The Influence of Metacognitive Strategies and Resource Management on Japanese Language Learning: A PLS-SEM Analysis

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ABSTRACT

The level of regulation for learners' cognitive strategies and learning behaviours is frequently influenced by how effective their language learning is, namely, the foreign language. Thus, this research examines the effect of metacognitive strategies, as well as resource management, on Japanese language learning utilizing Partial Least Squares Structural Equation Modelling (PLS-SEM). This research uses a hierarchical component model (Type II) with a reflective-reflective construct to identify the association between metacognitive self-regulation, resource management, and cognitive learning strategies. The data were collected using a survey adapted from Wenden and Rubin (1987). The survey consists of 41 items and is measured on a 5-point Likert scale. The respondents were from a public university in Malaysia, with a distribution of 51% male and 49% female. The findings were analysed using SmartPLS 4 by adopting the measurement procedure and structural model. These findings reveal that metacognitive self-regulation and resource management play a vital role in encouraging cognitive strategies (organization, elaboration, and critical thinking). Japanese language learners can achieve better academic performance by planning, monitoring, and gauging their learning, while also handling their time effectively, putting in effort, and managing their materials. This research finds that these strategies together improve motivation, competence, and increase participation in linguistic acquisition. A comprehensive framework for learner behaviour can be theoretically understood by integrating Piaget's cognitive theory and Zimmerman's self-directed learning model. Meanwhile, this research recommends that educators design reflective tasks as well as structured resource management in the curriculum to encourage autonomy among learners. It is also recommended that future studies explore the effects of longitudinal and technology-enabled classrooms to obtain more holistic insights into strategic learning behaviour.

Keywords: Metacognitive Strategies, Resource Management, Language Learning, Self-Regulated Learning, PLS-SEM

INTRODUCTION

Background of Study

In the field of language learning, success is not determined by hard work. It often depends on how well learners manage their own thinking and are aided by the resources available to them. Metacognitive strategies are critical for successful language acquisition. The idea that learners manage and control their own thinking and learning comes from Flavell (1979). He explained that metacognition means being aware of and guiding one's own thoughts. Metacognition has two parts: (i) Metacognitive knowledge (knowing about your own thinking and learning), and (ii) Metacognitive control (planning, organizing, and directing your thinking to reach a goal). Learners use metacognitive strategies when these two parts are combined. These strategies include planning the study paths, checking one's own progress, and evaluating results. According to Zhang & Seepho (2013), it helps learners to stay focused, organized, and adjust when needed. Karbalaei (2011) stated that learners who use

metacognitive strategies are more successful because they can reflect on what works, recognize mistakes, and improve. These strategies help learners set goals, do self-observations, and regulate their study habits. Damanik (2019) stressed that metacognitive strategies make learners more independent, confident, and capable of lifelong learning.

In addition to metacognitive strategies, managing resources (the use of time, energy, and learning materials) can ensure the learning progress is sustainable and productive to support effective learning. Time management refers to the ability to organize and value time for learners to effectively balance their academic and personal tasks. Time management is a skill that helps learners stay engaged in their studies. Effective time management reflects the tendency to plan and manage time, which can result in better focus and motivation in learning.

Schwartz (2007) popularized the concept of energy management in learning and work. Schwartz (2007) suggests that people should focus on managing their personal energy (physical, emotional, and mental) because energy drives productivity and balance. Learning materials are a key component of resource management. It refers to the texts, instructional tools, and structured programs that learners use to support their study processes. These materials provide the scaffolding that enables strategies to be applied more successfully, enabling students to become active and strategic learners when managed effectively (Chamot, 2005). If these materials are designed with metacognitive awareness, learning materials function as scaffolds that support self-regulated learning, enabling students to apply strategies such as planning, monitoring, and evaluating more effectively (Conley, 2014)

As metacognitive strategies and resource management are essential for successful language acquisition, this study highlights both the internal regulation of cognition and the external organization of resources to offer a more holistic understanding of how learners achieve mastery in language learning. Despite extensive research on language learning strategies, there is still a large information gap, as many studies have investigated metacognitive strategies or resource management separately. Only a few have explored how these constructs interact to shape learning outcomes.

To address this gap, the study employs Partial Least Squares Structural Equation Modelling (PLS-SEM) in order to explain the complicated relationships between latent constructs. PLS-SEM allows researchers to test both direct and indirect effects to offer deeper insights into how metacognitive strategies and resource management jointly affect language learning outcomes. This study shows the structural relationships between these factors and contributes to a more comprehensive understanding of how learners can optimize their language learning journey, as stated by Hair & Alamer (2022).

