Characterization of Competencies for Micro-entrepreneurs and their Impact on Productive Development: A Data-Driven Analysis in Ecuador

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ABSTRACT

Personal and professional competencies have be- come key factors in the commercial performance of micro-entrepreneurs. This sector maintains high participation in the productive activity of developing countries, yet the lack of knowledge regarding these skills constitutes a significant obstacle to growth. This research determines the relationship between micro-entrepreneurs' competencies and their pro- ductive development through a bivariate analysis applied to 687 micro-entrepreneurs located in Zone 5 of Ecuador. The study adapts a model composed of four competency groups (self-regulation, motivation, empathy, social ability) distributed across three areas of action (business, educational, and social). The methodology utilizes statistical processing via SPSS, in- cluding ANOVA and multiple regression models. The results demonstrate a direct proportion between competencies and productivity. Furthermore, the data highlights a preference for "Initiative" (90%) while revealing a critical gap in "Cognitive Capacity" (12%) and professional training. The regression analysis identified job performance as the strongest predictor of productive development ($\beta = 0.218$, $p < .001$), followed by personal and professional aptitudes. These findings suggest that strengthening these capacities is essential not only for sur- vival but to guarantee self-sustainability. From a technological perspective, these findings also offer guidance for the design of information systems aligned with the practical needs and cognitive characteristics of micro-entrepreneurs.

Keywords: Micro-entrepreneur productive development, competencies data analysis regression model SME skills.

INTRODUCTION

Micro, small, and medium-sized enterprises (MSMEs) constitute a central pillar of economic development, em- ployment generation, and social mobility in most devel- oping countries [1], [2]. Their contribution is particularly significant in Latin America, where they represent almost the entire productive fabric and provide a substantial share of national employment [3], [4]. In Ecuador, this pattern is especially pronounced. As summarized in Table 1, MSMEs account for approximately 99% of all active companies, with micro-enterprises representing more than 90% of this segment and generating close to 60% of jobs nationwide. This quantitative relevance contrasts with their compara- tively modest contribution to productivity and long-term business growth, highlighting persistent challenges related to strategic management, technological adoption, and human- capital development.

Table 1: Economic Landscape of MSMEs in Ecuador

Indicator	Statistic / Value
Total active companies	≈ 900,000
MSME participation	99% of total companies
Micro-enterprise share	>90% of the MSME sector
Employment contribution	≈ 60% of national jobs
Target region (study)	Zone 5: Guayas, Los Ríos, Bolívar, Santa Elena

Although structural barriers such as limited access to credit or technology are well documented, a growing body of research points to an equally critical internal factor: the com- petencies of micro-entrepreneurs themselves. These compe- tencies—ranging from self-management and motivation to negotiation and teamwork—have been associated with better business performance, increased resilience, and improved adaptation to changing environments [5]–[7]. However, most competency frameworks originate from studies on managers in medium or large firms, leaving a gap in models tailored to micro-enterprises operating in heterogeneous and often vul- nerable environments. To address this limitation, Fernández- Ronquillo et al. [8] proposed a competency model specif- ically designed for micro-entrepreneurs in depressed or resource-constrained settings. The model organizes 27 com-petencies into four clusters (self-management, motivation, empathy, and social skills) and distributes them across three areas of action (business, educational, and social). This makes it particularly suitable for empirical studies aiming to understand the behavioral, relational, and decision-making dimensions that shape micro-enterprise performance.

The present study adopts this framework as the basis for analyzing the competency profile of micro-entrepreneurs in Ecuador's Zone 5. Figure 1 summarizes the conceptual relationship guiding the research. It assumes that the so- ciodemographic and contextual characteristics of the en- trepreneur influence the structure of their competencies, which in turn affects the perceived productive development of the business. This simple but operational model provides a consistent foundation for evaluating how specific com- petencies strengthen— or limit—the daily functioning and overall sustainability of micro-enterprises.

