# How does the cognitive process of knowledge accumulation affect Vietnamese entrepreneurs' success likelihood: A mindsponge-based interpretation

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***Abstract:***

**The economic reform in 1986 transformed Vietnam from a centrally planned economy to a socialist-oriented market economy. It is suggested that entrepreneurs and entrepreneurial spirits within the populace fuelled the structural changes. Despite the importance of entrepreneurship in Vietnam's economy, studies in Vietnam mainly focus on the practical aspects of entrepreneurial activities and neglect the cognitive and theoretical aspects of entrepreneurship. Thus, this study employs the information-processing perspective of the Mindsponge Theory to explore how entrepreneurs' knowledge accumulation affects their perceived likelihood of business success. By analysing a comprehensive dataset of Vietnamese entrepreneurship using Bayesian methods, our findings reveal that entrepreneurs with significant business-related experience have higher probabilities of success. Additionally, a greater willingness/readiness to transform thinking, actions, and beliefs can improve the business success of entrepreneurs who carefully study others' failures. However, for those who perceive learning from others' failures as unnecessary, a higher willingness/readiness to transform diminishes their chance of success. We recommend a balanced approach: entrepreneurs should build their knowledge pool through experience, learning, and open-mindedness. A sufficient pool of knowledge can empower Vietnamese entrepreneurs, enabling them to make informed decisions, foster innovation, and contribute substantially to the nation's entrepreneurial landscape.**

***Keywords:*** **Bayesian Mindsponge Framework, Bayesian Mindsponge Framework analytics, cognitive process, creativity, entrepreneurship, information-processing, innovation, knowledge management, openmindedness, success.**

***Classification numbers:*** **1.4, 2.2, 7**

## 1. Introduction

Entrepreneurship is widely acknowledged to be vital to economic progress. Due to its benefits for employment, innovation, and welfare, entrepreneurship is a significant mechanism for fostering economic growth [1-4]. Theories of economic development, dating back to the 18th century, have attempted to account for the significance and function of entrepreneurship and the entrepreneurs who drive it [5, 6]. Throughout the 1990s, entrepreneurship research increased dramatically but was not widely recognised until the late 2000s. Anglo-Saxon researchers have dominated the field for the last two decades, with notable representation from the United States, the United Kingdom, and Canada [5]. Thus,

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many scholars underline the need to better understand entrepreneurship's function in developing countries, as entrepreneurial spirit may be culturally influenced and, to some extent, institutionally supported [1, 7-9].

The *Đổi Mới* reform not only dramatically improved economic growth but also laid the ground for entrepreneurship development [10]. Vietnam's *per capita* income doubled from $202 to $417 in 2001. According to World Bank statistics, this figure skyrocketed to more than $3756, around 19 times higher than the *per capita* income in 1986. The rise of the first generation of Vietnamese entrepreneurs can be traced back to 1991 to 1999, when there were around 40,000 newly founded businesses [10]. Considering the relatively modest size of its economy, Vietnam is dominated by small and medium enterprises (SMEs), whose expansion in number and capital over the last two decades has firmly established entrepreneurship as the economic backbone. While there were only around 37,700 SMEs in 2000, accounting for 96.47% of all firms, the number has risen to approximately 593,600 in 2018, accounting for 97.2% (about 610,600 firms) [11]. According to the Global Entrepreneurship Research Association (2018) [12], Vietnam had the highest overall early-stage entrepreneurial activity (23.3%) and notable entrepreneurial spirit score (0.26) in 2018. Given the substantial composition of SMEs in Vietnam's economic structure and entrepreneurship potential, studying the determinants of entrepreneurs' success is crucial to bolster the country's socio-economic development. However, entrepreneurship research in Vietnam remains modest [13].

Most entrepreneurship studies in Vietnam concern firms' capital and economic efficiency [13-15]. Although financial capital is essential, other non-financial resources also significantly impact the performance or success of entrepreneurial ventures, such as innovation capability and knowledge management. However, scholars have discovered that Vietnamese enterprises pay little attention to innovation because it is costly and requires massive investment in technological upgrades [16]. Thus, the country's economic growth relies greatly on capital accumulation and cheap labour, which can lead to a resource curse and "resource poisoning" – adverse economic and social effects of excessive investment poured into society without considering resource abundance [17, 18]. Building a knowledge-based economy is a prominent way to avoid the adverse effects of the resource curse [18-20]. Moreover, a recent review suggests that entrepreneurship studies in Vietnam mainly focus on the practical aspects of entrepreneurial activities (e.g., determinants of firm performance) and neglect the cognitive and theoretical aspects of entrepreneurship, which are pivotal topics in global entrepreneurship research.

Entrepreneurial success is closely linked to the ability to make effective decisions [21, 22]. As cognitive factors are fundamental in determining individuals' thinking and behaviours, they play a substantial role in entrepreneurial decision-making and significantly affect the success of new businesses, where the entrepreneur is the main decision-maker and executor [23-25]. Although studies have found that entrepreneurial success is significantly affected by business experience [26, 27], human capital [28, 29], education [30, 31], knowledge [32], and competencies [33], few studies have explored the effect of knowledge accumulation from the cognitive perspective, hindering the understanding of the underlying cognitive processes of knowledge accumulation. J.M. Unger, et al. (2011) [29] underscore that researchers should use a moderator approach to study the connection between knowledge and entrepreneurial success instead of the static perspective, considering the ever-changing nature of business and the constant demand for learning and adaptation.

To fill this gap, this study explores how entrepreneurs' knowledge accumulation affects their perceived likelihood of business success through the information-processing lens of Mindsponge Theory. The information-processing perspective was employed for several reasons. First, it is founded on

the metaphysical premise that everything inside and outside human brains may be analysed through the lens of information [34-36]. Hence, the information-processing-based viewpoint affords us additional analytical and explanatory freedom regarding the mental mechanism (or cognitive process). It is even more effective when studying entrepreneurs whose performance is greatly influenced by bricolage, serendipity, and creativity [37-39]. Lastly, the dynamic and constantly updating characteristics of the Mindsponge Theory's information-processing approach have proven effective in explaining other psychological and behavioural issues [40-50].

Using the Bayesian Mindsponge Framework (BMF) analytics on the most comprehensive dataset of 3,071 Vietnamese entrepreneurs, this study investigates how entrepreneurs' business-related knowledge and learning from others' failures affect their success likelihood in relation to their willingness to transform ways of thinking, acting, or beliefs. In other words, it examines the effects of business-related knowledge and learning from others' failures on the likelihood of business success and how entrepreneurs' willingness to transform ways of thinking, acting, or beliefs moderates those effects. BMF is an analytical framework that employs the strengths of Mindsponge Theory's theoretical reasoning and the inference advantages of Bayesian analysis. Detailed reasoning and model formulation based on Mindsponge Theory are presented in the next section.

Factors contributing to the success of entrepreneurs' businesses are crucial for shaping effective entrepreneurship policies, educational programmes, and support systems tailored to the unique needs of Vietnamese entrepreneurs, ultimately fostering a vibrant and innovative entrepreneurial ecosystem in the nation. Thus, this study's findings have the potential to contribute valuable knowledge that can enhance the success rates of entrepreneurs, drive economic growth, and bolster Vietnam's position in the global business landscape.

