

Innovative Work Behavior and Technological Knowledge Competencies: Evidence from SMEs in Southern Italy

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The interaction between technology and skills is a key factor influencing the observed differences in productivity and competitiveness. This relationship, in turn, shapes innovative work behavior and stimulates innovation. Recognizing the importance of efficient policies to transition the SME sector towards technology, alongside the awareness of the need to effectively increase regional human capital, are fundamental steps for achieving technology-driven improvements in living standards. SMEs' innovative activity heavily relies on technological opportunity and appropriability, serving as principal industry-level determinants. The present study aims to significantly contribute to existing literature by comprehensively analyzing tools for innovative work behavior and technological knowledge competencies in the SME business environment. Gathering a total of 210 responses, this paper highlights and explains how technological development, particularly through social media, has engaged SMEs across diverse categories and its relative impact on their performance. Additionally, it paves the way for further research in related areas.

Keywords: innovative work behavior, technological knowledge competencies, social media, SMEs, performance

Introduction

To navigate swiftly changing economic landscapes and secure a competitive edge, organizations must demonstrate proficiency in innovation (Bos-Nehles et al. 2017). Sustaining competitiveness and ensuring long-term viability necessitate a continuous commitment to innovation within companies (Santoso and Heng 2019). Consequently, numerous organizations worldwide incentivize innovative work behaviors, recognizing that employees play a crucial role in fostering innovation within organizations (Di Virgilio 2021b, Arain et al. 2020).

Depending on the circumstances, the nature of innovation may encompass various forms, including innovative practices, methodologies, and workplace environments. However, without innovative work behaviors, the realization of innovation remains unattainable, leaving many of the benefits associated with entrepreneurial ideas uncertain, as well as the determination of development and/or implementation costs (Di Virgilio 2021b, Akmal and Mehmood 2020).

Consequently, creative ideas necessitate support, enrichment, and dissemination among colleagues, executives, and consumers to facilitate implementation (Baer 2012).

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The aims of this paper are to highlight and explain how technological development has involved SMEs of diverse categories and its relative impact on their performance. Particularly in recent years, social media has become a strategic tool for SMEs in the business environment (Di Virgilio et al. 2022, Di Virgilio 2021a).

The rationale behind social media being regarded as indispensable for every SME stems from a shift in company structure, where the customer assumes a central role driven by an innovative perspective. The primary objective is to satisfy customers' needs and expectations. Social networks possess the capacity to bolster this pivotal relationship and yield significant impacts on company performance, which is constantly evolving to align SMEs' objectives with technological capabilities (Di Virgilio and Das 2023a).

The study is a pilot study concerning Molise's SMEs, aimed at estimating their level of technological improvement. The survey results were analyzed using statistical methods to elucidate the various relationships between the principal variables. The Pearson's Chi-square index and the Goodman-Kruskal's Gamma were fundamental for the overall analysis, as they helped decrypt the relative correlation between social media effects on SME profitability and their impact on performance.

The combination of information technology means and organizational skills represents a competitive advantage, as it results in impressive performance that leads to high future incomes. Specifically, the term "technological knowledge competencies" is used to denote the technological resources that a company requires to develop new items or processes in response to market demand (Garcia-Morales et al. 2018). The managerial tool that enables the realization of technological knowledge competencies equates to innovation capabilities, defined as an intangible asset that ensures the transformation of ideas and knowledge into new elements such as products and systems. This also promotes internal welfare within SMEs and enhances their relationships with external stakeholders.

Scientific evidence demonstrates that the growth of technological knowledge competencies is directly proportional to a company's performance. This is because it enhances innovation capability, resource utilization efficiency, and knowledge interaction. Social media plays a fundamental role in validating companies to receive information and acquire technological knowledge competencies. This is achieved through the enhancement of internal communication between employees and managers, enabling faster and more effective learning processes.

In this scenario, the paper is organized into two parts. The first part discusses the literature review on innovative work behavior and past studies related to technological knowledge competencies, the usage of social media in organizations, and their potential influence on firm performance. In the second part, we present a pilot study, and empirical results are showcased in the findings section, followed by discussion and conclusion.

Our exploratory research introduces a tool for understanding the role of innovative work behavior and its influence on technological knowledge competencies, guiding future research on SMEs. Replicating similar studies in other regions and countries is therefore imperative for increasing the generalizability of prior findings.

Literature Review

Innovative Work Behavior: An Overview in Different Organizational Contexts

Innovative Work Behavior (IWB) is an extensively researched subject matter, with the predominant definition within the literature attributed to Janssen (2000). IWB delineates the actions undertaken by employees to conceive, introduce, and purposefully implement novel work concepts within a collective or organizational framework, aiming to enhance performance and integrate themselves into the organizational dynamics (Bogilović et al. 2017, Černe et al. 2014, Rousseau and Aubé 2018, Khalid et al. 2018, Arain et al. 2020, Wang et al. 2018).

IWB concerns the involvement of individuals and groups in the implementation of organizational innovation and aims to increase the total effectiveness and efficiency of the organization and its practices (Bogilović et al. 2017, Černe et al. 2014).

IWB is conceptualized as an intentional attitude on the part of employees to produce and implement new and useful ideas with the goal of creating individual, organizational, or group benefits (Rousseau and Aubé 2018).

IWB is relevant because employees are the primary source of innovation in any organization. Their drive for innovation enables them to contribute to the overall success of the organization (Arain et al. 2020). Employees' determination to identify problems, seek information, codify, and generate ideas in the right way leads to unique and innovative solutions (Karwowski et al. 2019, Reiter-Palmon 2021).