Zone 5 offers a particularly relevant context for this type of analysis, as it combines the dynamism of highly com- petitive urban markets (e.g., Guayas) with the constraints of semi-rural or peripheral provinces (e.g., Bolívar). These territorial contrasts suggest that the prevalence and activation of competencies may vary across sectors, locations, and levels of business maturity, making the region an appropriate case for a detailed empirical assessment.

Based on these considerations, this study pursues two ap- plied objectives: (i) to characterize the competency structure of micro-entrepreneurs in Zone 5, and (ii) to estimate the statistical relationship between these competencies and their perceived productive development. To achieve this, a quan- titative, non-experimental design was implemented using a stratified probabilistic sample of 687 micro-entrepreneurs.

The remainder of this article is organized as follows. Section 2 reviews the main contributions on competency models and micro-entrepreneurial performance. Section 3 presents the methodology, including sampling procedures, instrument design, and statistical techniques. Section 4 re- ports the empirical findings, while Section 5 discusses their practical implications for micro-enterprise development and technological adoption. Finally, Section 6 concludes the arti- cle with recommendations and directions for future research.

RELATED WORK

Research on entrepreneurial competencies has evolved considerably over the past five decades, moving from early psychological approaches to more integrative frameworks that incorporate behavioral, social, and organizational di- mensions. The foundational work of McClelland et al. [9] established the notion that success in entrepreneurial con- texts cannot be explained solely by cognitive intelligence, but rather by underlying characteristics such as motivation, persistence, and the capacity to act under uncertainty. This principle was later expanded by Boyatzis [10], who con- ceptualized competencies as observable behaviors linked to superior performance and rooted in deeper emotional, cognitive, and motivational attributes.

The relevance of competencies in micro- and small- enterprise performance has been widely documented. Sev- eral studies report that traits such as initiative, opportunity recognition, negotiation, and resilience significantly influ- ence business continuity, revenue stability, and adaptability in changing markets [5], [11], [12]. In contexts charac- terized by informality or constrained resources, competen- cies related to self-regulation and social interaction appear particularly important, as micro-entrepreneurs often operate without formal managerial structures and rely heavily on personal networks and day-to-day decision making [13], [14].

Despite these contributions, most competency models in the literature were designed for medium or large or- ganizations with established hierarchies and standardized processes [7], [15]. Their applicability to micro-enterprises, which in many cases function as single-person or family- run businesses, is limited. Micro-entrepreneurs frequently assume multiple roles simultaneously: they manage opera- tions, negotiate with suppliers, interact directly with clients, and perform administrative tasks. As a result, the compe- tencies required for their effective performance are multidi- mensional and context-dependent.

Addressing this gap, the model proposed by Ferna´ndez- Ronquillo et al. [8] represents one of the few frameworks specifically developed for micro-entrepreneurs operating in vulnerable or depressed environments. The model organizes 27 competencies into four clusters based on emotional intel- ligence principles: self-management, motivation, empathy, and social skills. These clusters are then distributed across three domains of action (business, educational, and social), acknowledging that micro-entrepreneurs must navigate rela- tional, operational, and learning-oriented demands simulta- neously. Figure 2 depicts this multidimensional structure.

Empirical studies in developing economies support the relevance of this type of model. For instance, Klepic´ [6] finds that competency-based human resource management correlates with improved performance among SMEs in East- ern Europe, while Mubarik et al. [16] demonstrate that entrepreneurial competencies significantly influence the suc- cess of micro-enterprises in South Korea. Other regional analyses, including those conducted in Latin America, em- phasize the centrality of negotiation, communication, and adaptability for sustaining micro-businesses in dynamic mar- kets [17], [18].