## 2. Methodology

### *2.1. Theoretical foundation*

#### *2.1.1. Overview of the Mindsponge theory*

In their early research on acculturation and globalisation, Quan-Hoang Vuong and Nancy K. Napier coined the term "mindsponge" [51]. The notion was characterised as a dynamic process or mechanism that explains how a mind absorbs new cultural values and discards fading ones depending on the context, using the metaphor "the mind as a sponge that squeezes out inappropriate values and absorbs new ones that fit or complement the context" [51]. The original mindsponge mechanism is constructed by studying psychological and social phenomena, which is consistent with and complements a large number of other theories and frameworks [52-57]. Later, it evolved into a theory of mental information processing, integrating the most recent findings from brain and life sciences [58]. In the theory, the mind is described as a collection-cum-processor of information, including biological and social systems of varying degrees of complexity.

The following are the characteristics of a mindsponge information-processing system [59]: (i) It reflects underlying biosphere system patterns; (ii) It is a dynamic, dynamically balanced process; (iii) It involves cost-benefit analysis, which seeks to maximise the perceived benefits of the system while minimising its perceived costs; (iv) It consumes energy and thus adheres to the concept of energy saving; (v) It includes objectives and priorities based on system requirements; (vi) Its primary purpose is to ensure the continued life of the system, which includes survival, growth, and reproduction.

The mindset is the system's memory-resident collection of all accepted information. Based on the content of the existing mindset, the filtering mechanism governs what information enters and leaves the mindset. Filtering information changes both

the thinking and the filtering mechanism. The trust mechanism (selective prioritisation) can be utilised to speed up the filtering process to save energy [58].

Through biochemical changes in neurons, information acquired from the external world or created internally is retained as engrams - cognitive information imprinted in a physical substance. In engram neurons, memory consolidation occurs as a result of DNA (deoxyribonucleic acid) methylation activated by signals that result in stable structural changes [60, 61]. The hippocampus and amygdala are thought to be in charge of constructing cognitive maps of stored information. Before being consolidated in the neocortex for long-term storage, information entering the brain is suggested to be stored temporarily in the hippocampus [62, 63]. In the process of long-term potentiation, the strength of synaptic connections grows as signals are transferred via synapses [64]. These dynamic information storage mechanisms serve as the foundation for neuroplasticity, enabling flexible adaptations for the processing system (or the mind).

Based on knowledge of neuroscience, mindsponge theory defines a mindset as a set of stored information in the central nervous system that can be aware of in the form of trusted (accepted) values - subjective meanings attached to the information. From this set of trusted values, the processing system develops responses (i.e., behaviours) deemed appropriate for the current situation. The outputs of conscious and non-conscious mental processes (e.g., beliefs, thoughts, attitudes, feelings, behaviours, etc.) are also influenced by the existing trusted values within the mindset. It is worth emphasising that interpretations of things are influenced by the information in mind rather than the objects themselves. Thus, a person's response to the surrounding environment is constrained by the amount and types of information available in their mind.

The evolution of minds tends to progress towards greater information storage and processing capability for more flexible and efficient utilisation of such information. The evolutionary tendency is founded on the most basic premise of all living things: survival. As a social species, humans also have a sense of social survival besides natural survival [65]. In this respect, a human being's thinking may be thought of as a well-optimised adaptive memory system.

*2.1.2. Proposed hypotheses*

Entrepreneurs are characterised as decision-makers "whose entire role arises out of his alertness to hitherto unnoticed opportunities" [66]. After noticing the opportunities, entrepreneurs have to monitor different sources of innovation, solve various issues regarding the implementation process *ex ante*, pool and utilise resources, and translate the implementation into realities [67]. Decision-making effectiveness can be defined as "the extent to which decisions result in desired outcomes or similarly the extent to which decisions achieve the objectives established by the decision-makers at the time they are made" [22, 68, 69]. As such, decision-making effectiveness can be a measure of a decision's success, and the effectiveness of entrepreneurs' judgments is critical to the success of their businesses.

From the mindsponge theory's perspective, entrepreneurs' decisions are products of information processes. Such decisions will lead to subsequent functions of entrepreneurial businesses [70]. The market or the external environment tests whether such businesses are successful or not. If entrepreneurs' thinking (or information in their minds) fits with reality, their decisions will likely generate revenue and make the businesses successful [71]. Otherwise, the decisions will likely result in businesses' poor performance, leading to failure [72]. As the mindset greatly influences the information processes, entrepreneurs who have experience (memories) with business-related work are more likely to respond to the surrounding environment (or market) better and generate better decisions, which might increase the likelihood of success for the businesses. Thus, our first hypothesis (H) is as follows:

H1: Entrepreneurs acquiring business-related experience are more likely to have a higher chance of business success.

The information absorption process is required for information to appear in mind. An organism cannot comprehend the world around it, navigate within it, or make decisions to adapt to a changing external environment without the absorption process. Absorbing the information of other entrepreneurs' failures is one effective way to make the information within the mind fit with reality, as failures are tested attempts. When the information is integrated into the mindset, it will be used to generate subsequent decisions that are likely to help entrepreneurs avoid risks inducing previous failures. Considering the complex and unpredictable legal practices in Vietnam's transitional context, learning from other failures is vital for success. For example, due to a set of unwritten rules, businesses have to pay out of their own pockets to smoothen operations, thereby increasing entrepreneurial transaction costs. In Vietnam, however, "giving an envelope" has a deeper meaning: it is about building a mutually beneficial relationship between the businesses and the authorities involved. In this sense, institutional boundaries are momentarily breached, allowing for personal manoeuvring. Some research has shown that bribery or "speed money" assists businesses in reducing expenses associated with a lack of security and transparency [73, 74]. As a result, we hypothesised that:

H2: Entrepreneurs learning from others' failures are more likely to have a higher chance of business success.

The absorption process in humans is influenced by sensory systems, information stored in the internal mind, and information accessible in the external world. When the four following conditions are met, information is absorbed into the mindset and turns into a highly trusted value [58].

(i) First, the information must be present in the environment to be absorbed.

(ii) Second, to absorb information, the mind must have a receptor compatible with the information (i.e., the visual system for seeing and the auditory system for hearing).

(iii) Even if the first and second conditions are met, the quantity of information that may be absorbed is subject to the reception efficiency of the receptors.

(iv) The fourth condition is whether the mind trusts or perceives the benefits of the information.

Even after the information is absorbed into the mind, it can still be discharged if perceived as waning values during the multi-filtering process. The filtering system uses stored information in the mindset to assess the compatibility of newly received information, so its evaluation is heavily subjective. Due to this mechanism, information with similar characteristics to trusted values will be accepted more easily, and vice versa. Suppose there is no relevant information existing in the mindset. In that case, information will be thoroughly evaluated using the information within the mind and that absorbed from the environment, which is a timely process. When new information is incorporated, the mindset is updated. The mindset can still be updated due to values contrasting with the mind if they result in positive feedback from the environment and the person is willing to change [75]. If an entrepreneur's willingness/readiness to change their mind is high, it will affect the filtering process and the updated mindset, subsequently influencing the decision-making processes and likelihood of success. For example, people with a high willingness/readiness to change will have a more effective absorption process of others' failures. Then, they will have a higher likelihood of success. Given this characteristic of the filtering system, we hypothesised that:

H3: The effect of business-related experience on a business's chance of success is conditional on the entrepreneurs' willingness to transform their ways of thinking, acting, and beliefs.