Defined as the intentional attitude of individuals to create and implement innovative ideas that create benefit for themselves, their teams, or their institutions, IWB is identified as problem exploration, idea generation, idea championing, and implementation of innovative ideas (Rousseau and Aubé 2018). The initial feature of idea exploration within the innovation process entails the investigation of opportunities. During this phase, novel methods are delineated to optimize the existing array of products and services (Örnek and Ayas 2015). This stage encompasses a spectrum of activities, including the establishment of organizational processes and the quest for alternative products and services.

Numerous factors contribute to the cultivation of innovative ideas, such as disparities between anticipated outcomes and actual results, unforeseen developments, operational exigencies, fluctuations within the market or sector, demographic shifts, alterations in perceptual frameworks, and the assimilation of new insights pertaining to organizational dynamics (Örnek and Ayas 2015, Middleton and Hall 2021). The prevailing view suggests that IWB embodies a blend of discontinuous and interconnected behaviors, with individuals often engaging in various combinations of these activities simultaneously (Baer 2012).

Empirical studies have uncovered both personal and organizational factors that foster employees' innovative behavior within the workplace. Personal factors encompass attributes intrinsic to individuals, including behavior, personality, motivation, instinct, and cognitive processes. A recent study (Srirahayu et al. 2023) has delineated five organizational factors that may exert influence on IWB

specifically: leadership, organizational behavior, organizational culture, organizational climate, and management. Furthermore, organizational culture stands out as a direct influencer of IWB, with research indicating its positive impact. Organizational climates exhibiting a direct impact on IWB encompass a variety of dimensions, including multiple organizational changes, organizational justice, organizational empowerment, teamwork satisfaction, creative collective efficacy, perceptions of performance appraisal quality, knowledge management, and training opportunities.

Innovation in organizations occurs in a dynamic environment, where competitive advantage is achieved and developed only through continuous adaptation to external changes (Fauchart and Keilbach 2009, Al-Omari et al. 2019, Mustafa et al. 2022). It becomes apparent that innovative work behavior remains a subject of ongoing debate, primarily due to its profound impact on fostering innovation, enhancing individual, group, and organizational performance, and notably, on value creation, competitive advantage acquisition, and sustainability maintenance.

In this scenario, social media has become a strategic tool in the business environment, with technological development involving companies and SMEs across diverse categories and impacting their economic equilibrium (Di Virgilio and Das 2023a, b, Di Virgilio et al. 2022, Di Virgilio 2018). This ongoing process began with an innovative perspective on the customer's role within the company structure, where they now play a central role. Presently, the primary goal is the satisfaction of clients' needs and expectations. Digital solutions for social media have the power to strengthen this crucial relationship and generate consistent effects on company performance, which is continuously evolving to align SMEs' objectives with technological means.

From Technological Knowledge Competencies to Social Media Organizational Performance

The combination of information technology means and organizational skills represents a competitive advantage because it results in impressive performance that leads to high future incomes. In particular, the scientific expression "technological knowledge competencies" is used to indicate the technological resources that a company requires to develop new items or processes to respond to market demand (Garcia-Morales et al. 2018). The managerial tool that allows the realization of "technological knowledge competencies" equals "innovation capabilities," defined as an intangible asset that guarantees the transformation of ideas and knowledge into new elements such as products, systems, and promotes internal welfare within firms and external relations with stakeholders. Scientifically, it has been demonstrated that the growth of "technological knowledge competencies" is directly proportional to a company's performance because it enhances innovation capability, resource utilization efficiency, and knowledge interaction. Social media represent a fundamental key for companies to receive information and gain "technological knowledge competencies" due to the enhancement of internal communication between employees and managers,

enabling faster and better learning. Social media provide a dynamic environment where a firm must participate to achieve its goals (Kaplan and Haenlein 2010).

Furthermore, social media strengthens external interaction, serving as a competitive advantage that can surpass competitors. In this scenario, it is interesting to analyze through a pilot study:

RQ1. How do social media influence performance? Which business areas are involved?

RQ2. What is the correlation between the sector of each entrepreneur's company and the profitability generated by the use of social media in their firms?

Methodology

This section presents exploratory research employed to better understand the SMEs sector in Southern Italy, focusing on new variables not previously investigated in past studies, and to generate initial insights needed for future research. To achieve this goal, an online survey was conducted to gather data for analysis from 210 entrepreneurs of SMEs in the Molise region of Southern Italy.

Our research questions were tested over a period of three months, from October 2023 to December 2023. Out of 300 questionnaires distributed, 210 were returned, generating usable responses for statistical analysis. The main assumption associated with this convenience sampling is that the participants were randomly selected from the Register of SMEs in the Molise Region.

Instrument Development: The Questionnaire

The structure of the questionnaire comprises multiple sections aimed at acquiring information regarding the personal data of the entrepreneur, such as age, education, place of education, residence abroad for long periods, and previous work experience, to individualize the main features of the subject and their abilities. Meanwhile, the second part illustrates the SMEs, identified through their dimensions, legal business form, and business sector.

The last part is considered crucial for this research because it presents an accurate and satisfying overview regarding the implementation of social media and performance (Table 1). It is divided into 14 questions, all adapted from prior studies (To and Ngai 2006, Liang et al. 2007, Wang et al. 2010, Ghobakhloo et al. 2011, Watson 2012, Yen and Tang 2015). The interviewee had the possibility of choosing only one option for each question.

