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A Fuzzy Analytical Network Process Framework for Prioritizing Competitive Intelligence in Startups

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Abstract: Competitive intelligence (CI) is a critical tool for startups, enabling informed decision making through the systematic gathering and analysis of relevant information. This study aims to identify and prioritize the key factors influencing CI in startups, providing actionable insights for entrepreneurs, educators, and support organizations. Through a systematic literature review, key variables and components impacting competitive intelligence were identified. Two surveys were conducted to refine these components. The first employed a five-point Likert scale to evaluate the significance of each component, while the second used a pairwise comparison approach involving ten experts in CI and startup mentorship. Utilizing the fuzzy Analytical Network Process (ANP), this study ranked Technology Intelligence as the most critical factor, followed by market and Strategic Intelligence. Competitor Intelligence and Internet intelligence were deemed moderately important, while Organizational Intelligence ranked lowest. These findings emphasize the importance of technology-driven insights and market awareness in fostering startups' competitive advantage and informed decision making. This study provides a structured framework to guide startups in prioritizing CI efforts, offering practical strategies for navigating dynamic market conditions and achieving long-term success.

Keywords: competitive intelligence; market intelligence; fuzzy analytic network process (ANP); competitive advantage in startup

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1. Introduction

New businesses are an important part of any economy, yet the key elements to achieve startup success are often unclear or up for debate [1]. Similar to other businesses, startup companies develop and execute strategies by adopting either a position-based view, which emphasizes the external environment, or a resource-based view, which integrates both external and internal factors. To support these strategies, startups rely on data, information, and knowledge obtained through formal methods or informal activities. These efforts, commonly referred to as competitive intelligence, are also known by other terms such as Competitor Intelligence, business intelligence, environmental scanning, and Market Intelligence [2–4]. In highly competitive, dynamic, and volatile environments, firms must actively gather critical information to enhance their decision-making processes. While this is challenging for any business, it poses an even greater hurdle for startups striving to establish a foothold in the market [1,5]. Startups put significant effort into carving out their place in the market, where survival and growth depend on their performance. It is important to recognize that small firms are not simply smaller versions of large corporations. They differ

in their organizational structures, available resources, management practices, responses to environmental challenges, and competitive approaches [1]. This article emphasizes the need to focus on the business intelligence capabilities of startups, highlighting their significant impact on overall firm performance [6].

Information holds little value unless it is properly understood, relevant, timely, cost-effective, and capable of driving improved performance or providing a competitive advantage [7]. Every organization aspires to gain a competitive advantage, and leveraging knowledge of the external environment effectively can create such differentiation, particularly through the strategic use of diverse datasets [8]. The ultimate goal for management is to formulate fact-based, actionable decisions derived from the knowledge gained through competitive intelligence activities [9–11].

The adoption and use of competitive intelligence (CI) programs are gaining traction among small businesses. Despite facing constraints such as limited resources, staff time, and expertise, small businesses can still develop and implement CI programs tailored to address their specific challenges and requirements [12,13]. Competitive intelligence plays a crucial role in business management and practice. It provides company management with critical information to support decision making and gain a competitive edge. By leveraging intelligence insights, companies can stay informed and aligned with the dynamics of the business environment [9,14].

The definition of competitive intelligence varies widely among authors and depends on the specific approaches adopted within the field of business [15]. Another study describes competitive intelligence as being similar to the intelligence activities conducted by intelligence agencies, with the key distinction that it relies exclusively on legal methods and legitimate information sources [16]. In the intelligence process, competitive intelligence information is gathered from legal sources according to a structured framework. It is then analyzed and enhanced with added value before being presented to company management for decision making. According to [17], competitive intelligence aims to forecast future trends and events, using these predictions as a foundation for strategic company decisions. Another definition describes competitive intelligence as a systematic framework encompassing the processes of defining, collecting, analyzing, and distributing information within an organization [18]. According to [19], competitive intelligence involves the surveying, monitoring, and evaluation of the competitive environment, including companies and organizations, to identify competitors' strengths, weaknesses, and strategic objectives. This process encompasses the analysis and synthesis of data and information, transforming it into strategic knowledge. It also includes gathering insights about competitors and monitoring various entities within the corporate environment [20]. According to [21], Strategic Intelligence is utilized to manage risks in the external environment, serving as an early warning system for management to anticipate and address potential challenges proactively. Another study defines competitive intelligence as the process of gathering actionable information about the competitive environment to support decision making [22].