H4: The effect of learning from others' failures on a business's chance of success is conditional on the entrepreneurs' willingness to transform their ways of thinking, acting, and beliefs.

### *2.2. Model development*

#### *2.2.1. Variable selection and rationale*

In this study, we thoroughly analyse a comprehensive dataset sourced from Q.H. Vuong (2016) [76], aiming to unravel the intricate dynamics that influence entrepreneurs' success in the Vietnamese business landscape. The dataset, curated from a nationwide field survey, provides valuable resources to study entrepreneurs' perceptions and decisions regarding the likelihood of their businesses' success and continuity. This survey took place over a three-month period from March to May 2015, strategically targeting

entrepreneurs actively participating in seminars, conferences, and meetings held in five pivotal regional economic centres of Vietnam: Hanoi, Ho Chi Minh city, Da Nang, Buon Ma Thuot, and Can Tho.

The survey was conducted under the guidance of authorised personnel who ensured that participating entrepreneurs were well-informed about the survey's objectives and methodologies. Entrepreneurs who expressed their willingness to participate were provided with detailed instructions on how to complete the questionnaire, ensuring the accuracy and depth of the gathered data. Following the conclusion of each event, the responses were meticulously compiled, capturing the diverse perspectives and insights of entrepreneurs from varied sectors and backgrounds.

A key aspect of this data collection effort was the random sampling strategy. Out of an estimated 50,000 entrepreneurs attending these events, the survey team strategically and randomly approached approximately 10,000 participants, ensuring a diverse and representative sample. Subsequently, 3,071 observations were obtained, forming the foundation of our study. This comprehensive dataset allows us to explore in detail the relationships between entrepreneurs' business-related knowledge, their ability to learn from failures, their willingness to embrace transformative thinking, actions, or beliefs, and their respective likelihood of success. Through this rigorous analysis, we aim to contribute valuable insights to the field of entrepreneurship and inform strategies that can enhance entrepreneurial success in the Vietnamese context. The dataset is available for public use at: https://data.mendeley.com/datasets/kbrtrf6hh4/2.

The survey included four questions related to the entrepreneurs' knowledge and knowledge-seeking behaviours: the previous job of participants, the pattern of learning from others' failures, entrepreneurial efforts to transform ways of thinking, acting, and beliefs, and the evaluated chance of success. In Q.H. Vuong's work (2016) [76], the author summarised all the data in three fields: coded name, explanation, and values. However, to serve our work, the variables needed to be transformed into a format readable by our methodology (i.e., converted to numbers for the estimations of models). Hence, in Table 1, the variables and how they were coded are described in five categories: coded name, explanation, values, converted variable, and converted value.

The variable *InternalInfor* was converted from variable *X1.job* in the original dataset to measure the business-related experience of the entrepreneur. This variable reflects the familiarity of entrepreneurs with the business environment in which they operate: the more familiarity, the better the fit between their mental expectations and realities. If the entrepreneur possessed any business-related job before starting the entrepreneurial businesses, they would be coded as 1; otherwise, they would be coded as 0.

The variable *ExternalInfor* was converted from variable *X10.failurel* in the original dataset to measure the entrepreneurs' patterns of learning from others' failures. This variable reflects how an entrepreneur can

**Table 1. Data descriptions.**

| Coded name | Explanation | Values | Converted variable | Converted value |
|---|---|---|---|---|
| *X1.job* | Previous job | Human resources (hmr); sales/marketing (salesm), production/ operations (pom); finance/accounting (finance); administrative or other departments (admin); no significant job experience (none) | *InternalInfor* | None =0<br>Others =1 |
| *X10.failurel* | Learning from others' failures | Careful study (a); exploring few noteworthy cases (b); and no need (c) | *ExternalInfor* | a=3<br>b=2<br>c=1 |
| *X19.msponge* | Entrepreneurial efforts to transform ways of thinking, acting and beliefs? | Strong; some aspects; negligible; none | *TransMind* | Strong =4<br>Some aspects =3<br>Negligible =2<br>Non =1 |
| *X23.chance* | Evaluated chance of success? | Certain; high (>80%); med (50-80%); low (<50%). | *EvaluatedSuccess* | Certain =4<br>High =3<br>Med =2<br>Low =1 |

access more information about tested attempts, which can aid them in aligning their mental expectations with realities. Entrepreneurs with a more thorough examination of the failure cases were coded with a higher number; specifically, the careful study was coded as 3, exploring few noteworthy cases was coded as 2, and no need was coded as 1.

The variable *TransMind* was converted from *X19.msponge* in the original dataset to measure entrepreneurs' willingness/readiness to transform their thinking, actions, and beliefs (or set of trusted values in their minds). When the willingness/readiness is high, new and strange information will be evaluated less rigorously and more likely to be accepted into the mindset. As this willingness/readiness is difficult to measure objectively, we employed the self-evaluation method. The higher the willingness/readiness of the entrepreneur, the higher the value was coded, ranging from 1 to 4.

The success likelihood of entrepreneurs' businesses is difficult to measure objectively due to the significant variance among their businesses and contexts. Thus, self-evaluation of success was employed to measure the likelihood of success. Each entrepreneur has their own expectations of success (e.g., revenue, reputation, social improvement, etc.), so the more perceived realities fit their expectations, the more likely they will think the business will succeed. The variable *EvaluatedSuccess* was measured with four levels: certain, high (>80%), medium (50-80%), and low (<50%). These levels correspond to 4, 3, 2, and 1, respectively. This measurement aligns with the need for entrepreneurs to have a well-fitted mental model that aligns with the realities of their business context, analogous to the concept of life satisfaction as employed in related social science literature [77].

*2.2.2. Statistical models*

In this study, we assumed that working experience and the pattern of learning from others' failures might have positive impacts on a business's success chance (Hypotheses 1 and 2), and these effects are conditional on the entrepreneurs' willingness/readiness to change (Hypotheses 3 and 4). We constructed four multiple linear regression models to test our assumptions, starting with the simplest. Specifically, Model 1 was constructed to examine Hypotheses 1 and 3:

$$EvaluatedSuccess \sim normal(\mu,\sigma) \quad (1.1)$$

$$\mu_i = \beta_0 + \beta_{InternalInfor} * InternalInfor_i + \beta_{InternalInfor*TransMind} * InternalInfor_i * TransMind_i \quad (1.2)$$

$$\beta \sim normal(M,S) \quad (1.3)$$

The probability around $\mu$ is determined by the form of the normal distribution, whose width is specified by the standard deviation $\sigma$ $\mu_i$ indicates the evaluated success of entrepreneur *i's* business; $InternalInfor_i$ indicates whether entrepreneur *i* had any business-related experience; $\beta_{InternalInfor*TransMind}$ indicates the coefficient of the non-additive effect of $InternalInfor_i$ and $TransMind_i$ on *EvaluatedSuccess*. If the coefficient $\beta_{InternalInfor*TransMind}$)'s distribution is significant, and the association between business-related experience and success likelihood is considered conditional on the willingness/readiness to transform. Model 1 has four parameters: the coefficients $\beta_{InternalInfor}$ and $\beta_{InternalInfor*TransMind}$, the intercept, $\beta_0$, and the standard deviation of the "noise", σ. The coefficients of the variable $InternalInfor_i$ and interaction variable between $InternalInfor_i$ and $TransMind_i$ are distributed as a normal distribution around the mean, denoted as *M*, and with the standard deviation denoted as *S*.