Table 1. *The Third Section of the Survey Concerning the Use of Social Media and Performance*

Construct and items		References
Social Media Usage		(To and Ngai 2006, Ghobakhloo et al. 2011)
SMU 1	Social media is used for advertising and promotion	
SMU 2	Social media is used to search for competitor information	
SMU 3	Social media is used for getting referrals (e-WOM: likes, shares, and followers in Facebook, Instagram, etc.)	
SMU 4	Social media is used to communicate with customers	
SMU 5	Social media used for building customer relations.	
SMU 6	Social media is used to analyze customer requirements more efficiently	
SMU 7	Social media used for marketing and branding	
Ownership/management orientation to apply a social media policy		(Wang et al. 2010, Liang et al. 2007)
OPI 1	Owners/top management considers social media adoption important to the organization	
OPI 2	Owners/top management is likely to invest funds in social media technology	
OPI 3	Owners/top management effectively communicates support for the use of social media	
OPI 4	Owners/top management had established goals and standards to monitor the benefits of social media usage in their organizations.	
Performance in terms of profitability		(Yen and Tang 2015, Watson 2012)
PP1	Achieving firm profit goals over the past 3 years	
PP 2	Having a better return on investment over the past 3 years	
PP 3	Increase in total income over the past 3 years	

To increase the individual frequency and achieve consistent results, the first crucial modification was the categorization of business sector items into ten macro areas. The resulting values were associated with the total frequencies of elements included in each macro area. Frequency of an event is the number that expresses how many times one event occurs in an experiment or study (Irpino and Verde 2015). In the following tables, each sector is presented with its frequency in the sample (Table 2).

Table 2. *Sectors with Respective Frequencies*

Sector	Frequencies	Percentage (%)
Handicraft	17	8
Trade	46	22
Markt & Commun	10	5
Restaurants	21	10
Services	39	18
Professional Offices	65	31
Tourism	12	6
Total	210	100

Another notable variation concerns the third part of the survey, where each answer was assigned a corresponding number. Specifically, the first reply of each question corresponds to the number 1, the second to number 2, and so on. This

allowed for the creation of a simplified table for subsequent analysis. For example, "To develop communication channels with consumers" and "Use of social media can damage own corporate reputation" are assigned number 1, while "To increase sales volume" and "Company products/services could be negatively interpreted by consumers who use social media" are assigned number 2. Consequently, a new sample has been formulated for the core analysis.

Measurement

The examination of multiple variables in the survey will be conducted to evaluate their relationships. The adopted method is divided into three crucial levels: the interpretation of the "Contingency matrix," the "Independent matrix," and the "Pearson's Chi-square index."

Firstly, the "Contingency matrix" allows for the representation of two variables, X (the sector) and Y (the education), corresponding to the simultaneous observation of two attributes on the N units of our sample, along with their respective frequencies (an attribute being the aspect of the considered unit). The overall set of joint frequencies equals the absolute frequencies of the units which present, at the same time, the i-th variable of the first attribute and the j-th variable of the second attribute (where variable indicates the possible values of the attribute) (Valera and Ghahramani 2017).

This type of table comprises further distributions beyond the double one: on one hand, the "marginal distributions," situated in the row and column of the total, express the simple frequency distribution related to the attributes X and Y. In particular, the column of the total represents the simple distribution of the attribute X, where the term n_i refers to the absolute frequency of the units that present the variable x_i in the sample. Similarly, the row of the total represents the absolute frequency of the units that present the variable y_j in the sample. On the other hand, internal rows and internal columns of the matrix identify the conditional distributions (Valera and Ghahramani 2017).

The second step involves defining the "Independent matrix" based on the previous table. Two attributes, X and Y, are independent if the conditional distributions related to one attribute, compared with the variables of the other attribute, are equal to each other. Specifically, the conditional distribution of X is the ratio between the conditional distribution of X and the corresponding row total, whereas the conditional distribution of Y is the ratio between the conditional distribution of Y and the respective column total.

$$\frac{n_{ij}}{n_{i0}} = \frac{n_{0j}}{N} \longrightarrow \bar{\Pi}_{ij} = \frac{n_{i0} \times n_{0j}}{N}$$

Where n_{ij} represents the joint absolute frequency, n_{0j} is the conditional related distribution of X, n_{i0} is the conditional related distribution of Y, and N is the number of elements in the sample, indicating the sample size. The theoretical frequencies of independence; the relative table is also known as the matrix of theoretical frequencies of independence. These frequencies represent what would

have been obtained if the two attributes, based on their simple distributions, had been independent (Hayes and Preacher 2014).

The final step involves calculating the Pearson's Chi-square index to assess the interdependence between the two attributes. When it's not feasible to establish a connection of independence or logical dependence between two variables, the interdependence is analyzed, indicating a bidirectional link between the attributes. Additionally, this index evaluates the association for discrete (or nominal) qualitative attributes. This implies that the variables represent a quality of the unit, and it's only possible to determine if the variables are similar or different. Mathematically, it's defined as follows:

$$\chi^2 = \sum_{i=1}^H \cdot \sum_{j=1}^K \frac{(n_{ij} - n'_{ij})^2}{n'_{ij}}$$

where χ^2 represents the Pearson's Chi-square index, n_{ij} denotes the observed frequencies, and n'_{ij} stands for the theoretical frequencies of independence. The disparity between them is referred to as contingencies (not to be confused with the contingency table!). If the two attributes are perfectly independent, $n_{ij} = n'_{ij}$, resulting in $\chi^2 = 0$. Conversely, if the attributes are associated or interdependent, χ^2 will be positive, increasing as the observed frequencies diverge further from the theoretical ones (Bryant and Satorra 2012).