Competitive intelligence entails examining both individuals within your network and the broader industry landscape to inform strategic decisions. It involves conducting research and evaluating actions based on the insights gained. Competitive intelligence focuses on providing purposeful, actionable information to guide strategic decision making. For instance, in law firms, common competitive intelligence projects include creating biographical sketches and relationship profiles of prospective or current clients or hires, analyzing similarly positioned firms, and developing industry or company profiles along with their reputation histories [23]. During the 1990s, competitive intelligence experienced rapid growth; however, areas like competitive analysis and the dissemination of intelligence received comparatively less attention than other aspects of the field [24]. Competitive

intelligence is emphasized as a system of activities within strategic management, designed to deliver actionable insights for informed decision making [21,25]. It is an essential component of strategic practice, warranting further exploration for its contributions to both emergent and deliberate strategies, as well as its role in bridging intra-organizational and extra-organizational activities [26].

Competitive intelligence is commonly categorized into distinct but overlapping areas, including Strategic Intelligence, Competitor Intelligence, Market Intelligence, and Technology Intelligence [27]. Also, the article titled *Competitive Intelligence Practices of European Firms* highlights that market insight, competitor insight, strategic planning, as well as marketing and market research significantly influence competitive intelligence [28].

Another study argued that the Internet, as a resource rich in information and a tool for inter-organizational communication, has revolutionized the way firms gather, generate, and share competitive intelligence [29]. The utilization of the Internet for competitive intelligence activities and its influence on the quality of competitive intelligence information are evaluated across three dimensions: research, internal use, and external use [29].

Strategic Intelligence was evaluated using four key variables: human resources, taxation, economic policies, and strategic viewpoint [30–32]. The variables used to measure Market Intelligence include customers, suppliers, and innovation in services and products [31,33,34]. Technology Intelligence was assessed using three key variables: articles, fundamental research, and industrial procedures [31,35,36]. It is essential to evaluate the cost–benefit ratio of current and emerging technologies and to predict potential future technological disruptions [31]. Understanding competitors' success is crucial for assessing the evolution of competitive strategies over time, particularly through changes in competitors' structures, the introduction of new product substitutes, and the entry of new players into the industry [31]. Organizational Intelligence was measured using key variables such as information technology, planning and decision making, and content factors [37–39].

The growth trajectory of startup companies is rarely linear [40]. Unexpected events or advancements in business plans and technological exploration can significantly impact their time to market and overall performance [41,42]. Startups operate in a highly complex environment, demanding substantial attention and support during their early stages [43]. Additionally, some entrepreneurs adopt a "born-to-be-sold" approach, designing their businesses with the intent of eventual sale [44].

Entrepreneurial business models must be tailored to align with the specific environment in which they operate [45]. Building a competitive advantage involves designing an effective model that connects technology, development, and business performance while adapting to market dynamics [46]. Entrepreneurs can effectively address customer needs and gain a competitive edge by staying responsive to evolving market conditions through innovation [47]. Customer development and the lean startup methodology have become increasingly popular approaches in entrepreneurship. These methods emphasize hypothesis testing, not in the traditional sense, but by encouraging entrepreneurs to scan the environment, gather information, and make well-informed judgments based on educated guesses [48]. However, leaders of small firms often face challenges due to the lack of support staff for delegating managerial tasks [48]. In line with the small business management paradigm, these leaders must gain insights into effective management practices while juggling responsibilities across operations, administration, and human resources [49].

Startups can leverage competitive intelligence to streamline the launch of new products or features, enabling them to identify and prioritize potential issues to avoid delays. The primary objective of competitive intelligence is to empower companies to make strategic and informed decisions by identifying future opportunities, providing valuable customer insights, minimizing resource wastage, and more.

2. Materials and Methods

This study employs both quantitative and qualitative approaches to identify and prioritize the critical components influencing competitive intelligence (CI) in startup companies. Using a systematic review of the existing literature, 19 significant attributes related to CI were identified. These components were extracted from various studies, each with unique goals and methodologies, contributing to a comprehensive understanding of CI in startups.