Similarly, to test Hypotheses 2 and 4, we constructed Model 2:

$$EvaluatedSuccess \sim normal(\mu,\sigma) \quad (2.1)$$

$$\mu_i = \beta_0 + \beta_{ExternalInfor} * ExternalInfor_i + \beta_{ExternalInfor*TransMind} * ExternalInfor_i * TransMind_i \quad (2.2)$$

$$\beta \sim normal(M,S) \quad (2.3)$$

$ExternalInfor_i$ indicates entrepreneur *i*'s pattern of learning from others' failures; $\beta_{ExternalInfor*TransMind}$ indicates the coefficient of the non-additive effect of $ExternalInfor_i$ and $TransMind_i$ on *EvaluatedSuccess*. If the distribution of $\beta_{ExternalInfor*TransMind}$ is significant, the association between the learning pattern and success likelihood is considered conditional on the willingness/readiness to transform.

To test whether Hypotheses 1-4 are robust when other factors appear in the model, we combined Models 1 and 2 and added variable $\beta_{TransMind}$ into the model. As a result, Model 3 is as follows:

$$EvaluatedSuccess \sim normal(\mu,\sigma) \quad (3.1)$$

$$\mu_i = \beta_0 + \beta_{InternalInfor} * InternalInfor_i + \beta_{InternalInfor * TransMind} * InternalInfor_i * TransMind_i + \beta_{ExternalInfor} * ExternalInfori + \beta_{ExternalInfor * TransMind} * ExternalInfor_i * TransMind_i + \beta_{TransMind} * TransMind_i \quad (3.2)$$

$$\beta \sim normal(M,S) \quad (3.3)$$

The logical model of Model 3 is plotted in Fig. 1.

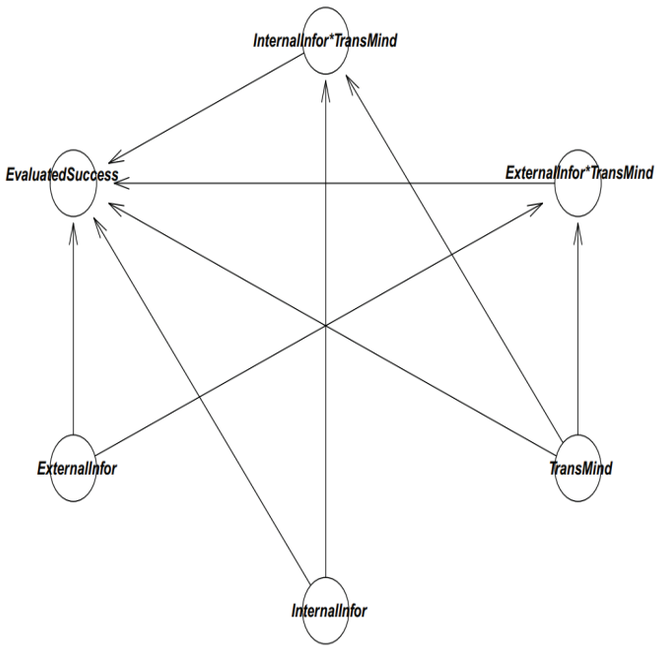


**Fig. 1. Logical network of Model 1.** Source: Authors.

### *2.3. Analysis and validation*

This study employed BMF analytics, an analytical approach that combines the Mindsponge theory's ability to explain psychological complexity in the human mind and the statistical advantages of Bayesian as an analytical framework [62, 78]. There are several advantages to employing BMF analytics. First, the Mindsponge theory and Bayesian inference have many compatible properties with each other, of which some can be utilised in the current study: (i) they are built on subjectivity; (ii) they offer great flexibility in model construction and fitting; and (iii) they obtain the updating features. Second, Bayesian analysis probabilistically examines all attributes (including unknown parameters and uncertainties) [79, 80], so it helps researchers avoid concerning control factors and focus solely on the theoretically chosen variables, ensuring the parsimony principle (also known as Occam's razor). Moreover, the Hamiltonian Monte Carlo algorithm-supported Bayesian inference does not rely on the asymptotic assumption [59, 60], providing a more accurate estimation using the data at hand.

All Bayesian linear regression problems were evaluated using the bayesvl R package [81], chosen for its user-friendly and intuitive procedure, capacity to display stunning graphics, and affordability [82]. Four Markov chains, each having 5000 iterations, were used to fit the model. As a warm-up phase, the first 2000 iterations were installed. Since this is an exploratory study, the models were built using uninformative priors defining a flat prior distribution to offer as little prior information as possible to the model estimate. While the prior information is still there, it is so little as to be insignificant [83].

Following the simulation, the Pareto smoothed importance-sampling leave-one-out cross-validation (PSIS-LOO) method was used to verify the model's goodness of fit with the available data [84, 85]. LOO is computed using the following formula.

$$LOO = -2LPPD_{loo} = -2\sum_{i=1}^{n} \log \int p(y_i|\theta) p_{post(-i)}(\theta) d\theta$$

$p_{post(-i)}(\theta)$ is the posterior distribution based on the data minus data point *i*. When employing the PSIS method in R, *k*-Pareto values are used to compute leave-one-out cross-validation, which helps identify observations with a problematic influence on the PSIS estimate. If the *k* values are less than 0.5, the model has a sufficient degree of goodness-of-fit.

By analysing the effective sample size (*n_eff*) and Gelman-Rubin shrink factor (*Rhat*), the Markov property or the convergence of the Markov chains was evaluated to determine whether the estimated results are qualified for interpretation. After the stochastic simulation, the n_eff value reflects the number of non-autocorrelated iterative samples. The effective samples are deemed adequate for credible inference if the *n_eff* values are more than 1000. Another measure of convergence is the *Rhat* value (Gelman-Rubin shrink factor). If the *Rhat* values are more than 1.1, the chains may fail to converge. *Rhat* values equalling one indicate convergence. The convergence may additionally be diagnosed visually using the trace, Gelman-Rubin-Brooks, and autocorrelation plots. All the code and data employed for the current study were deposited in the following link to reduce the cost of reproduction [86].

## 3. Results

### *3.1. Model comparison*

We measured the weight of model predictions using Pseudo-BMA without Bayesian bootstrap, Pseudo-BMA with Bayesian bootstrap, and Bayesian stacking. Model 3 appears to be the most predictive model as it outweighs other models in most categories (i.e., Pseudo-BMA with Bayesian bootstrap and Bayesian stacking). Thus, Model 3 is chosen for result presentation and interpretation (Table 2).

**Table 2. Model weights comparison and model ranking.**

| Model | Pseudo-BMA without Bayesian bootstrap | Pseudo-BMA with Bayesian bootstrap | Bayesian stacking |
|---|---|---|---|
| Model 1 | 0.0000 | 0.3760 | 0.0532 |
| Model 2 | 0.5021 | 0.4948 | 0.4642 |
| Model 3 | 0.4979 | 0.5032 | 0.4826 |
| Most predictive model | Model 2 | Model 3 | Model 3 |

Source: Authors.

The PSIS-LOO approach was then employed to check the model's goodness of fit with the data. Fig. 2 illustrates that all Model 3's Pareto *k* indicators are below the threshold of 0.5, suggesting a good fit with the data.

### *3.2. Convergence diagnostics*

Based on convergence indicators, all models' posteriors are deemed well-convergent. Specifically, all *Rhat* values equal 1, and the effective sample size (*n_eff*) passes the standard threshold of 1000 (Table 3).