To assess the relationship between two ordered qualitative attributes, the appropriate index is Goodman-Kruskal's Gamma because it not only measures the strength of the correlation but also indicates the direction. The direction explains whether variables of a higher order, related to one attribute, frequently correspond to variables of a higher or lower order of the other attribute. Consequently, the index determines if there is concordance or discordance between the X and Y variables. In the former case, variables of a higher order of X are associated with variables of a higher order of Y, or variables of a lower order of X are matched with variables of a lower order of Y. In the latter case, variables of a higher order of X are associated with variables of a lower order of Y, or variables of a lower order of X are matched with variables of a higher order of Y.

The gamma index can assume negative values to indicate discordance between the attributes or positive values for concordance. It equals -1 if the sample units are perfectly ordered with the two attributes, and 1 in the opposite situation. Additionally, this index measures the reduction in error when predicting how a pair of units will be ordered with the variables of one attribute compared to knowing how the pair of units will be ordered with the variables of the other attribute. The formula is as follows:

$$\gamma = \frac{N_c - N_d}{N_c + N_d}$$

N_c represents the number of couples equally ordered on both attributes, while N_d refers to the number of couples differently ordered on both attributes (Higham and Higham 2019).

Results and Discussion

This section will thoroughly analyze the relationship between various factors. The obtained results will be interpreted analytically to assess and highlight specific business aspects of SMEs' profiles.

The Relationship between Sector and Education

The correlation between the variable 'Sector' and 'Education' is the focus of the initial segment of this statistical study, aiming to highlight a particular background regarding the entrepreneurs' educational levels, which significantly impact company management (Refer to Tables 3-4).

Table 3. *The Contingency Matrix of Sector and Education*

Sector	High-school Diploma	Bachelor Degree	Middle School Diploma	Professional Course	Total
Handicraft	4	6	7	0	17
Trade	35	9	2	0	46
Markt & Commun	5	5	0	0	10
Restaurants	20	0	1	0	21
Services	26	8	0	5	39
Professional Offices	13	16	1	35	65
Tourism	11	1	0	0	12
Total	114	45	11	40	210

Two noteworthy data points emerge: 52% of the interviewees attained a high school diploma, while only 21.43% obtained a bachelor's degree. Additionally, 54% of professional offices acquired a certificate after completing a professional course. Consequently, the overall educational attainment level falls within the middle to high range.

Table 4. *The Independent Matrix of Sector and Education*

Sector	High-school Diploma	Bachelor Degree	Middle School Diploma	Professional Course	Total
Handicraft	9.2	3.6	0.9	3.2	17
Trade	25.0	9.9	2.4	8.8	46
Markt & Commun	5.4	2.1	0.5	1.9	10
Restaurants	11.4	4.5	1.1	4.0	21
Services	21.2	8.4	2.0	7.4	39
Professional Offices	35.3	13.9	3.4	12.4	65
Tourism	6.5	2.6	0.6	2.3	12
Total	114	45	11	40	210

The final result is 72.46%, calculated by dividing the total result of the chi-square matrix by the total result of the independent matrix (Table 5). This demonstrates a high dependence between the 'Sector' variable and the 'Education' variable, indicating that the majority of entrepreneurs in SMEs in Molise have obtained an educational certificate to enhance their abilities and knowledge. Specifically, the highlighted data reveal that 24.52% of professional offices have a high school diploma, with 71.99% of them being positively correlated with participation in a professional course. Another noteworthy finding pertains to the handicraft category, where 84.44% exhibit a strong dependence on obtaining a middle school diploma.

Table 5. *The Chi-square Matrix of Sector and Education*

Sector	High-school Diploma	Bachelor Degree	Middle school Diploma	Professional Course	Total
Handicraft	3.0	1.5	41.9	3.2	49.6
Trade	4.0	0.1	0.1	8.8	12.9
Markt & Commun	0.0	3.8	0.5	1.9	6.3
Restaurants	6.5	4.5	0.0	4.0	15.0
Services	1.1	0.0	2.0	0.8	4.0
Professional Offices	14.1	0.3	1.7	41.3	57.4
Tourism	3.1	1.0	0.6	2.3	7.0
Total	31.8	11.2	46.9	62.3	152.2

The Relationship between Sector and Social Media Effects on Profitability

Firstly, it is important to clarify the distinction between profit and profitability. Profit refers to the absolute number representing the revenues generated by a company exceeding its expenses. In contrast, profitability is a relative measure indicating a company's profit in relation to the size of its business, serving as a measurement of efficiency. Additionally, profitability reflects a business's ability to generate a return on investment across its resources compared to alternative investments. Therefore, while a company may realize a profit, it does not necessarily mean that it is profitable (Tulsian 2014).

Although the process for formulating the three tables follows the same steps as the previously, a crucial aspect must be highlighted. Profitability is an ordered qualitative attribute, as it expresses a quality of the unit, and a natural order exists among the diverse variables. Consequently, each value corresponds to a specific estimation, as depicted in the following matrices (Tables 6-7).