Application of Fuzzy Analytical Network Process (ANP)

The fuzzy ANP approach was used to analyze and rank the factors. This technique integrates fuzzy logic with ANP to prioritize factors when dealing with ambiguity and uncertainty, which is common in decision making for CI. The fuzzy numbers are calculated using two indexes: confidence (α) and optimism (μ). The confidence index (α) reflects the decision maker's level of confidence in their rankings, and all the equations are from another significant paper in this field [8].

Equations (1) and (2) are for the confidence index:

$$\mu_F(x) = \begin{cases} 0 & x < l \\ \frac{(x-l)}{(m-l)} & l \le x \le m \\ \frac{(u-x)}{(u-m)} & m \le x \le u \\ 0 & x > u \end{cases} \quad (1)$$

$$\forall_\alpha \in [0.1]\ M_\alpha = [l^\alpha . u^\alpha] = [(m-l)\alpha + 1. - (u-m)\alpha + u] \quad (2)$$

where l, m, and u represent the lower, middle, and upper values of the fuzzy number, respectively. The optimism index (μ) can be used to estimate the success rate. The optimism index, as shown in Equation (3), is a linear convex combination:

$$a_{ij}^{-\alpha} = \mu a_{iju}^{\alpha} + (1-\mu) a_{iju}^{\alpha}. \forall_\mu \in [0,\ 1] \quad (3)$$

The next step involves creating a pairwise comparison matrix to compare each factor relative to the others. Accordingly, the following matrix can be formed from pairwise comparisons Equation (4):

$$\tilde{A} = \begin{bmatrix} 1 & \tilde{a}_{12}^{\alpha} & \cdots & \cdots & \tilde{a}_{1n}^{\alpha} \\ \tilde{a}_{21}^{\alpha} & 1 & \cdots & \cdots & \tilde{a}_{2n}^{\alpha} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \tilde{a}_{n1}^{\alpha} & \tilde{a}_{n2}^{\alpha} & \cdots & \cdots & 1 \end{bmatrix} \quad (4)$$

where a_{ij} represents the relative importance of factor i compared to factor j. By completing pairwise comparisons, the weight vector of the indexes is calculated by using the following formula, where λ is the largest eigenvalue of the matrix Equation (5):

$$Aw = \lambda_{max} w \quad (5)$$

Obviously, the largest eigenvalue of the matrix is referred to as the λ value.

Then, the consistency index is obtained by the application of the formula below for each matrix when all the pairwise comparisons' matrices are formed:

$$\text{Consistency Index} = \frac{\lambda_{max} - n}{n-1} \quad (6)$$

Then, the consistency rate (CR) is obtained through Equation (7):

$$CR = \frac{Consistency\ Index}{Random\ consistency\ index} \tag{7}$$

Here, the n value represents the pairwise comparison matrix's size, and randomly produced average weights or the random consistency index (RI) is calculated from the relevant. Acceptable consistency rate (CR) values are lower than 0.01 (CR < 0.01).

By the application of fuzzy ANP, all these matrices merged into one single matrix. Assuming a_{ij}^{p} as an element which is related to the p-th respondent, in comparing component i with component j, the following calculation shows the element's geometric mean:

$$_{ij} = \left(\prod_{k=1}^{n} {}_{ij}^{p}\right)^{\frac{1}{n}} \tilde{\mathbf{A}}_{ij} = \left(\tilde{\mathbf{A}}_{ij}^{1} \times \ldots\ldots \times \tilde{\mathbf{A}}_{ij}^{9} \times \tilde{\mathbf{A}}_{ij}^{10}\right)^{\frac{1}{10}} \tag{8}$$

To calculate the fuzzy weight for competitive intelligence, the process begins with appraising and obtaining the integrated matrix of components. This is achieved using fuzzy ANP (Analytic Network Process), which calculates the geometric mean value of the j-th component in relation to other components. The geometric mean is expressed as follows in Equation (9):

$$\widetilde{r}_1 = \left({}_{11} \otimes {}_{12} \otimes \ldots\ldots \otimes {}_{1j}\right)^{\frac{1}{j}} \tag{9}$$

In this formula, A1j represents the pairwise comparisons of the j-th component against other components, and the geometric mean consolidates these comparisons into a single representative value.