**Table 3. Results of Model 3.**

| Parameters | Mean | SD | n_eff | Rhat |
|---|---|---|---|---|
| Constant | 2.39 | 0.28 | 3521 | 1 |
| *TransMind* | -0.16 | 0.08 | 3527 | 1 |
| *ExternalInfor* | -0.14 | 0.13 | 3406 | 1 |
| *ExternalInfor*TransMind* | 0.10 | 0.04 | 3382 | 1 |
| *InternalInfor* | 0.14 | 0.16 | 4869 | 1 |
| *InternalInfor*TransMind* | -0.03 | 0.05 | 4847 | 1 |

Source: Authors.

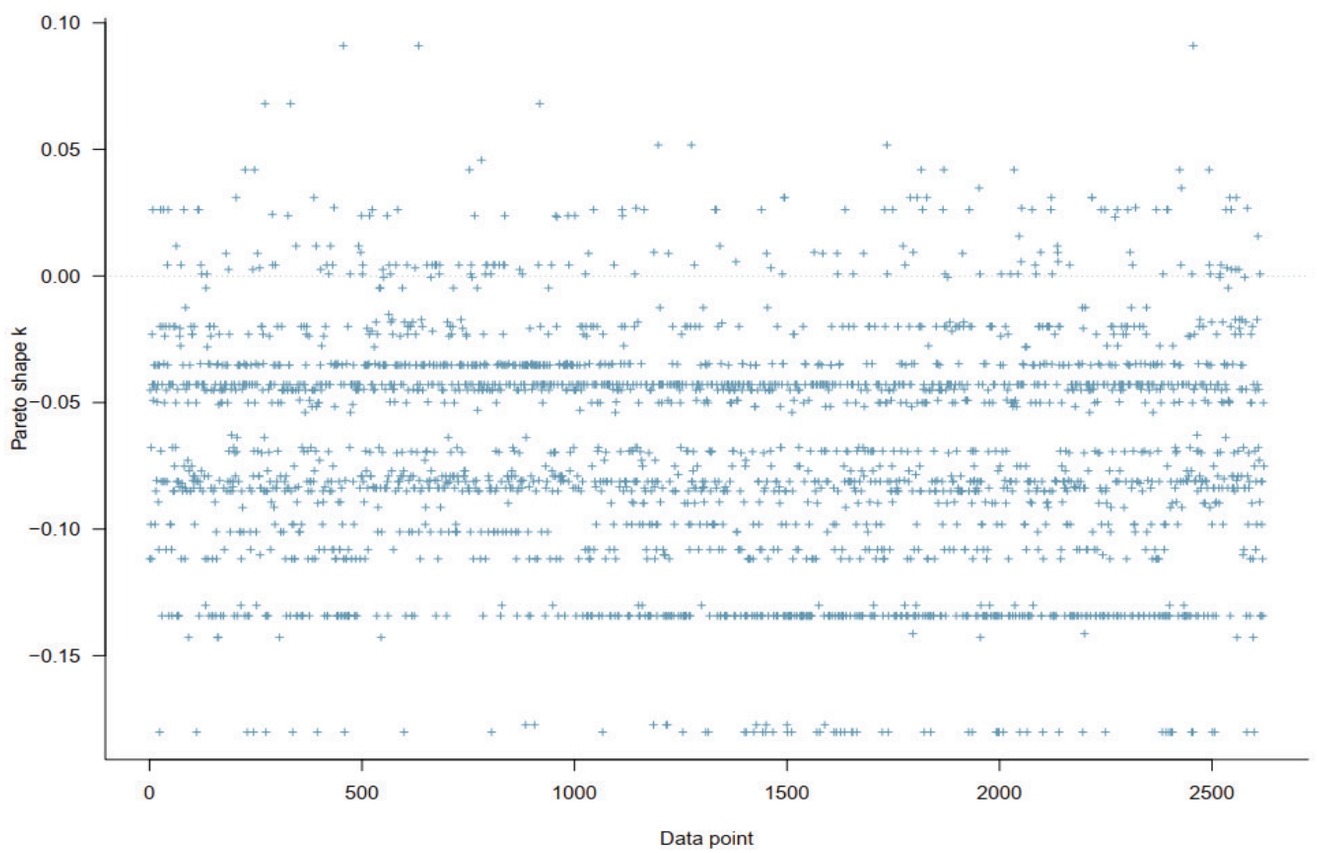


**Fig. 2. Model 3's PSIS-LOO diagnosis plots.** Source: Authors.

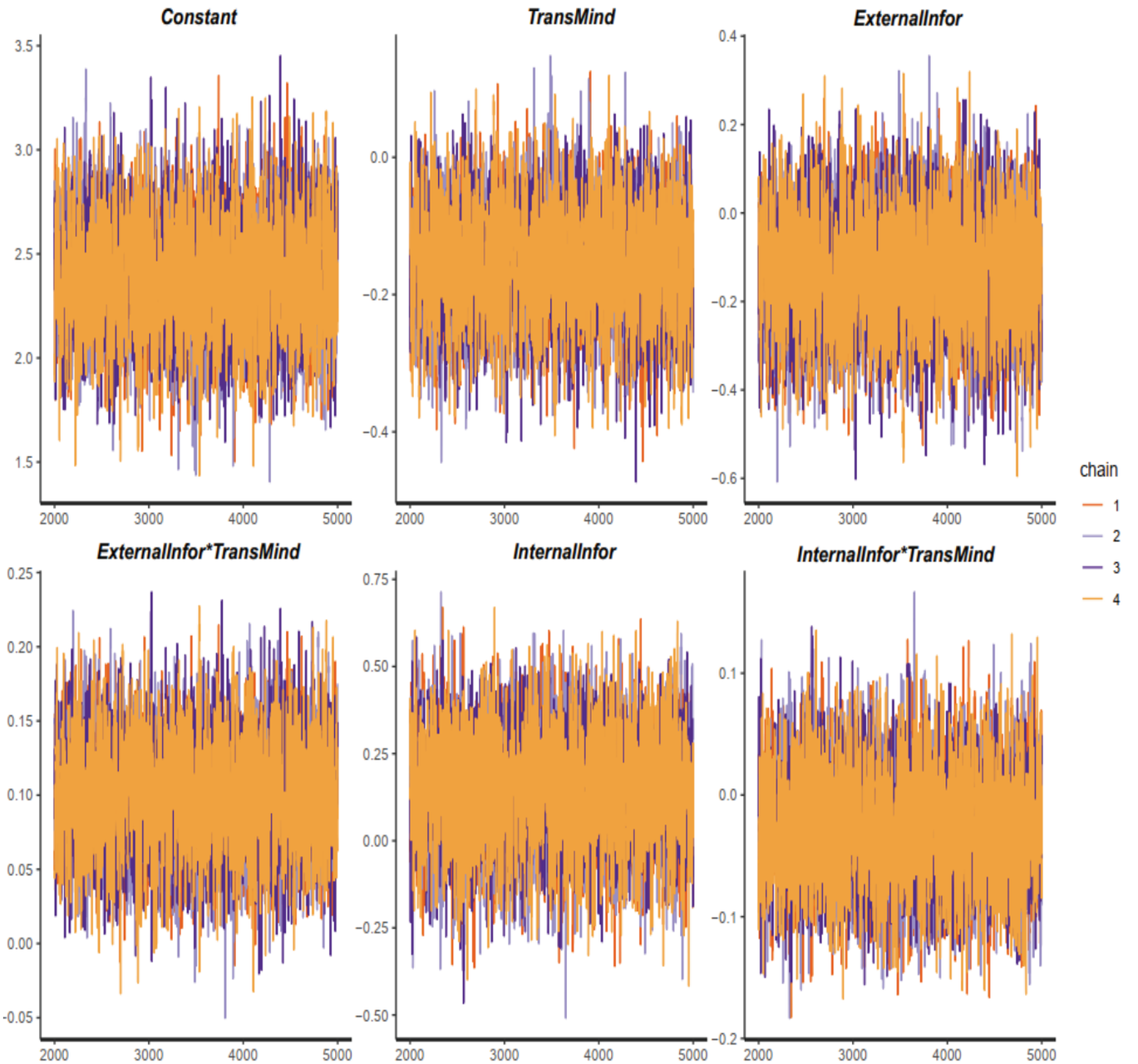


**Fig. 3. Model 4's trace plots.** Source: Authors.

The convergence diagnosis plots also validate Model 3's Markov chains convergence. Fig. 3 shows a stable variation of the Markov chains of Model 3 around a central equilibrium, which is a sign of convergence. The Gelman-Rubin-Brooks plots also validate the convergence as shrink factors decrease to one before the warm-up periods end (Fig. 4).

Figure 5 presents the autocorrelation plots, further validating the Markov chain convergence. The autocorrelation levels drop to zero after several lags, implying that iterative samples in the stochastic simulation process are memoryless.

