieved on July 16, 2022, from uis.unesco.org/apps/visualisations/research-and-development-spending/#!lang=en

Verzat, C. (2012). Educating the entrepreneurial spirit: Assessment and Research Questions. Habilitation thesis in Management Sciences. UPMF Grenoble, France.

Wang, Y. (2010, September). Evolution of Intention and Development of Entrepreneurial Mindset Among Engineering Students of a French school: A Longitudinal Study. Doctoral thesis in Industrial Engineering. Central School of Lille, France.

World Bank. (2021). Retrieved June 15, 2022, from https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?locations=DZ

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The effect of foreign direct investment (FDI) on economic growth: The case of AMU

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Abstract

This study analyses the impact of foreign direct investment (FDI) on economic growth (GDP) in the Arab Maghreb Union (AMU). For this purpose, it uses Angel Granger cointegration method for the period from 1980-2021. The estimation results show that these two variables are cointegrated. We found that FDI has a significant positive impact on economic growth, which confirms that FDI is an important factor in promoting Maghreb economic growth. The causality test show that there exists a directional causality from GDP to FDI in AMU.

1. Introduction

The international movement of capital is one of the most important factors for the development of the world economy, especially in the case of developing and less developed countries. The importance of FDI, as a form of international capital movement, is in the existence of positive externalities created by multinational corporations (MNCs).

The contribution of foreign direct investment (FDI) to economic growth in host countries has long been the subject of intense debate. It is widely observed that FDI mitigates the saving-investment imbalance and provides technology which is used for the production of goods and services. Additionally, FDI enhances tax revenue as well as human capital (Buckley, 2002).

Foreign direct investment (FDI) has grown significantly in the past 20 years. Its growth has outpaced world production and the growth of international trade. Although most foreign direct investment is concentrated in developed countries, its flows have become increasingly important in developing countries. This large influx has led economic policy makers in developing countries to focus their efforts on attracting more foreign capital after realizing their impact on the economic performance of the host country, This paper tries to describe and analyze broad literature to detect the proper variables in explaining the impact of FDI on growth in the Maghreb countries (Algeria, Tunisia, Morocco, Libya and Mauritania) during the period 1980-2021 by applying the methodology of cointegration of Angel Granger.

The structure of the paper is as follows. Following this Instruction section, Section 2 Foreign direct investment in the countries of the Arab Maghreb region, Section3 Discusses the literature review. Section 4 Methodology. Section 5 presents empirical results, followed by the Conclusions and policy implications provided in Section 6.

2. Foreign direct investment in the countries of the Arab Maghreb region

Foreign direct investment (FDI) is defined as a project established or owned by a foreign investor outside the borders of their home country. This ownership can be either complete or partial, allowing the investor to manage and monitor the project in conjunction with the local investor. Through FDI, the necessary funding for projects can be provided, job opportunities can be generated, and advanced technologies and expertise can be created. According to the International Monetary Fund (IMF), foreign investments are considered direct when the foreign investor owns 10 percent or more of the company's capital shares and has the ability to influence its management.

Developing countries work to encourage foreign direct investment as a driving factor for economic growth and development, aiming to achieve a set of objectives in reality. The flow of FDI from one country to another results in various effects that can be summarized as follows:

- Utilizing technological knowledge and high managerial skills transferred from the investing country to the host country, benefiting both in terms of production methods and techniques.
- Providing employment opportunities and mitigating unemployment issues, as foreign companies in host countries contribute to increased employment for their citizens and raise wages.
- Contributing to improving the balance of payments and developing exports while reducing imports.
- Contributing to capital formation.
- Influencing the local market structure and promoting competition in favor of consumer interests regarding price, quality, and service.
- Increasing economic growth rates in the host country by enhancing product quality, which opens global markets for these products, ultimately increasing average individual income and improving their living standards.

The countries of the Arab Maghreb region possess vast potentials and resources that enable them to attract foreign direct investments. However, their performance remains limited and is characterized by a lack of diversity, as they focus on specific sectors.