Next, the fuzzy weight of each component is calculated. This involves multiplying the value of each component (r_i) by the inverse of the fuzzy sum of all components' values. For the first component, this calculation is shown in Equation (10):

$$\widetilde{w}_i = \widetilde{r}_i \otimes \left(\widetilde{r}_1 \oplus \widetilde{r}_2 \oplus \ldots\ldots \oplus \widetilde{r}_i\right)^{-1} \tag{10}$$

Here, $\oplus$ denotes the fuzzy sum, and $\otimes$ represents the fuzzy multiplication operator. This step ensures that the weights are normalized and reflect the relative importance of each component. This study adopts a mixed-methods approach, combining quantitative and qualitative techniques to identify and rank factors influencing competitive intelligence (CI) in startup companies. Initially, a comprehensive literature review identified 19 critical attributes relevant to CI, such as customer understanding, innovation, strategic planning, and organizational resources. These components provide a broad foundation for analyzing how CI contributes to startup success.

To prioritize the factors, this study uses the Fuzzy Analytical Network Process (ANP), a method that accounts for the complexity and uncertainty in decision making. Two key indexes, confidence (α) and optimism (μ), help assess the reliability of each decision maker's choices. Confidence reflects how sure the decision maker is about their priorities, while optimism estimates the likely success of those choices. These indexes are then used to create a matrix that compares each factor against others, setting up a relative ranking. If the consistency ratio (CR) falls below 0.01, it means the comparisons are dependable.

Finally, the fuzzy ANP method combines all individual evaluations into one overall ranking, giving a clear, prioritized list of CI factors tailored for startups. This approach offers startups a clear pathway to focus their efforts on the most impactful areas of CI, ultimately aiding in informed and effective decision making.

3. Results

The study area is strategic management and examines the effective factors of competitive intelligence in startup companies. The statistical population of this study was 105 individuals actively engaged in the field of startup companies. These people were identified through some conferences and active companies in Iran (questionnaires and forms for data collection can be received from the authors upon the reader's request). A series of criteria were considered for the inclusion of participants; these criteria include working experience in startup companies, being an owner or coworker in a startup company, and having sufficient knowledge of information technology and at least a bachelor's degree. Factors were tested using the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. A factor analysis was used to identify a set of underlying dimensions known as components and summarize them in factors. For factor analysis, a questionnaire, which is based on a Likert five-point Scale, was distributed among 105 people who were actively dealing with startup companies. Eventually, 83 completed questionnaires were received out of a total of 105. In order to confirm the data convergent validity, factor loading values greater than 0.5 were accepted, as shown in Table 1.

Table 1. Factor loading of extracted variables.

Factors	Components	References	Factor Loading	Cronbach's α
Market Intelligence	C1	[33,35,36]	0.854	0.897
	C2	[33,35,36]	0.707	
	C3	[33,35,36]	0.622	
Strategic Intelligence	C4	[32–34]	0.687	0.912
	C5	[33–35]	0.811	
	C6	[33–35]	0.713	
	C7	[33–35]	0.822	
Technology Intelligence	C8	[33,37,38]	0.594	0.883
	C9	[33,34,38]	0.864	
	C10	[33,34,38]	0.771	
Competitor Intelligence	C11	[33]	0.674	0.719
	C12	[33]	0.832	
	C13	[33]	0.795	
Organizational Intelligence	C14	[39–41]	0.583	0.825
	C15	[39–41]	0.758	
	C16	[39–41]	0.699	
Internet	C17	[31]	0.703	0.901
	C18	[31]	0.815	
	C19	[31]	0.684	

In this paper, the effective components of competitive intelligence are divided into six factors: Market Intelligence, Strategic Intelligence, Technology Intelligence, Competitor Intelligence, Organizational Intelligence, and Internet.

The Analytic Network Process (ANP), developed by Saaty in the 1980s as an extension of the Analytic Hierarchy Process (AHP), has since become a widely applied method for solving multi-criteria decision-making problems [50]. Unlike AHP, ANP does not assume the independence of elements, allowing it to model more complex interrelationships. Furthermore, ANP prioritizes not only individual elements but also clusters or groups of elements, which is particularly critical in addressing real-world problems [51].

This study employed triangular fuzzy numbers (TFNs) to account for uncertainty and subjectivity in expert judgments. A TFN is represented as (l, m, u), where l denotes the smallest possible value, m represents the most likely value, and u indicates the largest possible value describing a fuzzy event [52].