Table 6. *The Contingency Matrix of Sector and Social Media Effects on Profitability*

Sector	0-Null	1-Minimum	2-Sufficient	3-Good	4-Excellent	Total
Handicraft	9	2	2	1	3	17
Trade	4	2	31	8	1	46
Markt & Commun	2	1	5	2	0	10
Restaurants	10	0	8	3	0	21
Services	19	3	14	2	1	39
Professional Offices	24	2	26	13	0	65
Tourism	0	0	7	4	1	12
Total	68	10	93	33	6	210

Table 7. *The Independent Matrix of Sector and Social Media Effects on Profitability*

Sector	0-Null	1-Minimum	2-Sufficient	3-Good	4-Excellent	Total
Handicraft	5.5	0.8	7.5	2.7	0.5	17.0
Trade	14.9	2.2	20.4	7.2	1.3	46.0
Markt & Commun	3.2	0.5	4.4	1.6	0.3	10.0
Restaurants	6.8	1.0	9.3	3.3	0.6	21.0
Services	12.6	1.9	17.3	6.1	1.1	39.0
Professional Offices	21.0	3.1	28.8	10.2	1.9	65.0
Tourism	3.9	0.6	5.3	1.9	0.3	12.0
Total	68.0	10.0	93.0	33.0	6.0	210.0

The analysis reveals a marginal correlation between the “Sector” variable and its impact on profitability, as evidenced by the total result of 28.70% (Table 8). This suggests that the sector has minimal influence on the profitability generated by integrating social media into the organization. Notably, the 22,1 value indicates a stronger association between the two factors, signifying that the adoption of this innovative tool is particularly advantageous for the handicraft sector, where 58.92% of entrepreneurs have reported significant benefits in their organizations.

Table 8. *The Chi-square Matrix of Sector and Social Media Effects on Profitability*

Sector	0-Null	1-Minimum	2-Sufficient	3-Good	4-Excellent	Total
Handicraft	2.2	1.8	4.1	1.0	13.0	22.1
Trade	8.0	0.0	5.5	0.1	0.1	13.7
Markt & Commun	0.5	0.6	0.1	0.1	0.3	1.5
Restaurants	1.5	1.0	0.2	0.0	0.6	3.3
Services	3.2	0.7	0.6	2.8	0.0	7.3
Professional Offices	0.4	0.4	0.3	0.8	1.9	3.7
Tourism	3.9	0.6	0.5	2.4	1.3	8.6
Total	19.7	5.0	11.3	7.2	17.1	60.3

The Relationship between Education and Social Media Effects on Profitability

The contingency table provides a comprehensive overview of entrepreneurs with different educational backgrounds and their respective influence on company profitability, as indicated by the estimated class values associated with each (Table 9). Subsequently, the analysis entails a direct comparison between the negative and positive outcomes depicted by the various marginal totals of the “Education” variable (Figure 2). Furthermore, employing a histogram with grouped columns would be an effective method to illustrate this relationship (Figure 3).

Table 9. *The Contingency Matrix of Education and Social Media Effects on Profitability*

Education	0-Null	1-Minimum	2-Sufficient	3-Good	4-Excellent	Total
Middle school Diploma	5	2	2	0	2	11
Professional Course	10	2	17	11	0	40
High-school Diploma	32	2	61	16	3	114
Bachelor Degree	21	4	13	6	1	45
Total	68	10	93	33	6	110

Figure 2. *Negative and Positive Results*

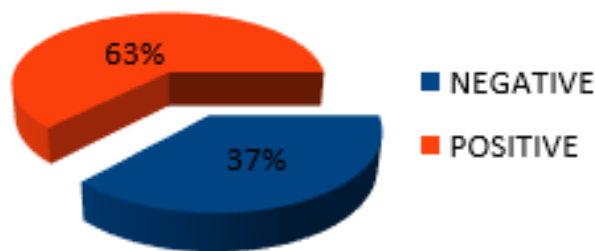
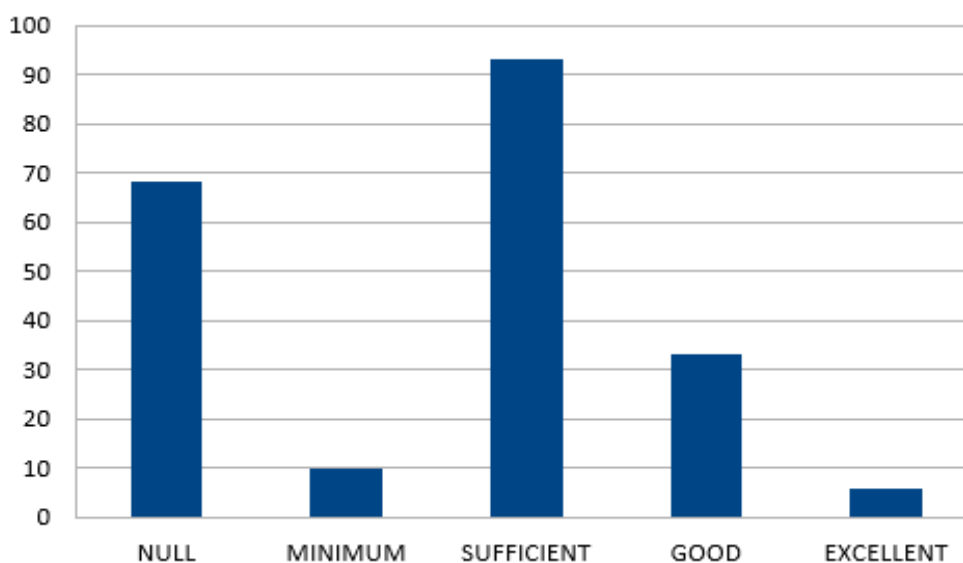


Figure 3. *The Evaluation of Social Media Effects on Company Profitability*



The histogram provides a clear visual representation of the different categories of social media (SM) effects on company profitability alongside the distribution of entrepreneurs across various educational levels. The data indicate that 44.29% of entrepreneurs have successfully integrated social media to achieve significant improvements in firm profitability. Conversely, a substantial proportion, accounting for 32.38%, experienced negligible effects. Interestingly, only 2.86% of entrepreneurs reported outstanding outcomes. These findings suggest that while the implementation process is ongoing, SMEs in Molise have effectively begun integrating social networks into their operations, leading to positive profitability levels.