Statement of Problem

The Japanese complex writing system, sociocultural differences, and high cognitive requirements have created a challenging learning environment for Japanese language students. To be able to have a meaningful learning experience, students need to manage their learning resources effectively. Ruiz & Smala (2020) argued that self-directed learning, as well as resource management strategies (time management, effort regulation, and use of learning aids), are crucial for metacognitive strategies (self-monitoring, planning, and evaluation), on top of aiding in maintaining motivation and efficiency (Ahmad et al., 2024).

Despite their influence on language learning, recent studies frequently view them as separate issues. One example is from Heather (2022), who examined the Reading Strategies Metacognitive Awareness Inventory for the Japanese language by using PLS-SEM and focused on the significance of metacognitive awareness. However, Heather (2022) did not look into resource management as one of the factors. On the other hand, Lensun et al. (2025) examined self-regulated learning among Japanese language learners by developing metacognitive awareness through mnemonic strategy training. Similar to Heather (2022), Lensun et al. (2025) also did not investigate resource management as part of their study.

Based on the discussed research, it is safe to view that there is insufficient literature regarding metacognitive strategies and resource management in relation to Japanese language learning. Thus, this research aims to fill the

gap by utilizing Partial Least Squares Structural Equation Modelling (PLS-SEM), resulting in a better design of classroom intervention and stronger support for learners who are facing difficulties.

Objective of the Study and Research Questions

The research questions will be answered by smart PLS analysis using both measurement and structural models.

Table 1- Research Objectives, Research Questions, and Research Hypothesis

Research Objectives	Research Questions	Research Hypothesis
To investigate if there is a significant relationship between Metacognitive and Organization Strategies	Is there a significant relationship between Metacognitive and Organization Strategies?	Ho1: There is no significant relationship between Metacognitive and Organization Strategies
To investigate if there is a significant relationship between Metacognitive and Elaboration Strategies	Is there a significant relationship between Metacognitive and Elaboration Strategies?	Ho2: There is no significant relationship between Metacognitive and Elaboration Strategies
To investigate if there is a significant relationship between Metacognitive Strategies and Critical Thinking	Is there a significant relationship between Metacognitive Strategies and Critical Thinking?	Ho3: There is no significant relationship between Metacognitive Strategies and Critical Thinking
To investigate if there is a significant relationship between Resource Management and Organization Strategies	Is there a significant relationship between Resource Management and Organization Strategies?	Ho4: There is no significant relationship between Resource Management and Organization Strategies
To investigate if there is a significant relationship between Resource Management and Elaboration Strategies	Is there a significant relationship between Resource Management and Elaboration Strategies?	Ho5: There is no significant relationship between Resource Management and Elaboration Strategies
To investigate if there is a significant relationship between Resource Management and Critical Thinking	Is there a significant relationship between Resource Management and Rehearsal Strategies?	Ho6: There is no significant relationship between Resource Management and Rehearsal Strategies
To investigate if there is a significant effect of Metacognitive and Organization Strategies	Is there a significant effect between Metacognitive and Organization Strategies?	Ho7: There is no significant difference between Metacognitive and Organization Strategies
To investigate if there is a significant effect of Metacognitive and Elaboration Strategies	Is there a significant effect between Metacognitive and Elaboration Strategies?	Ho8: There is no significant difference between Metacognitive and Elaboration Strategies
To investigate if there is a significant effect of Metacognitive Strategies and Critical Thinking	Is there a significant effect between Metacognitive Strategies and Critical Thinking?	Ho9: There is no significant difference between Metacognitive Strategies and Critical Thinking
To investigate if there is a significant effect of Resource Management and Organization Strategies	Is there a significant effect of Resource Management and Organization Strategies?	Ho10: There is no significant difference between Resource Management and Organization Strategies
To investigate if there is a significant effect of Resource Management and Elaboration Strategies	Is there a significant effect of Resource Management and Elaboration Strategies?	Ho11: There is no significant difference between Resource Management and Elaboration Strategies
To investigate if there is a significant effect of Resource Management and Critical Thinking	Is there a significant effect between Resource Management and Critical Thinking?	Ho12: There is no significant difference between Resource Management and Critical Thinking

Table 1 presents the alignment between the research objectives, research questions, and hypotheses. It provides a clear overview of the research framework and of how this study was designed to examine the relationships between various learning strategies. In particular, this study focused on determining whether metacognitive strategies, organization, elaboration, training, and resource management are associated with critical thinking.

These objectives guided the development of the research questions, which were then translated into testable hypotheses. The null hypothesis assumes that no significant relationship or difference exists between the variables. It serves as the basis for statistical analysis. Overall, the table shows a logical progression from the research objectives to the research questions and hypotheses. It ensures that this study is structured systematically and aligned with its intended purpose.