Table 2 shows the scale which has been used by experts to make pairwise comparisons. Several key considerations were made in this process. First, a pre-approved questionnaire was utilized to enhance its reliability. Second, Saaty's principles of homogeneity and clustering were employed to ensure validity [53]. Finally, after the initial validation, a group of experts reconfirmed the questionnaire's validity before it was distributed among all participants [54].

Table 2. Adapted fuzzy linguistic scales for assessing difficulty and significance.

Difficulty Scale	Importance Scale	Triangular Fuzzy Scale	Inverse Fuzzy Scale
Identical	Identical	(1, 1, 1)	(1, 1, 1)
Similar	Similar	(1/2, 1, 3/2)	(3/2, 1, 1/2)
Slightly more challenging	Slightly more significant	(1, 3/2, 2)	(1/2, 2/3, 1)
Markedly difficult	Markedly significant	(3/2, 2, 5/2)	(2/5, 1/2, 2/3)
Substantially more challenging	Substantially more significant	(2, 5/2, 3)	(1/3, 2/5, 1/2)
Extremely challenging	Extremely significant	(5/2, 3, 7/2)	(2/7, 1/3, 2/5)

Table 3 presents the consistency rate (CR) results for each factor in competitive intelligence (CI) for startups. The CR is a critical measure in the Analytical Network Process (ANP), ensuring that the comparisons between factors are logically consistent. In this study, a CR of less than 0.01 is considered acceptable, indicating that the judgments made in comparing each factor are reliable and consistent.

Table 3. Consistency rate of factors.

Factors	Consistency Rate (CR)
Market Intelligence	0.035
Strategic Intelligence	0.048
Technology Intelligence	0.040
Competitor Intelligence	0.007
Organizational Intelligence	0.037
Internet	0.031

Each factor was compared against others, and the CR was calculated based on these pairwise comparisons. Consistency rates close to zero suggest that the experts' evaluations are aligned and that the ranking process is robust. This validation step is crucial in studies using fuzzy ANP, as it confirms that the priority weights assigned to each factor accurately reflect their relative importance in influencing CI within startups.

In this study, the total number of pairwise comparisons reached 36, according to the fact that this research obtained six factors and 19 components. The factors consist of fifteen pairwise comparisons, six pairwise comparisons among Organizational Intelligence, and three comparisons among Market Intelligence, Strategic Intelligence, Technology Intelligence, Competitor Intelligence, and the Internet. Furthermore, 10 experts were employed in this study, and 10 separate matrices were obtained.

Based on the presented results (Table 4), the Defuzzified Weights represent the priorities calculated for both main components (factors) and their associated sub-components. These weights allow for comparisons of importance between groups (factors) and within groups (sub-components). Technology Intelligence ranked as the highest-priority factor,

with a defuzzified weight of 0.23, highlighting its significant role in competitive intelligence for startups. Market Intelligence and Strategic Intelligence followed, tied in second place with equal weights of 0.19, indicating their strong influence on the overall framework. Competitor Intelligence and the Internet ranked jointly in fourth place, with weights of 0.17, reflecting their moderate importance. Finally, Organizational Intelligence scored the lowest weight, 0.04, and was deemed the least influential factor in this ranking.

Table 4. Fuzzy weight of main component and sub-component.

$\tilde{w}_i$ (Factor)	$\tilde{w}_j$ (Component)	Defuzzied Weight		Rank	
$\tilde{w}_1$	C1	0.22	0.19	3	2
	C2	0.28		2	
	C3	0.50		1	
$\tilde{w}_2$	C4	0.20	0.19	4	2
	C5	0.22		3	
	C6	0.28		2	
	C7	0.30		1	
$\tilde{w}_3$	C8	0.25	0.23	3	1
	C9	0.35		2	
	C10	0.40		1	
$\tilde{w}_4$	C11	0.37	0.17	1	3
	C12	0.31		3	
	C13	0.32		2	
$\tilde{w}_5$	C14	0.17	0.05	3	4
	C15	0.36		2	
	C16	0.47		1	
$\tilde{w}_6$	C17	0.36	0.17	2	3
	C18	0.38		1	
	C19	0.26		3	

While the table highlights the relative importance of factors and sub-components, it does not explicitly provide the global synthesized weights of sub-components. These weights are calculated by combining the weight of each main component with the weight of its sub-components within the group. The global weight of a sub-component is determined using the following formula: Global Weight = Weight of Main Component × Weight of Sub-Component (Within the Group). For example, under Technology Intelligence, which has a main component weight of 0.23, the sub-component C8, with a local weight of 0.25, would have a global weight of 0.23 × 0.25 = 0.0575. Including these global weights would enable a comprehensive ranking of all sub-components across the entire framework, offering a synthesized view of their relative importance.