The Relationship between Age and Social Media Effects on Performance

In the survey, other essential factors were examined. The first one is "Age", aiming to identify the intervals where the majority of interviewed entrepreneurs fall (Table 10).

Table 10. Age Group

Age	N.
Up to 30	13
31-40	40
41-50	86
51-60	48
Over 60	23
Total	210

The class with the greatest significance is the third one, 41-50, as evidenced by the calculation of the arithmetic mean, median, and mode. The arithmetic mean is the value that, when substituted for the observed variables, does not alter the overall intensity of an attribute. The general formula is as follows:

$$\bar{x} = \frac{\sum_{i=1}^N x_i}{N}$$

For classes, the formula transforms to: $\bar{x} = \frac{\sum_{i=1}^k x'_i \cdot n_i}{N}$, $x'_i = \frac{x_i + x_{i+1}}{2}$

Where k is the number of variables pertaining to the attribute, x_i and x_{i+1} represent the boundaries of a specific class, and n_i denotes the corresponding absolute frequency. In this instance, the arithmetic mean equals 46. The median is the variable that splits the distribution into two groups with equal numbers. The variables must be arranged from the minimum to the maximum. Two scenarios can be distinguished:

- If the number of data (N) is odd, the median corresponds to the central value, which is the value occupying the position $(n+1)/2$.
- If the number of data is even, the median is estimated between the two values covering positions $(n/2)$ and $[(n/2)+1]$. Their arithmetic mean is selected if the attribute is quantitative.

- If the variables are grouped in classes, the median class is identified by integrating the cumulative frequencies. These are the sums of the absolute frequencies related to the variable or class of variables under consideration and the sums of the absolute frequencies of the preceding variables or classes. Meanwhile, the cumulative relative frequencies associated with a mode or a class of modes are defined as the ratio between its cumulative absolute frequency and the sum of total absolute frequencies present in the sample. The formula is:

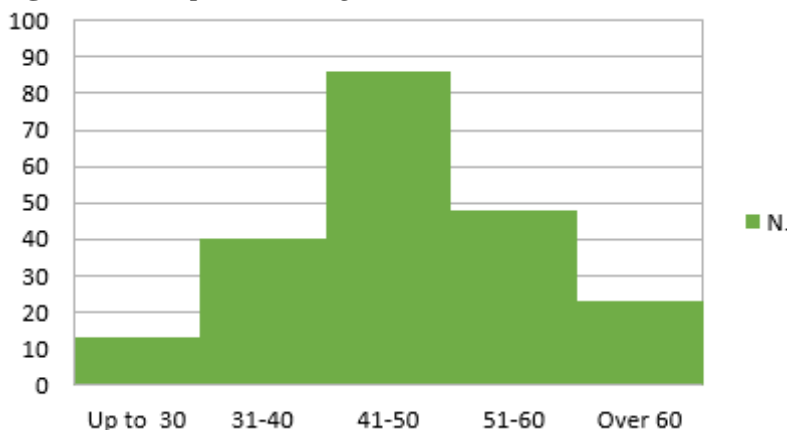
$$N_k = \sum_{i=1}^k n_i \quad \Longrightarrow \quad F_k = \frac{N_k}{N} = \sum_{i=1}^k f_i$$

Where n_i is the absolute frequency of the i -th variable, and f_i is the relative frequency of the i -th variable. For classes, the median is calculated differently, as shown in the following formula:

$$Me = X_i + (X_{i+1} - X_i) \frac{0.5 - F_i}{F_{i+1} - F_i}$$

Where $(X_{i+1} - X_i)$ indicates the range between the two extremes of the class, F_i is the cumulative relative frequency of the i -th observation, and F_{i+1} is the cumulative relative frequency of the next class. In this case, it equals 45. The mode represents the variable with the highest frequency and it equals to 41 (Sarkar and Rashid 2016). The calculated values of the arithmetic mean, median, and mode of the “Age” variable are depicted in the following histogram. It is evident that 40.95% of entrepreneurs fall within the 41-50 years old class (Figure 4). It can be inferred that the majority of individuals who decide to start a business have previous work experiences, which are fundamental for acquiring practical skills, regardless of the educational level attained for their personal cultural background.

Figure 4. *Entrepreneurs’ Age*



The analysis delves into the paper's critical aspects, focusing on the relationship between the “Age” variable and the “Social Media Effects on Performance” variable. Notably, the latter is an ordered qualitative attribute, with each value

corresponding to a specific estimation as depicted in the following tables (Tables 11-12). The methodology involves formulating the contingency matrix, the independent table, and the chi-square matrix to discern the significance of their relationship.