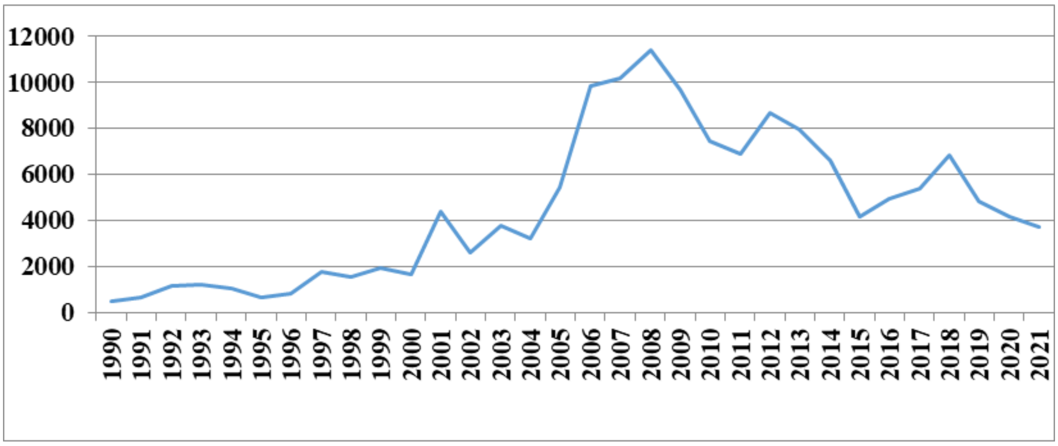

Figure 1: FDI inflows to Arab Maghreb Countries during the period 1990-2018 (Millions of U.S)

Source : ((https://unctadstat.unctad.org))

Through the above figure, it can be observed that the inflow of foreign direct investment (FDI) into the Arab Maghreb countries is irregular, fluctuating between periods of increase and decrease. For instance, FDI increased modestly from $293.7 million in 1990 to approximately $1481.52 million in 2000. Then, from 2003 to 2008, FDI experienced significant jumps, reaching a value of $7877.41 million. However, in the subsequent two years, FDI declined due to the global financial crisis and the absence of security and political stability in Tunisia, negatively affecting its performance.

In 2015, foreign direct investments saw a decline in inflows due to the petroleum crisis caused by a decrease in global petroleum prices, particularly affecting Algeria, which experienced a negative value of -$584.46 million, as foreign investors became hesitant to invest in the fuel sector. Subsequent years saw increases in FDI values, albeit with modest percentages, attributed to improved investment conditions in the region. However, FDI declined again in 2019 due to the COVID-19 pandemic.

3. Literature review

The relationship between foreign direct investment (FDI) and economic growth has motivated a voluminous empirical literature focusing on both industrial and developing countries. For instance, (Argiro, 2003) indicated that FDI has a direct, and indirect positive effect on the growth rate of European Union economies through trade reinforcement. According to the author, FDI may raise the productivity in the receiving country and exports. This increase in productivity, in turn, may indirectly affect exports.

(Alege , 2014) investigate the relationship between foreign direct investment and economic growth in the ECOWAS sub-region for the period 1970-2011 by employing the Generalized Methods of Moment technique of estimation (GMM). The report suggested a negative and insignificant relationship between foreign direct investment and economic growth in the ECOWAS sub-region despite enhanced human capital, trade openness and sound governance in the Sub-region.

(Anochie et al, 2015) in a study of foreign direct investment flows in Nigeria: Pro or Economic Growth Averse concluded that there is a positive relationship between economic growth (GDP) and FDI as well as the fact that domestic investment was responsible for the growth witnessed in Nigeria's economy over the period under review. Although, the result was positive but statistically insignificant which could be a result of insufficient FDI funds invested into the Nigerian economy which has not been able to significantly impact the economic growth.

(Panagiotis Pegkas, 2015) The study was conducted during the period 2002-2012, using panel data, FMOLS and DOLS. The results revealed a long-term and positive correlation between the stock of foreign direct investment and economic growth in the European Union. Opposite results were found by (Sonja & Tanja , 2016)after investigating the effect that FDI had on economic growth in the European Union. Their result indicated a negative interdependence between FDI and GDP and no positive impact of FDI on the value of GDP in the EU from 2005 to 2015. The global economic crisis in the reporting period can be one of the causes of the given negative coefficients.