The inclusion of global synthesized weights would enhance the utility of the ranking by providing startups with a clearer understanding of how to prioritize individual sub-components. As currently presented, the results emphasize the dominance of Technology Intelligence, underscoring the importance of technology-driven insights in competitive intelligence for startups. Similarly, Market Intelligence and Strategic Intelligence highlight the significance of market awareness and strategic planning in decision-making processes. Competitor Intelligence and the Internet maintain moderate importance, while Organizational Intelligence plays the least prominent role. Revising Table 4 to include the global synthesized weights would provide a more complete picture of the prioritization framework, making it more actionable for startups seeking to optimize their competitive intelligence strategies.

Sensitivity Analysis

To ensure the robustness and stability of the research findings, a sensitivity analysis was conducted on the fuzzy ANP model results. The original weights assigned to the six competitive intelligence (CI) factors—Technology Intelligence, Market Intelligence, Strategic Intelligence, Competitor Intelligence, Internet Intelligence, and Organizational Intelligence—were incrementally varied by ±10%. These adjustments were made while maintaining the total weight sum at one to ensure consistency. Each scenario involved increasing or decreasing one component's weight, followed by proportional adjustments to the remaining weights. For each variation, the adjusted weights were normalized, and the ranking of the six factors was recalculated to observe any shifts in priority. This step aimed to evaluate how sensitive the overall rankings are to changes in the importance assigned to each component.

The results of the sensitivity analysis, as presented in Table 5, indicate that the priority rankings of the factors remain largely stable under varying weight conditions. Technology Intelligence consistently ranked as the most critical factor, even with a 10% decrease in its weight, followed by Market and Strategic Intelligence. Competitor Intelligence and Internet Intelligence maintained moderate importance, while Organizational Intelligence, despite weight adjustments, consistently ranked lowest. These results demonstrate the robustness of the fuzzy ANP model, confirming that the prioritization of CI factors in startups is reliable and not overly sensitive to minor changes in input weights.

Table 5. Sensitivity analysis showing adjusted weights and rankings.

Technology Intelligence	Market Intelligence	Strategic Intelligence	Competitor Intelligence	Internet Intelligence	Organizational Intelligence
0.288	0.2	0.2	0.155	0.155	0.0
0.257	0.2	0.2	0.171	0.171	0.0
0.232	0.191	0.191	0.171	0.171	0.040
0.217	0.186	0.186	0.170	0.170	0.069
0.207	0.182	0.182	0.169	0.169	0.088

4. Discussion

The findings of this study emphasize the significant role that competitive intelligence (CI) plays in shaping the success of startup companies. Among the six key factors analyzed, Technology Intelligence emerged as the most crucial, underscoring the importance of technological capabilities in helping startups navigate rapidly changing and often unpredictable business environments. This factor highlights that startups thriving in today's competitive landscape must leverage technology to gather, process, and apply data effectively for strategic advantage. Market Intelligence and Strategic Intelligence were identified as highly influential, emphasizing the importance of understanding customer needs, competitive positioning, and crafting robust strategies to sustain and grow in the face of challenges. The focus on Market Intelligence suggests that startups must remain closely aligned with customer demands and preferences, which can shape product development and marketing efforts. Strategic Intelligence, on the other hand, highlights the value of long-term planning and the ability to pivot and adapt as circumstances evolve. Together, these three factors provide a foundation for startups to remain agile, innovative, and customer-focused.