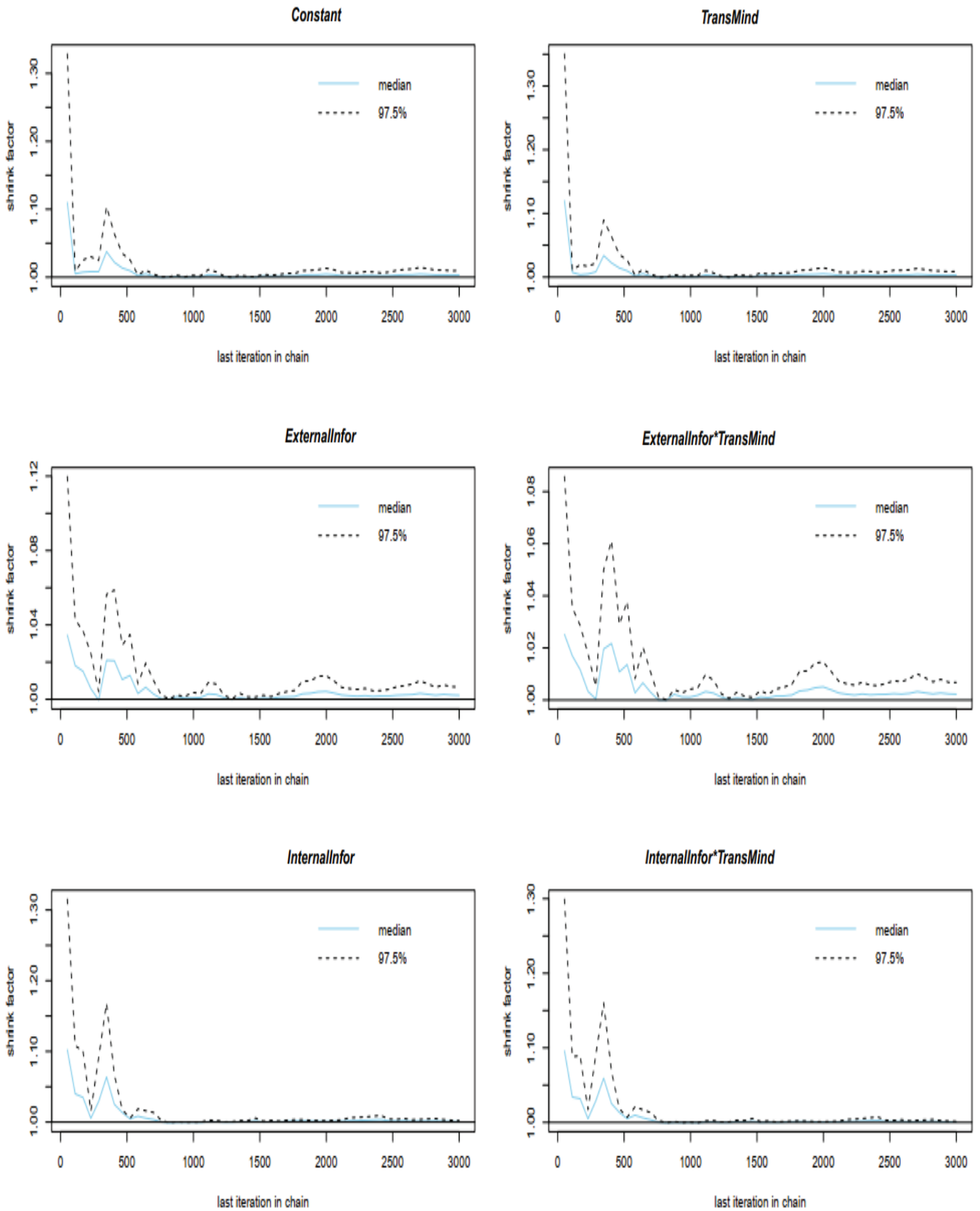


**Fig. 4. Model 4's Gelman-Rubin-Brooks plots.** Source: Authors.

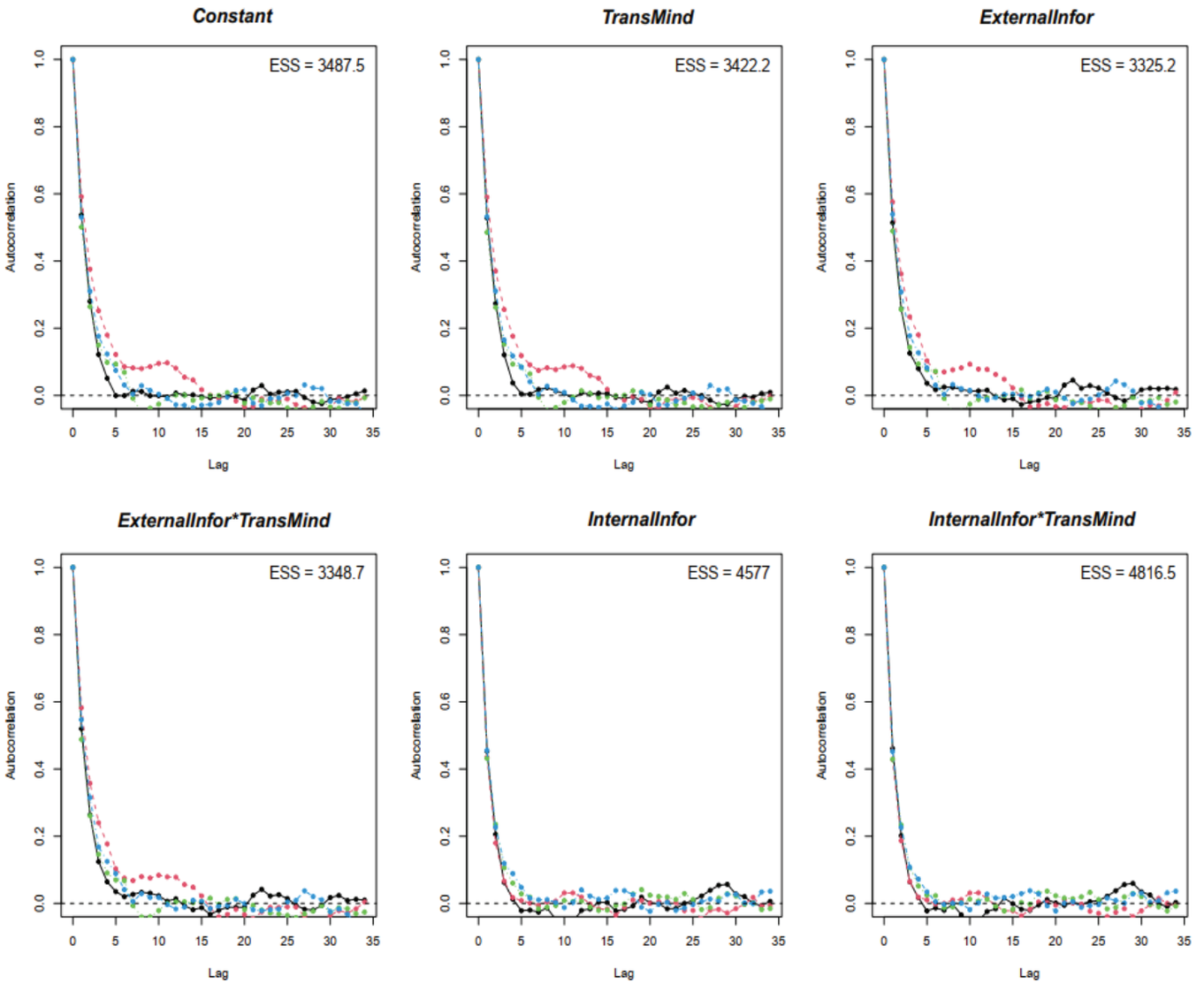


**Fig. 5. Model 4's autocorrelation plots.** Source: Authors.

### *3.3. Result interpretation*

The posterior distributions of Model 3's coefficients are presented in Table 3 and visualised in Fig. 6.

Figure 6 presents the simulated posteriors of Model 3 on an interval plot. The thick blue lines display the probability density within the 89% Highest Posterior Density Intervals (HPDI), while the thin blue lines represent the probability distributed outside of the highest credible zone, and the dot indicates the mean value, which is considered the highest probability parameter. It is noted from Fig. 6 that *TransMind* and *ExternalInfor* have negative effects on the success of entrepreneurship ($M_{TransMind}$=-0.16 and $S_{TransMind}$=0.08; $M_{ExternalInfor}$=-0.14 and $S_{ExternalInfor}$=0.13). However, the interaction between *TransMind* and *ExternalInfor* has a positive influence on EvaluatedSuccess ($M_{ExternalInfor*TransMind}$=0.10 and $S_{ExternalInfor*TransMind}$=0.04). The effects of *TransMind* and *ExternalInfor*TransMind* are highly reliable because their HPDIs are located entirely on the side of the x-axis, while the effect of *ExternalInfor* is moderately reliable as a portion of its HPDI is still located on the positive side of the

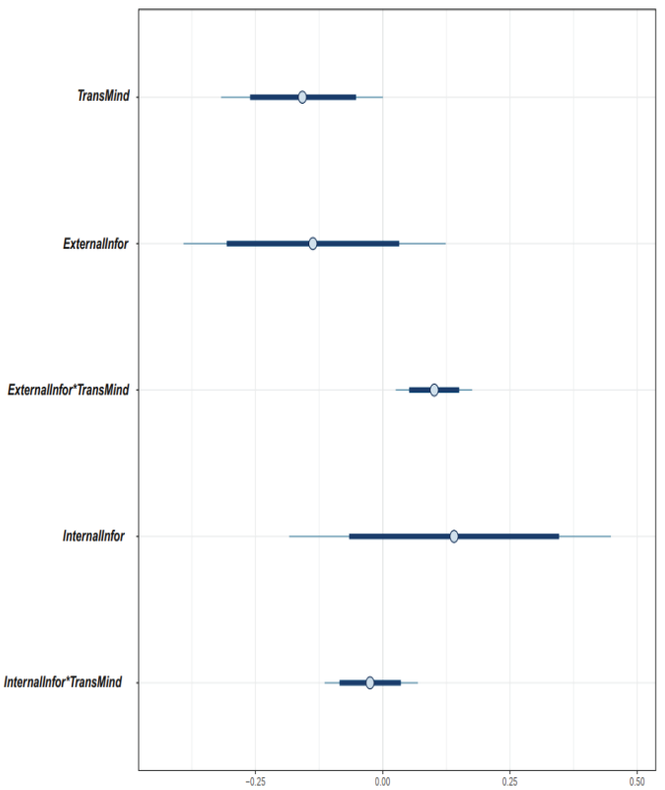


**Fig. 6. Model 3's posterior distributions.** Source: Authors.

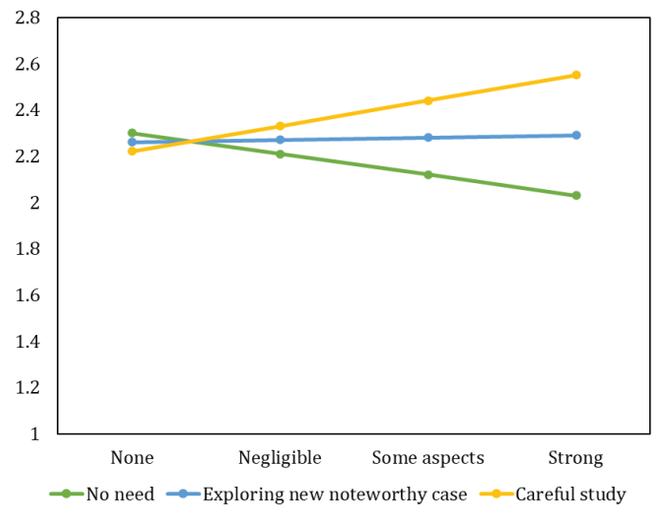