(Galaye & Helian , 2016) The estimation results show that FDI has a positive impact on economic growth. We found that FDI in WAEMU is going to facilitate trade, FDI liberalization, economic cooperation, improve the business environment and increase the labour cost. FDI will allow WAEMU countries to attract more foreign capital for the creation of jobs and wealth. (Seiko. M. Z, 2016), has examined the influence of FDI on Economic growth using panel data from fourteen countries in East Africa for the period 1980 to 2013. He uses the dynamic generalized method of moments (GMM) estimators after testing for autocorrelation and model specification tests. He decided that FDI is a main guide of economic growth and a promoter of economic conditional gathering in Eastern Africa; therefore, the sub-region requisite to attract more FDI by refining investment conditions, strengthening regional integration, developing human capital and basic infrastructure, and promoting export-oriented investment, (Habibi, Karimi , 2017)The empirical results show that the FDI is one of the major drivers of economic growth in Iran and GCC countries, (Stanisic, N, 2015) analyzed the FDI inflow and economic growth of Southeastern European economies and found that there is no significant association between these two variables, which was due to methodological imperfections.

This complexity may be because the effect of FDI on growth differs significantly from one group of countries to another as indicated by (Nlandu Mamingi &Kareem Martin, 2018). (Selma , 2013) indicated that FDI has both direct and indirect effects on employment. However, he did not show how those indirect effects increase GDP. Besides (2012), indicated that in addition to externalities, technology spillovers, human capital training, efficiency, and productivity are among the factors that indirectly increase GDP in the economic growth of the receiving country.

A study conducted by (Dinh et al, 2019)assessed the relationship for both short-run and long-run periods among FDI and 30 lower-middle-income countries' economic growth for a period ranging from 2000 to 2014. the authors concluded that a negative impact of lagged FDI for one and two periods on economic growth exists in the short run. On the other hand, in the long run, a positive impact occurs. The authors recommended that policies should be made to encourage FDI in order to improve economic growth in the long run. These results could be supported by (Koojaroenprasit, 2012); (Shahbaz &Rahman, 2010).

Quite recently, In order to address the question of whether FDI impacts economic growth, (Bibhuti & Farid , 2020) analyzed the causal nexus between FDI and GDP in Bangladesh. They used augmented Dickey-Fuller, augmented Dickey-Fuller generalized least square, Kwiatkowski-Phillips-Schmidt-Shin, and Lee-Strazicich unit root tests to check stationarity, augmented autoregressive distributed lag (augmented ARDL) bounds to test cointegration, and Granger causality to analyze the direction of causality. A long-run relationship between FDI and GDP was revealed. An unidirectional causality running from GDP to FDI was also detected.

(Huong et al, 2021) employs a VAR model based on unit root tests, Granger causality, impulse responses, and variance decompositions. In his conclusion, FDI has a positive impact on short-term economic growth, but negative impacts on long-term growth. While a study by Qureshi et al. (2021) (Qureshi et al, 2021) claims that economic growth is positively associated with corruption in developing countries while it is negatively associated with corruption in developed countries.

4. Methodology

The concept of cointegration in 1980 entered into the analysis of time series. Cointegration analysis is a method of attempting to determine whether a long-term relationship of two or more non-stationary time series. To be examined closely associated with economic variables in the long run equilibrium.

The presence of a cointegration relationship between the variables indicates that these variables move together in the long term. In this study, the long-term macroeconomic relationship between the two variables is examined.

Engel Granger's cointegration method has been employed to analyze the impact of foreign direct investment on economic growth in Arab Maghreb countries.

To make an empirical assessment of the link between foreign direct investment and economic growth a three-step procedure is adopted to investigate the relationship between two variables. In step one (Engel & Granger, 1987), the unit root test to determine the order of integration of the series. Step two tests for cointegration of the series identified as first deference I(1) using the Engel and Granger residual based approach. In step three, the Granger causality test to examine causality between the variables.