The importance of Technology Intelligence indicates that startups should prioritize investments in advanced tools and methodologies. For example, adopting data analytics and machine learning can help founders and managers make faster, more informed decisions. Technology Intelligence is not just a support mechanism but a core driver of innovation and strategic execution. Similarly, Market Intelligence encourages startups to deepen customer

engagement by leveraging insights to develop customer-centric strategies, ensuring that their offerings resonate with target audiences. Strategic Intelligence serves as the compass, ensuring startups have a clear direction and the ability to anticipate and respond to market shifts. Competitor Intelligence and Internet Intelligence were ranked moderately, reflecting their supportive but less central role in the broader competitive intelligence framework. While valuable, these factors may function as tools to complement the core capabilities of Market, Strategic, and Technology Intelligence. Finally, Organizational Intelligence ranked the lowest, perhaps due to the unique constraints of startups. Smaller teams and limited resources often force startups to concentrate on external-facing strategies rather than internal processes and organizational development.

The insights gained from this study provide a clear roadmap for startups to allocate their limited resources effectively. Prioritizing Technology Intelligence can significantly enhance their agility and capacity to innovate, which are essential for growth and survival in fast-paced markets. For instance, startups could invest in cloud-based platforms, CRM tools, or advanced data analytics systems to maximize their ability to make timely and data-driven decisions. Market Intelligence further encourages startups to refine customer-focused products and services, ensuring they stay competitive and relevant. Strategic Intelligence can guide long-term decisions and resource allocation, offering a safeguard against the unpredictable nature of startup environments. By leveraging these prioritized factors, startups can create a cohesive and effective competitive intelligence strategy that drives decision making and sustains growth.

These findings resonate with earlier studies that emphasize the importance of dynamic capabilities in startups, particularly the need to adapt quickly and decisively. However, this study also sheds light on unique challenges faced by startups, such as the constant balancing act between external competitiveness and internal development. Startups often lack the resources to focus extensively on Organizational Intelligence, which can sometimes hinder their growth as they scale. These challenges underline the importance of creating tailored support systems for startups, which mentors, incubators, and accelerators can help provide.

As with any study, there are limitations to consider. This research focused on a specific population of startup experts within a defined geographic and contextual scope. While this focus allowed for an in-depth analysis, it may limit the applicability of the findings to startups in other regions or industries. Expanding the participant base to include startups from diverse ecosystems could provide more comprehensive insights. Additionally, this study reflects a snapshot in time. Future research could take a longitudinal approach to explore how CI priorities evolve as startups grow and transition into more mature stages. Investigating the impact of emerging technologies, such as artificial intelligence and blockchain, on CI practices would also offer valuable insights. A deeper exploration of sector-specific CI needs could further refine the practical applications of this framework, helping startups in varied industries strengthen their competitive edge in an ever-changing market. By addressing these avenues, future research can build on this study's findings to provide even greater clarity and support for startups striving to thrive in today's competitive business environment.

5. Conclusions

This study highlights the essential role of competitive intelligence (CI) in fostering the success and sustainability of startup companies. Through a systematic analysis, six key factors were identified and prioritized, with Technology Intelligence emerging as the most significant. This finding underscores the importance of technological capabilities in enabling startups to navigate uncertainty, leverage data-driven insights, and maintain

agility in competitive markets. Market Intelligence and Strategic Intelligence were also ranked highly, emphasizing the critical need for startups to understand their customers, anticipate market trends, and implement robust strategic plans.

This study also revealed that Competitor Intelligence and Internet Intelligence play supportive roles, offering valuable tools for enhancing a startup's competitive edge. Organizational Intelligence, while important, ranked lowest, possibly reflecting resource constraints and external focus typical of startup operations. These findings offer actionable insights for startups and their stakeholders. By prioritizing investments in technology-driven tools and methodologies, startups can foster innovation and adaptability. Similarly, focusing on market and strategic insights can help align business efforts with customer needs and long-term goals, ensuring sustained growth and resilience in the face of challenges. While this study provides a clear roadmap for startups to optimize their CI practices, it is not without limitations. The research focused on a specific geographic and industry context, which may limit its generalizability. Future studies should explore CI frameworks across different industries and regions to validate and expand these findings. Longitudinal research tracking CI priorities as startups evolve could also offer deeper insights into how these factors shift with growth and maturity.

In conclusion, this study contributes to the growing body of knowledge on competitive intelligence in startups and provides a practical framework for prioritizing CI efforts. By implementing the recommended strategies, startups can enhance their decision making, navigate competitive landscapes more effectively, and position themselves for long-term success.

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