**Fig. 7. Business-experienced entrepreneurs' likelihood of success according to their willingness/readiness to transform and patterns of learning from others' failures.** Source: Authors.

x-axis. The *InternalInfor* also has a positive impact on the success ($M_{InternalInfor}$=0.14 and $S_{InternalInfor}$=0.16), but the effect is moderately reliable as there is still a portion of the distribution lying on the negative side of the x-axis. Meanwhile, the effect of *InternalInfor*TransMind* is negligible ($M_{InternalInfor*TransMind}$=-0.03 and $S_{InternalInfor*TransMind}$= 0.05).

To provide more detailed insights into our findings, we utilised Equation 3.2 along with the parameters' mean values obtained from Table 3 to calculate entrepreneurs' success probability. Fig. 7 visually represents this calculation, illustrating the relationship between the likelihood of success, the level of business experience among entrepreneurs, and their disposition towards transformative thinking and learning from others' failures. Notably, our analysis demonstrates that an entrepreneur's willingness and readiness to embrace transformative strategies significantly enhances their chances of success, but this effect is contingent on their approach to learning from others' failures. Entrepreneurs who conscientiously study others' failures experience a notable increase in their likelihood of success when they are open to transformation. However, a contrasting trend emerges among entrepreneurs who perceive learning from failures as unnecessary; in this case, a heightened willingness to transform is associated with a decline in their likelihood of success. This nuanced relationship underscores the importance of a strategic approach to both transformative thinking and failure learning, offering valuable insights for entrepreneurs seeking to optimise their success potential.