To assess empirically the impact of FDI on economic growth in AMU, we specify the following model:

$$LGDP = \alpha_0 + \alpha_1 LFDI + \varepsilon_t$$

Where:

$LGDP$: is the log of the gross domestic product

$LFDI$: is the log of foreign direct investment inflows

ε_t: is the error term

Engel and Granger have shown that if the two variables are stationary in the first difference and the error term is integrated in I(0), if a long-run relationship exists between the GDP and FDI this means that the two variables are cointegrated.

We hypothesise that the FDI inflows have a positive effect on economic growth in AMU.

The data for our analysis are obtained from the United Nations Conference on Trade and Development (UNCTAD) which covered 21 years from 1980 to 2021. The data cover five AMU countries (Algeria, Tunisia, Morocco, Libya and Mauritania).

5. Empirical results

5.1.Unit root test

As with the nature of time series data, the first step is to test the unit root for examining whether the time series data are stationary or non-stationary before identifying if a long relationship between the variables exists or not. The augmented Dickey-Fuller and Phillips- Perron tests were used to test the stationary of the variables. The results of the unit root test are reported in Table 1:

Table 1. Unit root test results

Variable	**ADF**		**PP**	
	Level	**First difference**	**Level**	**First difference**
GDP	-2.2529 (0.9173)	-5.5495* (0.0000)	-0.3332 (0.9109)	-5.5442* (0.0000)
FDI	-2.6979 (0.2435)	-6.2520* (0.0000)	-2.7184 (0.2385)	-6.6798* (0.0000)

Note: * indicate the significance at the 1% levels

Source: Author's calculation (Eviews 9)

The results of Table 1 show that the null hypothesis of the presence of unit root test or non-stationary has been rejected for the two variables. This shows that all variables integrated in the first difference I(1). This also means that the series are non-stationary in level but stationary in first difference.As the results indicate that FDI and GDP have the same order of integration, the next step is to use Engel Granger cointegration test.

5.2. Cointegration test

Angel and Granger cointegration test is used to reveal the long-run relationship between the two variables. According to the test, variables are assumed to be stationary at the same level. Both variables should have first-order stationarity. After creating a new regression with the variables whose stationarity is obtained, the stationarity of the residuals of this regression at the level value is tested. If it shows stationarity in level value, it concludes that there is cointegration between variables (Yakup & Granger , 2021)**.**

We estimate our equation using the ordinary least squares (OLS) method in order to test the presence of a long-term relationship between the variables, the results are represented in Table 2:

Table 2. OLS Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FDI	0.292488	0.034657	8.439437	0.0000
C	4.371244	0.116347	37.57070	0.0000
R-squared	0.664255	Mean dependent var		5.335146
Adjusted R-squared	0.654928	S.D. dependent var		0.232722
S.E. of regression	0.136707	Akaike info criterion		-1.090751
Sum squared resid	0.672801	Schwarz criterion		-1.004563
Log likelihood	22.72428	Hannan-Quinn criter.		-1.060086
F-statistic	71.22410	Durbin-Watson stat		0.185512
Prob(F-statistic)	0.000000			

Source: Author’s calculation (Eviews9)

According to the results of Table 2, The coefficient of FDI inflows is positive and statistically significant, this suggests that FDI has a positive effect on economic growth in the Arab Maghreb Union (AMU). It also reveals that the 1% rise in FDI tends to increase 0.29% in GDP that confirms the importance of FDI and its role in promoting economic growth in the Maghreb countries. This can be explained by the potential to benefit from the spread of technologies and available competencies through establishing advanced investments, which positively impact productivity, as well as the deficiency of local investments. On the other hand, the governments of the Maghreb countries resort to tapping into foreign expertise in this field due to the weakness of domestic experience. For instance, in the case of Algeria, particularly concerning the hydrocarbons sector. Therefore, it can be said that foreign direct investment is linked to long-term economic growth, as confirmed by the study's findings.)The R^2 is 0.66. It indicates that 66% of the variance in GDP can be explained by FDI. The

F-statistic value of the cointegration regression model is (71.22), which shows that the model is statistically significant. The long-run equilibrium model is as follows:

GDP= 4.371244 + 0.292488 FDI+ ε_t

The ADF and the PP unit tests were applied on the residual from this long-run regression in order to examine whether or not the residual series are stationary in level. The results obtained are presented in table 3:

Table 3. Results of residual stationery

ADF		**t-statistic**	**Prob**
		-3.6256	**0.0419**
Test critical values	**1%** **5%** **10%**	**-4.2436** **-3.5442** **-3.2046**	
PP		**t-statistic**	**0.0299**
Test critical values	**1%** **5%** **10%**	**-4.2436**	
		-3.5442	
		-3.2046	

Source: Author’s calculation (Eviews9)

The results from ADF and PP tests suggest that the residuals are stationary at level I(0) which means a long-run relationship between FDI and GDP, These results indicate that the two variables are integrated and thus there is a cointegration between them.

5.3.Granger Causality Test

Since a long relationship is found between FDI and GDP, the last test carried out is Ganger Causality to determine the direction of the causality among the variables. The results are presented in Table 4:

Table 4. Causality test of Granger

Null Hypothesis:	Obs	F-Statistic	Prob.
FDI does not Granger Cause GDP	35	1.84372	0.1769
GDP does not Granger Cause FDI		2.50680	0.0297

Source: Author’s calculation (Eviews9)

The Granger causality test for the relationship between FDI and GDP indicates that there is a directional causality from GDP to FDI in AMU i.e. economic growth causes foreign direct investment, and there is also no significant Granger causality from FDI to GDP.

6. Conclusion

The foreign direct investments in the countries of the Arab Maghreb region remain limited and are concentrated in specific sectors compared to the potential of these countries and other economic blocs. Therefore, through our study, we attempted to understand the impact of foreign direct investment on economic growth in the Arab Maghreb Union during the period from 1980 to 2021, using the cointegration methodology of Angel Granger to study the long-term relationship between foreign direct investment (FDI) and gross domestic product (GDP). We arrived at the following results:

- The results of the unit root test indicated that the study variables had a unit root at the level but were stationary at the first difference.
- The results of the cointegration tests by Angel Granger showed a significant and positive relationship between foreign direct investment and gross domestic product in the Arab Maghreb Union, confirming that foreign direct investment is an important factor in promoting economic growth in the Maghreb region.
- The results of the residual stability test indicated that they were stationary at the level, confirming the existence of a long-term equilibrium relationship between the study variables.

- There is a one-way causal relationship, meaning that economic growth causes foreign direct investment, not the other way around. Therefore, it can be stated that there is a unidirectional relationship between the two variables.

Based on these findings, this study reveals a significant and positive relationship between foreign direct investment (FDI) and economic growth in the Maghreb region in the long term. However, this impact falls short of its potential when considering the region's capabilities and in comparison to global investment flows. Additionally, investments in the region are concentrated in specific sectors. In recent years, there has been a disturbance in the volume of FDI due to the unfavorable investment climate, economic and political instability in the region. This has raised concerns among foreign investors, deterring them from investing or expanding their existing investments in these countries, along with the various restrictions imposed on such investments across different sectors.

Based on the obtained results, we propose the following recommendations:

1. Ensure political, economic, and social stability in the Maghreb region as a necessity for providing a conducive investment climate and achieving economic growth.
2. Emphasize the development of the human capital as a fundamental factor for attracting foreign direct investment.
3. Increase expenditure in research and development to diversify and enhance the production base.
4. Work on improving and simplifying laws and regulations to instill greater confidence in investors.
5. Encourage and support developmental projects that contribute to accelerating the pace of growth and economic development in Maghreb countries.
6. Establish a Maghreb Free Trade Area to leverage significant advantages that can help attract foreign direct investment, transfer modern technology, and create job opportunities.
7. Promote collaborative efforts among Maghreb countries to enhance intra-regional investment climate and sign bilateral agreements to encourage the movement of individuals, goods, and capital between surplus and deficit countries.