LITERATURE REVIEW

Theoretical Framework of the Study

Cognitive Theory and Language Learning

Schemas are cognitive structures that learners develop. It assists them in interpreting and organizing new knowledge through assimilation and accommodation (Piaget, 1964). Assimilation is the process by which the latest information is incorporated into existing schemas. Accommodation is where schemas are altered to integrate new experiences. Through these two processes, learners gradually grow into more intricate ways of thinking as they go through each stage of cognitive development. Based on these concepts, Piaget (1964) proposed a cognitive framework that discussed how individuals form knowledge by interacting with their environment, as learning is viewed as an active mental process.

From the perspective of language learning, Piaget (1964) highlighted that learners actively digest and reorganize linguistic knowledge, instead of depending on linguistic knowledge. Cognitive learning strategies are connected closely to this perspective. Cognitive learning strategies include organization, elaboration, as well as critical thinking. Piaget (1964) explained that organization involved the act of constructing linguistic knowledge (such as vocabulary, grammatical rules, and discourse patterns) into meaningful categories, thus allowing learners to adjust and retrieve information more successfully. Next, learners will be able to associate the new language knowledge with the current knowledge, thus improving comprehension and focus. This is called elaboration, and in language learning, it involves giving examples, paraphrasing, or applying a new word to understood contexts. Finally, learners are able to play an active role in building knowledge and adjusting their cognitive structures to new linguistic experiences. This stage is called critical thinking, where, in language learning, learners can understand meaning, recognize the connection between ideas, and utilize language knowledge in various communication contexts. These discussed factors could lead language learners to the advancement of cognitive abilities. In addition, the application of organization, elaboration, and critical thinking helps language learners to develop a profound and more meaningful engagement with language knowledge.

Self-Regulated Learning Strategies and Resource Management in Learning

Through a cyclical process consist of forward thinking, performance control, and self-reflection, an effective learner can regulate cognition, motivation, and behaviour, and not receive knowledge passively (Zimmerman, 2002). In the beginning, learners will go through the forward-thinking phase where they set goals and plan strategies for learning tasks. After that, they go through the performance phase as they observe their development and utilize strategies to sustain their concentration. Finally, learners will reach the reflection phase, where they reflect on their performance and change their strategies for future learning. These stages are what Zimmerman (2002) proposed to be the Self-Regulated Learning Theory (SRL). Zimmerman (2002) concluded that learning is an active, self-directed process where students strategize, observe, and gauge their own learning behaviour to accomplish academic goals.

For language learning, as understanding a new language entails continuous practice, strategic learning, as well as continuous monitoring of progress, self-regulated learning becomes crucially important. One vital aspect found in metacognitive self-regulation is students' ability to plan their language task approach, observe their understanding when reading or listening, as well as assess their strategies' effectiveness used when learning vocabulary, grammar, or pronunciation. The other vital aspect is the way students handle their time, effort, learning environment, and available support to aid their language learning. This action is called resource management, and successful students frequently assign adequate time for practicing, asking for assistance from instructors or peers, utilizing learning materials such as dictionaries or digital tools, and forming a conducive

environment where they are able to focus and practice. Students who are effectively able to regulate their metacognitive processes and organize their learning resources tend to improve their autonomy, persistence, and strategic competence in language learning, resulting in more active and successful language learning.

Past Studies

Past Studies on the Motivation and Burnout

In foreign language learning, motivation is seen as a significant factor as it can affect learners' participation, persistence, and academic performance. Previous research had investigated Japanese language learning in relation to learners' learning experiences as well as motivation that was shaped by factors like personal goals, interest in Japanese culture, and learning experiences.

In a study on motivation to learn Japanese, Matsumoto and Obana (1984) analysed the persistence of New Zealand students through surveys and interviews, where they revealed that motivation acts as the "engine and steering wheel" of learning. Matsumoto and Obana (1984) discovered that students who study continuously demonstrated better integrative and instrumental drives, compared to those who quit. On the other hand, Amali et al. (2024) studied foreign language students' levels of motivation and burnout using a quantitative questionnaire. Amali et al. (2024) discovered that burnout, which was caused by heavy workload and unrealistic expectations, can significantly lower performance and requires institutional support despite being energized by motivation.

On the other hand, Singh et al. (2021) investigated motivational orientations using the Gardner Attitude/Motivation Test Battery (AMTB). Singh et al. (2021) focused their study on 200 Malaysian undergraduate students and revealed that instrumental motivation (career-related goals), integrative motivation (interest in Japanese culture), as well as encouraging attitudes towards language, lead to persistence. This shows that motivation is shaped culturally and multidimensionally.

Past Studies on Cognitive Japanese Language Learning Strategies

In assisting learners to study Japanese successfully, language learning strategies play an essential role by encouraging vocabulary, kanji, and grammar learning. Recent studies revealed that learners' choice of strategies, together with direct, indirect, and cognitive strategies, is impacted by learning requirements and linguistic backgrounds.