However, research also notes consistent weaknesses across micro-entrepreneurial populations, particularly in competencies related to long-term planning, innovation, and cognitive capacity [19], [20]. These gaps limit the ability of micro-enterprises to scale or incorporate digital technologies effectively, a factor increasingly relevant as governments and development agencies promote digital transformation strate- gies for the sector. In sum, existing literature underscores the need for competency models that reflect the realities of micro-entrepreneurs and their operational environments. The Ferna´ndez-Ronquillo framework [8] provides a structured and context-sensitive basis for such analysis, making it suitable for empirical studies focused on micro-enterprise
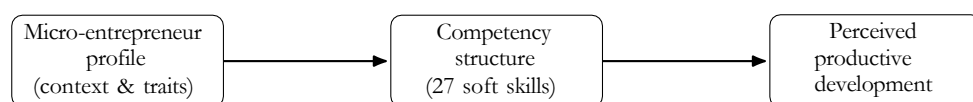
Figure 1: Conceptual model illustrating how the micro-entrepreneur's contextual profile shapes the competency structure, which in turn influences perceived productive development.
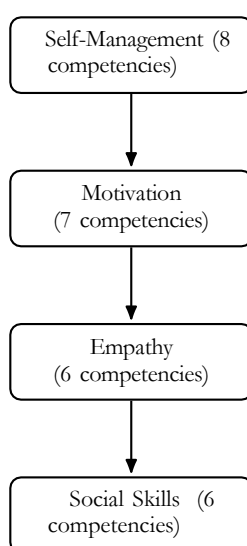
Figure 2: Four competency clusters of the Ferna´ndez- Ronquillo framework, used to structure the behavioral and relational dimensions analyzed in this study. development, particularly in regions where economic activ- ity is heterogeneous and predominantly informal, such as Ecuador's Zone 5.

METHODS

Research Design

The study adopted a quantitative, non-experimental, cross-sectional design aimed at characterizing the compe- tency structure of micro-entrepreneurs in Ecuador's Zone 5 and examining its relationship with perceived

productive development. Given the applied nature of the research, the design emphasized empirical measurement and statistical association rather than causal inference. The methodological workflow, presented in Fig. 3, summarizes the sequential stages followed throughout the study, from population iden- tification to statistical modeling.

Population and Sampling

The target population consisted of $N = 135,107$ regis- tered micro-enterprises located in the provinces of Guayas, Los R´ıos, Bol´ıvar, and Santa Elena (Zone 5). The Gala´pagos province was excluded due to logistical constraints and structural differences in its economic dynamics.
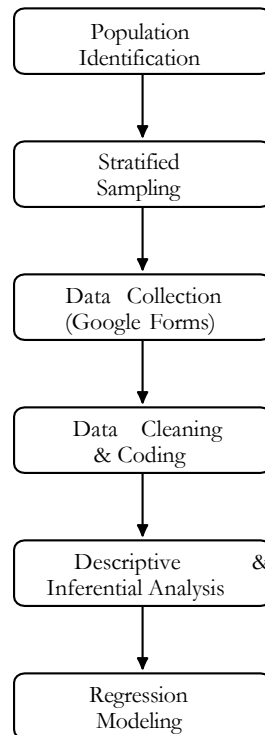
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Figure 3: Sequential methodological workflow summarizing population identification, sampling, data collection, clean- ing, and statistical modeling.

To obtain a representative sample, a probabilistic strat- ified sampling procedure was implemented. Strata were defined by province, and sample size was calculated using the finite population formula with a 95% confidence level and a 4% margin of error. This resulted in a final sample of $n = 687$ micro-entrepreneurs.

Within each province, simple random sampling was applied to ensure equal probability of selection. The dis- tribution of the sample reflected the relative size of each provincial stratum, with Guayas comprising the largest share due to its higher business density.

Participants

Participants were active micro-entrepreneurs operating in one of three economic sectors: commerce, services, or industry. Data collection was conducted in person with the support of trained undergraduate students from the State University of Milagro (UNEMI), who visited business lo- cations to ensure accurate responses and minimize non- response bias. This process took place between March and July 2024 through in-person visits conducted by trained undergraduate students.

Instrument

Data were collected using a structured questionnaire composed of four sections:

- **Demographics:** business type, location, age of the enterprise, and average revenue.
- **Productive Development Scale:** a seven-item con- struct evaluating efficiency, efficacy, and effective use of resources.