## 4. Discussion

The current study employed BMF analytics on a dataset of 3,071 Vietnamese entrepreneurs' perceptions to investigate how entrepreneurs' business-related experience and learning from others' failures affect the likelihood of business success and whether their willingness/readiness to adopt novel ways of thinking, acting, or beliefs moderates these effects.

We found that entrepreneurs with business-related experience are more likely to achieve higher success than those without experience. This result finds robust support in the mindsponge perspective. Business-experienced entrepreneurs possess a broader and more refined knowledge base related to the intricacies of conducting business. This knowledge base equips them with a well-calibrated set of expectations aligning with market dynamics, consequently elevating their decision-making and problem-solving capabilities. This pool of knowledge is accumulated through diverse channels such as experiential learning, direct observation, and formal training, all contributing to honing their decision-making and problem-solving acumen [87]. With this comprehensive pool of knowledge, entrepreneurs make decisions that seem to have the best chance of success and avoid actions that appear to be failures [88]. This adaptive decision-making process underscores the inherent value of hands-on experience and informed learning, emphasising the pivotal role of practical wisdom in navigating the complexities of entrepreneurship.

As a result, some information becomes trusted values that are crucial components of the information-processing system and influence the subsequent thinking process. This explanation is consistent with the dynamic model of entrepreneurial learning proposed by M. Minniti, et al. (2001) [89]. Trusted values will later affect information absorption by expediting the filtering process (or giving a "priority pass" to information analogous to the trusted values in the mindset), whereas distrusted information is discarded quickly without thorough examination. This mechanism is analogous to the term *heuristics* (or cognitive shortcuts) in entrepreneurial decisions [90]. Although the trust mechanism (or heuristics) will lead to both positive and negative outcomes [91], decisions induced by the trust mechanism (or heuristics) of experienced entrepreneurs are reasonably more effective than those of non-experienced ones. Besides better decisions, a larger knowledge pool also lays a better foundation for serendipity strikes, leading to innovation [92, 93].

Our findings also suggest that the willingness/readiness to transform thinking, acting, and beliefs is beneficial for business success only for entrepreneurs carefully learning others' failures. For entrepreneurs who perceive learning from others' failures as unnecessary, the willingness/readiness to transform even reduces their likelihood of success. Through the lens of mindsponge theory, the willingness/readiness to transform helps reduce the perceived cost of absorbing and filtering new information, making the mindset more likely to be updated. However, not all information is beneficial or accurate. Absorbing inaccurate information can create cognitive traps that deviate the mind from realities and influence it to adopt poor adaptive decisions to the changing environment, leading to a higher probability of failures [72, 94, 95]. Therefore, entrepreneurs should adopt willingness/readiness to transform together with in-depth learning from a good source of information (e.g., failure lessons) to update their minds to better fit with the realities.

Our theoretical contributions emphasise the multifaceted nature of entrepreneurial success, encompassing experiential learning, the transformation of cognitive processes, and the discerning acquisition of knowledge. This provides a mindsponge-based theoretical framework in the entrepreneurial success context, which can be used for future research to explore the intricate dynamics of entrepreneurial decision-making in diverse cultural and economic contexts.

Based on these findings, we suggest entrepreneurs build up their knowledge pool through experience, learning, and being open-minded. A sufficient pool of knowledge will support entrepreneurs in making better decisions and can create mental conditions for them to navigate the business, respond to market dynamics, and even innovate. Our recommendations are even more crucial in the context of Vietnam, where entrepreneurs prefer imitation to innovation and are usually based on personal intuition and pure luck, with no logical planning for initial settings [96]. However, knowledge learning should also be selective (i.e., learning from others' failures). Knowledge is power, but inaccurate knowledge is poison.

The implications of this research are manifold. They offer practical guidance and actionable insights to foster a dynamic, innovative, and resilient entrepreneurial ecosystem in Vietnam and potentially inspire similar advancements in other developing countries with analogous contexts:

• Entrepreneurs stand to benefit by understanding the critical interplay between knowledge accumulation, learning from failures, and transformative thinking, which can inform their strategic decisions and increase the likelihood of business success.

• Policymakers can leverage these insights to craft targeted policies and support systems, emphasising entrepreneurial education, mentorship, and networking initiatives that nurture a conducive environment for innovation and sustainable business growth.

• Educational institutions have an opportunity to enhance entrepreneurship curricula by incorporating the cognitive dimensions highlighted in this study, preparing future entrepreneurs to navigate challenges and make well-informed decisions.

• Investors and funding agencies can utilise these findings to guide their investment decisions, recognising entrepreneurs who emphasise knowledge acquisition and transformative thinking as potentially lower-risk, higher-reward ventures.

• For researchers, this study opens avenues for further exploration, encouraging in-depth investigations into specific industry contexts, regional variations, and entrepreneurial stages using an information-processing perspective.

Moreover, the research contributes to the global understanding of entrepreneurship by offering valuable insights from a non-Western culture.

The current study is not without limitations [97]. Thus, we present them here for transparency. First, the study employs the self-reported likelihood of success to proxy their success, so the evaluation might be influenced by some other mental characteristics of entrepreneurs, leading to cognitive biases. Future studies should validate the results using objective measurements of success. Each sector (e.g., technology, food and beverage, etc.) and business structure (e.g., family business, etc.) will have different characteristics, so entrepreneurs also need to possess a suitable mindset to operate successfully. However, the present study did not focus on these points, so they can be potential topics for further research.

## 5. Conclusions

Identifying factors contributing to entrepreneurial success plays a pivotal role in shaping policies, educational programs, and support systems tailored to the specific needs of Vietnamese entrepreneurs. This, in turn, fosters a vibrant and innovative entrepreneurial ecosystem in the country. Our study reveals that entrepreneurs with prior business-related experience are more likely to achieve higher levels of success compared to those without such experience. Furthermore, we found that the willingness to transform one's mindset, actions, and beliefs based on a careful examination of others' failures is beneficial for success. However, not all information is valuable-absorbing inaccurate or misleading information can create cognitive traps, distorting reality and leading to poor decision-making in an evolving business environment, thus increasing the likelihood of failure. Therefore, entrepreneurs must not only be open to change but also engage in thoughtful, informed learning, particularly from reliable sources, such as lessons from other failures. This is especially critical in Vietnam, where entrepreneurship often relies on imitation, intuition, and luck, with little logical planning during the initial stages.

## CRediT author statement

Minh-Hoang Nguyen: Conceptualisation, Methodology, Formal analysis, Investigation, Writing - Original draft preparation, Reviewing, Editing, Validation; Quang-Loc Nguyen: Conceptualisation, Methodology; Phuong-Loan Nguyen: Methodology, Writing - Original draft preparation; Tam-Tri Le: Conceptualisation, Writing - Original draft preparation; Xuan-Tuan Phi: Writing - Original draft preparation; Cong Thuong Phi: Writing - Reviewing and Editing; Quan-Hoang Vuong: Conceptualisation, Methodology, Writing - Reviewing and Editing, Validation, Resources, Supervision.

## COMPETING INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this article.

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