References

Alege PO, Ogundip A. (2014). Foreign direct investment and economic growth in ECOWAS: A system GMM approach. *Covenant Journal of Business and Social Science, (JBSS), 15(1).*

Anochie UzomaC. Ph.D, Ude Damian Kalu and Mgbemena Onyinye O. (2015). Foreign Direct Investment (FDI) Flows in Nigeria: Pro or Economic Growth Averse?. *Journal of Economics and Finance (IOSR-JEF),6(4),*, 84-92.

Argiro Moudatsou. (2003). Foreign Direct Investment and Economic Growth in the European Union. *Journal of Economic Integration ,18(4),* 689-707.

Bibhuti Sarker . Farid Khan . (2020). Nexus between foreign direct investment and economic growth in Bangladesh: an augmented autoregressive distributed lag bounds testing approach. *Financial Innovation.vol. 6(1).*, pp 1-18.

Buckley, Peter J., Jeremy Clegg, ChengqiWang, and Adam Cross. (2002). FDI, regional difference and economic growth: Panel data evidence from China. *Transnatl. Corp. 11,* 1-28.

Dinh, Trang Thi-Huyen, Duc Hong Vo, Anh The Vo, and Thang Cong Nguyen. (2019). Foreign Direct Investment and Economic Growth in The Short Run and Long Run: Empirical Evidence from Developing Countries. *Journal of Risk and Financial Management 12: 176.*

Engel, R.F., & Granger, C.W.j, (1987). co-integration and error correction representation, estimating and testing,. *Econometrica, 55,,* p251-276.

Fateh Habibi, Mohammad Sharif Karimi . (2017). Foreign Direct Investment and Economic Growth: Evidence from Iran and GCC. *Iranian Economic Review, 21(3),,* pp.601-620.

F. Qureshi, S. Qureshi, X.V. Vo, I. Junejo. (2021). Revisiting the nexus among foreign direct investment, corruption and growth in developing and developed markets. *Borsa Istanbul Review, 21 (1) ,,* pp. 80-91.

Galaye Ndiaye, Helian Xu. (2016). Impact of Foreign Direct Investment (FDI) on Economic Growth in WAEMU from 1990 to 2012. *International Journal of Financial Research,7(4),* pp.33-43.

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Koojaroenprasit, B. (2012). The Impact of Foreign Direct Investment on Economic Growth: A Case Study of South Korea. *International Journal of Business and Social Science, 3,*, pp.8-18.

KURTISHI-KASTRATI Selma. (2013). "The Effects of Foreign Direct Investments for Host Country's Economy,". *European Journal of Interdisciplinary Studies, Bucharest Economic Academy, issue 01, March*.

Muhammad Shahbaz. Mohammad Mafizur Rahman. (2010). The Dynamic of Financial Development, Imports, Foreign Direct Investment and Economic Growth: Cointegration and Causality Analysis in Pakistan. *Global Business Review, 13(2).*, pp1-28.

Nguyen, Cuong and Tran, Tuyen and Vu, Huong . (2021). The Long-Term Effects of War on Foreign Direct Investment and Economic Development: Evidence from Vietnam. *MPRA .N° 111891.*, PP1-71.

Panagiotis Pegkas. (2015). "The impact of FDI on economic growth in Eurozone countries". *The Journal of Economic Asymmetries12*, pp. 124-132.

Seiko. M. Z. (2016). The Impact of Foreign Direct Investment (FDI) on Economic Growth in Eastern Africa: Evidence from Panel Data Analysis,. *Applied Economics and Finance, 3(1)*, pp145-160.

Sonja MILUTINOVIĆ. Tanja STANIŠIĆ . (2016). THE EFFECT OF FOREIGN DIRECT INVESTMENT ON ECONOMIC GROWTH IN THE EUROPEAN UNION. *The Review of International Affairs, Vol. LXVII, No. 1164,*, pp. 106–124.

Stanisic, N. (2015). Do foreign direct investments increase the economic growth of Southeastern European transition economies? South-Eastern Europe. *Journal of Economics, 6(1).*

Yakup Ari, Engel Granger. (2021). cointegration analysis between GARCH-type volatilities of gold and silver returns,. *Alanya academic review journal, Vol 5, N°2,*, P589-618.