- **Competency Dimensions:** sixteen items grouped into job performance, personal aptitudes, and professional aptitudes.
- **Competency Inventory:** twenty-seven competencies derived from the Ferna´ndez-Ronquillo model, orga- nized by cluster and domain of action.

All perception-based items used a 5-point Likert scale (1= "Never" to 5 = "Always"). The instrument was validated by expert judgment to ensure consistency with the theoreti- cal framework and relevance to the micro-enterprise context. A five-point Likert scale was selected because it offers an optimal balance between response discrimination and response understanding in field studies with heterogeneous educational backgrounds. Previous research in applied social sciences recommends this format to reduce central-tendency bias and facilitate interpretation.

Ethical Considerations

Following the ethical principles of the Declaration of Helsinki, participants were informed about the purpose of the study, the voluntary nature of their participation, and the confidentiality of their responses. Informed consent was ob- tained digitally before completing the questionnaire. Given the non-experimental and low-risk nature of the study, no institutional ethics committee approval was required.

Data Processing

Data were collected via Google Forms and exported to IBM SPSS Statistics for processing. Preliminary steps in- cluded verification of completeness, removal of inconsistent entries, and coding of categorical variables. Missing data were minimal (**< 2%**) and handled through listwise deletion, as the rate did not compromise statistical power.

Data Analysis

The analysis proceeded in four stages:

1) **Descriptive statistics** to characterize the sample and sector distribution.

Table 2: Reliability Analysis (Cronbach's Alpha)

Dimension	Items	α
Productive Development	6	0.62
Global Competencies	16	0.81
Job Performance	7	0.76
Personal Aptitudes	5	0.60
Professional Aptitudes	4	0.60

2) **Reliability assessment** using Cronbach's alpha (α) for all multi-item constructs. Following [21], [22], co-efficients above 0.60 were considered acceptable for exploratory social research.
3) **Inferential analysis** using Pearson correlations to ex- amine linear associations and one-way ANOVA to identify differences across groups (e.g., sector, location, business age, revenue).
4) **Multiple linear regression** to estimate the predictive effect of competency dimensions (job performance, personal aptitudes, professional aptitudes) on perceived productive development.

All tests were conducted with a significance threshold of $p < 0.05$. Regression assumptions (normality, homoscedas- ticity, and multicollinearity) were evaluated and met, ensur- ing the validity of the model estimates.

RESULTS

Descriptive Findings

The final sample consisted of 687 micro-entrepreneurs distributed across the four provinces of Zone 5. The services sector represented the largest share of the sample (53.8%), followed by commerce (35.4%) and industry (10.8%). This distribution aligns with the economic structure of the region, where service-based micro-enterprises predominate in both urban and semi-urban areas.

Reliability Analysis

Internal consistency was examined using Cronbach's alpha (α) for all multi-item constructs. As shown in Table 2, reliability coefficients ranged from 0.60 to 0.81, indicating acceptable to good internal consistency for exploratory re- search. The global competency construct achieved the high- est reliability (0.81), while productive development showed moderate consistency (0.62).

Correlation Analysis

Pearson correlation coefficients were computed to ex- plore associations between competency dimensions and pro- ductive development. All correlations were positive and statistically significant at the 1% level.

As displayed in Table 3, job performance demonstrated the strongest association with productive development ($r = 0.407$), followed by professional aptitudes ($r = 0.333$) and personal aptitudes ($r = 0.326$). The global competency construct also showed a moderate positive correlation with productive development ($r = 0.458$).