Table 11. *The Contingency Matrix of Age and Social Media Effects on Performance*

Age	0-Null	3-Minimum	7-Good	9-Excellent	Total
22	1	3	2		6
25	1	1	2		4
28	2	0	1		3
32	1	3	3		7
34	2	2	0	1	5
35	1	0	4	1	6
36	4	7	3	0	14
38	1	2	4	2	9
41	7	9	9	1	26
43	3	0	2	0	5
44	7	6	1	1	15
45	3	2	1	2	8
48	6	6	6	1	19
49	2	4	3	1	10
51	4	2	2	2	10
52	1	4	4	1	10
56	5	4	4	0	13
57	4	3	3	0	10
58	0	1	3	1	5
60	4	1	0		5
62	3	1	1		5
63	1	2	3		6
65	5	1	2	1	9
Total	68	64	63	15	210

Table 12. *The Independent Matrix of Age and Social Media Effects on Performance*

Age	0-Null	3-Minimum	7-Good	9-Excellent	Total
22	1.9	1.8	1.8	0.4	6.0
25	1.3	1.2	1.2	0.3	4.0
28	1.0	0.9	0.9	0.2	3.0
32	2.3	2.1	2.1	0.5	7.0
34	1.6	1.5	1.5	0.4	5.0
35	1.9	1.8	1.8	0.4	6.0
36	4.5	4.3	4.2	1.0	14.0
38	2.9	2.7	2.7	0.6	9.0
41	8.4	7.9	7.8	1.9	26.0
43	1.6	1.5	1.5	0.4	5.0
44	4.9	4.6	4.5	1.1	15.0
45	2.6	2.4	2.4	0.6	8.0
48	6.2	5.8	5.7	1.4	19.0
49	3.2	3.0	3.0	0.7	10.0
51	3.2	3.0	3.0	0.7	10.0
52	3.2	3.0	3.0	0.7	10.0
56	4.2	4.0	3.9	0.9	13.0
57	3.2	3.0	3.0	0.7	10.0

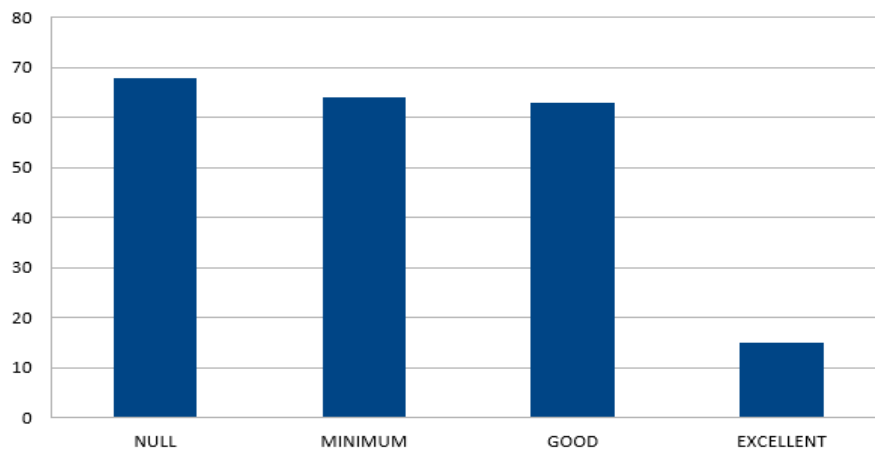
58	1.6	1.5	1.5	0.4	5.0
60	1.6	1.5	1.5	0.4	5.0
62	1.6	1.5	1.5	0.4	5.0
63	1.9	1.8	1.8	0.4	6.0
65	2.9	2.7	2.7	0.6	9.0
Total	68.0	64.0	63.0	15.0	210.0

The ultimate finding reveals a modest dependency of 29.22% between the two variables (Table 13). This suggests that the impact of social media on company performance is not significantly influenced by the age of the entrepreneur.

Table 13. *The Chi-square Matrix of Age and Social Media Effects on Performance*

Age	0-Null	3-Minimum	7-Good	9-Excellent	Total
22	0.5	0.8	0.0	0.4	1.7
25	0.1	0.0	0.5	0.3	0.9
28	1.1	0.9	0.0	0.2	2.2
32	0.7	0.4	0.4	0.5	1.9
34	0.1	0.1	1.5	1.2	2.9
35	0.5	1.8	2.7	0.8	5.7
36	0.1	1.8	0.3	1.0	3.2
38	1.3	0.2	0.6	2.9	4.9
41	0.2	0.1	0.2	0.4	1.0
43	1.2	1.5	0.2	0.4	3.2
44	0.9	0.4	2.7	0.0	4.1
45	0.1	0.1	0.8	3.6	4.5
48	0.0	0.0	0.0	0.1	0.1
49	0.5	0.3	0.0	0.1	0.9
51	0.2	0.4	0.3	2.3	3.2
52	1.5	0.3	0.3	0.1	2.3
56	0.1	0.0	0.0	0.9	1.1
57	0.2	0.0	0.0	0.7	0.9
58	1.6	0.2	1.5	1.2	4.5
60	3.5	0.2	1.5	0.4	5.5
62	1.2	0.2	0.2	0.4	1.9
63	0.5	0.0	0.8	0.4	1.7
65	1.5	1.1	0.2	0.2	3.0
Total	17.4	10.8	14.8	18.3	61.4

Hence, it is advisable to examine the following graph derived from the contingency matrix for a clearer insight into the correlation between the two variables under scrutiny (Figure 5).

Figure 5. *The Evaluation of Social Media Effects on Company Performance*

While 32.38% of entrepreneurs in SMEs experienced no discernible impact on their organizations, 30.48% and 30% respectively attained minimal and satisfactory outcomes. This suggests that in SMEs in Molise, more time is required to identify the most effective strategy for seamlessly integrating social networks, ensuring substantial future improvements in company performance.