Table 3: Pearson Correlation Matrix

PD		JP	PA	PrA
Productive Development (PD)	1.000	–	–	–
Job Performance (JP)	0.407**	1.000	–	–
Personal Aptitudes (PA)	0.326**	0.468**	1.000	–
Professional Aptitudes (PrA)	0.333**	0.421**	0.364**	1.000

**p < 0.01

Table 4: ANOVA Results for Group Comparisons

Factor	F	Sig.
Business Type	0.948	0.388
Geographic Location	3.195	0.023
Business Age (years)	4.998	0.001
Gross Revenue (USD)	6.494	0.000

ANOVA RESULTS

A one-way ANOVA was conducted to identify differ- ences in perceptions of productive development according to business type, geographic location, business age, and gross revenue.

Table 4 summarizes the results. Significant differences ($p < 0.05$) were observed for geographic location, business age, and gross revenue. No significant differences were found across business sectors (commerce, services, indus- try), suggesting that perceptions of development do not vary substantially by activity type.

Regression Model

A multiple linear regression model was estimated to assess the predictive effect of the three competency dimen- sions on productive development. The resulting equation is:

$$Y = 2.017 + 0.218X_1 + 0.167X_2 + 0.142X_3 + \varepsilon$$

where Y is productive development, and X_1, X_2, and X_3 represent job performance, personal aptitudes, and pro- fessional aptitudes, respectively.

The model was statistically significant (ANOVA: $F = 61.203$, $p < 0.01$), explaining a meaningful proportion of variance in productive development.

Table 5 presents the standardized coefficients. Job per- formance emerged as the strongest predictor ($\beta = 0.218$), followed by personal aptitudes ($\beta = 0.167$) and professional aptitudes ($\beta = 0.142$).

Graphical Representation of Predictors

For visualization purposes, Fig. 4 illustrates the relative contribution of each competency dimension to productive development. The figure highlights the predominance of job performance as the main driver of perceived business growth.

Table 5: Multiple Regression Coefficients

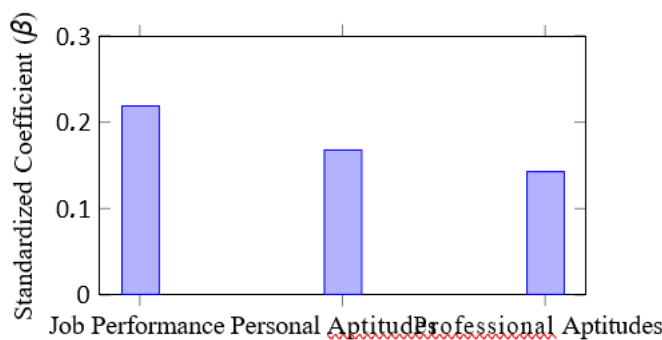| Predictor	β	t	Sig.
Constant	–	10.564	0.000
Job Performance	0.218	6.732	0.000
Personal Aptitudes	0.167	3.504	0.000
Professional Aptitudes	0.142	4.408	0.000

Figure 4: Standardized regression coefficients showing the relative contribution of each competency dimension to productive development.

DISCUSSION

The findings of this study provide a detailed view of the competency structure of micro-entrepreneurs in Ecuador's Zone 5 and its relationship with productive development. Overall, the results confirm that competencies are not merely complementary traits but key predictors of business per- formance. This aligns with previous research indicating that behavioral and relational skills significantly influence the performance and sustainability of micro-enterprises in developing economies [5], [13], [16].

The Predominance of Execution-Oriented Competencies

Among the three competency dimensions examined, job performance emerged as the strongest predictor of pro- ductive development. This dimension includes competen- cies related to operational efficiency, perseverance, decision- making, and the ability to manage day-to-day business activities. The strong association identified in the regres- sion model reflects a common pattern observed in micro- enterprises across Latin America: entrepreneurs tend to rely heavily on practical, experience-based competencies rather than on formal training or long-term strategic planning [23], [24].

This configuration is consistent with what some authors describe as a "survival-oriented entrepreneurial profile," characterized by high initiative, adaptability, and immediate problem-solving skills but limited development of cognitive or planning-related competencies [25]. In environments with high informality, fluctuating demand, and scarce institu- tional support, micro-entrepreneurs often prioritize short- term decisions to maintain business continuity. The present

findings reinforce this pattern, showing that while micro- entrepreneurs in Zone 5 display strong initiative and negotia- tion skills, they also exhibit notable weaknesses in cognitive capacity and professional aptitudes.

Competency Gaps and Structural Challenges

The low scores observed in competencies such as cog- nitive capacity, planning, and innovation reveal a struc- tural gap with direct implications for business growth. En- trepreneurs who lack these competencies may struggle to interpret financial information, adapt processes, or engage in long-term decision-making. Similar trends have been noted in other developing contexts, where limited formal education and heavy operational workloads reduce the opportunities entrepreneurs have to strengthen these skills [26]–[28].

These gaps also help explain the significant differences found in the ANOVA results. For instance, entrepreneurs with higher gross revenue reported more positive percep- tions of productive development, suggesting that businesses with better financial performance may have more resources or stability to invest in training and capability-building. Similarly, the effect of geographic location indicates that entrepreneurs in provinces with more dynamic commercial environments benefit from greater exposure to competition, networks, and market opportunities—all of which may en- courage the development of competencies related to nego- tiation, communication, and adaptation.

Interpreting the Competency–Development Link

The regression model demonstrates that the three com- petency dimensions jointly contribute to perceived produc- tive development. This confirms that productive develop- ment is a multifactorial construct influenced by behavioral, motivational, and strategic elements. Although job perfor- mance plays the leading role, personal and professional aptitudes also show meaningful contributions. These re- sults suggest that while operational skills may sustain the business in the short term, complementary competencies, such as self-reflection, continuous learning, and analytical ability—support more sustainable business trajectories.

This reinforces the idea that productive development cannot be understood solely through traditional economic indicators. Instead, it is shaped by the entrepreneur's abil- ity to learn, adapt, and manage the relational aspects of the business. Prior studies highlight that micro-enterprises with balanced competency profiles are better positioned to incorporate improvements, respond to external shocks, and explore new opportunities [6], [8]. The findings here are consistent with those conclusions, demonstrating that productive development increases when competencies are strengthened across different areas.

Implications for Capacity-Building Initiatives

From an applied perspective, the competency gaps iden- tified point to clear opportunities for targeted intervention.

Training programs for micro-entrepreneurs in Zone 5 should prioritize strengthening cognitive and planning-related com- petencies, particularly those linked to innovation, financial interpretation, and systematic problem-solving. Given that micro-entrepreneurs often have limited time to participate in formal training, educational interventions should be short, flexible, and oriented toward practical application.

The strong association between job performance and productive development suggests that training approaches based on "learning by doing" may be particularly effective. Programs that integrate practical exercises, simulations, and scenario-based challenges can support skill acquisition while respecting the time constraints of micro-entrepreneurs. At the same time, addressing professional aptitude gaps re- quires more structured support, such as mentorship pro- grams, peer-learning networks, or partnerships with local universities and technical institutes.

Contextual Considerations

Finally, the significant effects detected by the ANOVA highlight the importance of territorial and economic con- text when designing development strategies. Differences in infrastructure, market size, and institutional support across the four provinces of Zone 5 influence the ways in which competencies are activated and perceived. This suggests that policies aimed at strengthening micro-enterprises should incorporate territorial differentiation. Entrepreneurs in urban centers may benefit from programs focused on innovation and competitiveness, whereas those in rural or semi-rural areas may require support focused on collaboration, market access, and community-based networks.

In summary, the results indicate that strengthening the competency profile of micro-entrepreneurs is essential for improving productive development in Zone 5. While current strengths appear to support survival and operational continu- ity, significant gaps in cognitive and strategic competencies may limit long-term growth if not addressed through tar- geted intervention.

Implications for Information Systems and En- gineering Practice

The competency profile identified in this study has sev- eral implications for the design, implementation, and adop- tion of technological solutions within the micro-enterprise sector. The low prevalence of competencies associated with cognitive capacity, analytical reasoning, and long-term plan- ning suggests that many micro-entrepreneurs operate with limited ability to process abstract information or interpret complex system outputs. This represents a critical con- sideration for engineers and system designers seeking to promote digital transformation among micro-enterprises in developing regions.