The Relationship between Social Media effects on Performance and Social Media Effects on Profitability

When examining the association between two ordered qualitative attributes, the optimal approach involves several steps: beginning with the formulation of the contingency table as the foundation for subsequent calculations. These calculations involve determining the Goodman-Kruskal's Gamma index, which includes two additional steps: identifying N_c , representing the number of couples equally ordered on both attributes, and N_d , the number of couples differently ordered on both attributes (Table 14).

Table 14. *The Contingency Matrix of Social Media Effects on Performance and Social Media Effects on Profitability*

SM effects on Performance	0-Null	3-Minimum	6-Sufficient	8-Good	9-Excellent	Total
0-Null	68					68
3-Minimum		6	25	33		64
8-Good			63			63
9-Excellent		4	5		6	15
Total	68	10	93	33	6	210

The orange value represents the N_c , calculated by summing the marginal totals of either the "Social Media Effects on Performance" variable or the "Social Media Effects on Profitability" variable (Table 15).

Table 15. *The Matrix of Social Media Effects on Performance and Social Media Effects on Profitability for the Concordance Definition*

SM effects on Performance	0-Null	3-Minimum	6-Sufficient	8-Good	9-Excellent	Total
0-Null	9656					9656
3-Minimum		444	150	198		792
8-Good			378			378
9-Excellent						0
Total	9656	444	528	198	0	10826

Each n_{ij} is calculated by multiplying each n_{ij} value from the contingency table by the sum of the variables of the contingency matrix within the imaginary rectangle located in the right area of the considered n_{ij} , from the subsequent row of the n_{ij} value to the last one (excluding the row that contains the marginal total) (Tables 16-17). In this instance, the final total indicates a positive concordance.

Table 16. *The Matrix of Social Media Effects on Performance and Social Media Effects on Profitability for the Concordance Definition (Example 1)*

SM effects on Performance	0-Null	3-Minimum	6-Sufficient	8-Good	9-Excellent	Total
0-Null	68					68
3-Minimum		6	25	33		64
8-Good			63			63
9-Excellent		4	5		6	15
Total	68	10	93	33	6	210

Table 17. *The Matrix of Social Media Effects on Performance and Social Media Effects on Profitability for the Concordance Definition (Example 2)*

SM effects on Performance	0-Null	3-Minimum	6-Sufficient	8-Good	9-Excellent	Total
0-Null	68					68
3-Minimum		6	25	33		64
8-Good			63			63
9-Excellent		4	5		6	15
Total	68	10	93	33	6	210

The orange value represents the N_d , which is calculated by summing up the marginal total of the "Social Media Effects on Performance" variable or the marginal total of the "Social Media Effects on Profitability" variable (Table 18).

Table 18. *The Matrix of Social Media Effects on Performance and Social Media Effects on Profitability for the Discordance Definition*

SM effects on Performance	0-Null	3-Minimum	6-Sufficient	8-Good	9-Excellent	Total
0-Null						0
3-Minimum			100	2376		2476
8-Good			252			252
9-Excellent						0
Total	0	0	352	2376	0	2728

Each n_{ij} is calculated by multiplying each n_{ij} value in the contingency table by the sum of variables in the contingency matrix within the imaginary rectangle located in the left area of the n_{ij} being considered, from the subsequent row of the n_{ij} value to the last one (excluding the row that displays the marginal total). In this instance, the overall total indicates a positive discordance.

The findings indicate a clear improvement in company profitability and performance due to the effects of social media. Additionally, it's worth noting the significance of the Return on Investment (ROI) index, a widely recognized measure of profitability and a key performance indicator guiding entrepreneurs' investment decisions (Broccardo and Zicari 2020). The analysis reveals that in 60% of cases, an increase in profitability corresponds to a parallel growth in performance, directly impacting the enhancement of the ROI index attributed to social media (Hoffman and Fodor 2010).

In summary, the integration of social networks has boosted social media ROI within SMEs in Molise, leading to significant improvements in efficiency, effectiveness, and alignment with strategic objectives. However, there's potential for further progress, moving from the "Sufficient or Good" level to the "Excellent" one. This progression promises positive outcomes, primarily within internal sectors, facilitating enhanced communication among employees and departments or supporting personnel recruitment efforts. Externally, it strengthens connections with the cornerstone of the company structure.

Conclusion

The statistical results presented in the final paper provide further evidence affirming the crucial role of social media within company infrastructure, addressing several key aspects outlined in our research inquiries. Social networks have demonstrably elevated company performance and profitability, fostering innovation, optimizing resource productivity, and facilitating knowledge exchange among employees and managers. To quantify the economic impact of social media, a specific economic index known as Social Media Return on Investment was devised. Various frameworks and models were developed to standardize the calculation of this index across different organizational categories (Schleicher et al. 2018). Nevertheless, ongoing discussions persist, with many researchers actively engaged in resolving related issues.

For example, a social media initiative might target improving customer loyalty, a task complicated by the challenge of accurately gauging emotions and sentiments. Therefore, metrics should focus on factors directly influencing the objective. The pivotal aspect of implementing such a program is effectively assessing its performance in achieving goals through social media integration. Therefore, it's important to pinpoint relevant metrics and leverage social capital to understand the community's role in brand awareness. In summary, SMEs should establish clear objectives for social media implementation. Currently, there are no standardized strategies for social media measurement, allowing each firm to

customize approaches according to its specific goals and technological knowledge competencies.

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