First, the findings indicate that software intended for micro-entrepreneurs must minimize cognitive load. Inter- faces that rely heavily on dashboards, multistep config- uration processes, or abstract visualizations may not be suitable for users whose daily decision-making is driven primarily by immediate operational concerns and intuitive reasoning. Instead, systems should prioritize simplified in- teraction models, clear visual cues, and workflows aligned with the practical routines of micro-businesses. Designs that emphasize task automation, default recommendations, and step-by-step guidance can reduce friction and enhance usability.

Second, the predominance of execution-oriented compe- tencies—such as initiative and adaptability—suggests that micro-entrepreneurs respond better to tools that support rapid, hands-on experimentation rather than those requiring prolonged onboarding or training. This aligns with evidence from human–computer interaction research indicating that users with limited formal training benefit from progressive disclosure of functionality, contextual help, and scenario- based prompts. Systems that incorporate these elements are more likely to integrate smoothly into daily operations.

Third, the competency gaps identified highlight the importance of decision-support mechanisms. Micro-entrepreneurs with weak analytical skills may struggle to interpret financial reports, evaluate investment options, or forecast demand. Therefore, information systems should incorporate embedded intelligence capable of translating raw data into actionable insights. Examples include automated alerts, simple diagnostics, and rule-based recommendations that assist entrepreneurs in understanding key performance indicators without requiring advanced analytical capabilities.

Finally, the contextual differences observed across provinces imply that technological solutions must account for territorial variations in connectivity, market structure, and business maturity. For instance, micro-entrepreneurs in densely populated urban areas may require tools that em- phasize competitiveness and customer management, while those in rural settings may benefit more from inventory tracking, supplier communication, or mobile-first solutions compatible with intermittent connectivity. Adapting system functionality to these contextual constraints can significantly improve adoption rates and long-term impact.

Overall, the results suggest that effective technological intervention in the micro-enterprise sector requires not only robust system architecture but also an understanding of the behavioral and cognitive characteristics of end users. Engineering practice should therefore integrate competency- based user profiling into early design stages, ensuring that digital tools support—not overwhelm—the entrepreneurs they are intended to benefit.

CONCLUSION

This study examined the relationship between en- trepreneurial competencies and productive development among micro-entrepreneurs in Ecuador's Zone 5. The find- ings show a clear and consistent competency pattern: in- dividuals tend to exhibit strong operational and relational skills, while displaying more limited cognitive and planning abilities. These competency profiles are closely associated with productive development, with job performance emerg- ing as the strongest predictor, followed by personal and pro- fessional aptitudes. Contextual characteristics—particularly geographic location, business age, and gross revenue—also play a meaningful role in shaping entrepreneurial outcomes. The evidence highlights the need to strengthen micro- entrepreneurs' planning, management, and decision-making skills, as these dimensions are systematically weaker yet essential for long-term business performance. The results also offer practical value for the design of training programs, institutional support mechanisms, and information systems tailored to the behavioural characteristics and operational realities of micro-enterprises.

This study has several limitations that should be consid- ered when interpreting the findings. First, the results rely on self-reported information, which may be affected by subjective perceptions or social desirability bias. Second, the analysis focuses exclusively on Zone 5 of Ecuador, and caution is needed when generalising the findings to other regions with different socioeconomic dynamics. Third, the cross-sectional design does not allow for causal inference. Future research may incorporate longitudinal or experimen- tal approaches and include objective business performance indicators to validate and extend these conclusions.

Overall, the study contributes to a more nuanced under- standing of the competency structures that influence produc- tive development among micro-entrepreneurs. By identify- ing which competencies matter most—and how contextual factors interact with them—the findings offer valuable guid- ance for policymakers, training institutions, and researchers seeking to strengthen the micro-enterprise sector in Ecuador and similar contexts.

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