Abas et al. (2024) examined the distinction between direct and indirect learning strategies among tertiary students in Malaysia. They distributed a survey using the Oxford Language Strategy Inventory (SILL) to 150 Malaysian students. Abas et al. (2024) discovered that respondents typically use direct strategies such as drills and elaborations in order to memorize vocabulary and kanji. On the other hand, they also revealed that overall learning efficiency can be nurtured by indirect strategies, for example, metacognitive planning and resource management.

Meanwhile, Gamage (2026) investigated kanji learning strategies used by Japanese second language learners from diverse linguistic backgrounds. Gamage (2026) collected data from respondents and interviewed them. This study concluded that learners who are from alphabetic language backgrounds tend to focus more on metacognitive and organizational strategies. On the other hand. Those from logographic backgrounds prefer elaboration and mnemonic techniques. These findings highlighted that prior language knowledge can impact the strategies chosen by learners. Gamage's (2026) findings aligned with Abas et al. (2024). In the aspect of cognitive, Liang (2022) has looked into ten years of empirical studies on Japanese and English. Liang (2022) collected and analysed findings from various studies that examined cognitive strategies, such as conceptual mapping and schema-based learning. This study argued that cognitive strategies are vital in identifying learners' processes as well as internalizing complex language structures. This finding underlines the significance of cognitive approaches when it comes to Japanese language learning.

Past Studies on Resource Management in Japanese Language Learning

Resource management is vital for Japanese language learning as it aids learners in using time, learning resources, and support effectively. Previous research has discussed the advantages learners could obtain, as well as better facing Japanese language learning difficulties, and improving performance by managing their resources.

Abas et al. (2024) studied the relationship between resource management strategies and performance in vocabulary and kanji acquisition. They collected data from 150 Malaysian Japanese-language learners using a survey adapted from the Oxford Inventory of Strategies for Language Learning (SILL). They discovered that resource management strategies, such as asking peers for help, using reference materials, and arranging study schedules, are positively associated with vocabulary and kanji acquisition. They further revealed that learners who manage their resources diligently are able to persevere in the challenges of language learning.

Similarly, Gamage (2026) also looked into kanji learning strategies; however, in this study, respondents are from different linguistic backgrounds. By using surveys and interviews, Gamage (2026) uncovered that students who systematically utilize external sources, for example, kanji dictionaries and mnemonics, have higher persistence compared to students who only focus on memorizing repeatedly.

On the other hand, Liang (2022) studied resource management by scrutinizing a decade's worth of cognitive linguistics research. Liang (2022) concluded that resource management is about external aid as well as the way students assign cognitive effort strategically, for instance, allocating equal practice time between reading, writing, and speaking.

In short, these studies discovered that resource management plays a central role in Japanese language learning as it allows students to face its complexity and lower the possibility of burnout through the enhancement of external and internal support

Conceptual Framework of the Study

Figure 1, which is the conceptual framework of this study, examines how cognitive learning strategies shape language learning through the mediating roles of metacognitive self-regulation and resource management. The framework is based on the cognitive learning perspective proposed by Piaget (1964). Piaget (1964) views learning as an active process in which learners construct knowledge by organizing and restructuring information through mental processes. The theory outlines how learners develop internal cognitive structures that enable them to process new information through assimilation and accommodation. These cognitive processes are reflected in utilizing strategies that help learners process linguistic information effectively.

This study focuses on three cognitive components (organization, elaboration, and critical thinking), building upon the learning strategies framework proposed by Wenden and Rubin (1987). Organization refers to the structuring and categorization of language information, such as vocabulary, grammar rules, and discourse patterns. Elaboration involves connecting new language knowledge with prior knowledge through examples, paraphrasing, or summarizing. Critical thinking represents higher-order cognitive processing in which learners analyse, evaluate, and synthesize language information to construct a deeper understanding. This cognitive strategy allows learners to actively engage in language input and build meaningful language knowledge.

The framework further integrates principles of self-regulated learning proposed by Zimmerman (2002), which emphasize learners' ability to regulate their cognition, behaviour, and learning environment. In this model, cognitive components are hypothesized to influence metacognitive self-regulation and resource management. Metacognitive self-regulation refers to the ability of learners to plan, monitor, and evaluate their learning process. At the same time, it performs language tasks to enable them to select appropriate strategies and adjust their approach when difficulties arise.

Resource management involves the ability of learners to manage their time, effort, learning environment, and external supports, and learning materials to facilitate effective language learning. Based on the structural relationships suggested in the diagram, organization, elaboration, and critical thinking are expected to positively

influence both metacognitive self-regulation and resource management. Using Partial Least Squares Structural Equation Modelling (PLS-SEM), this framework allows for the examination of how cognitive learning strategies contribute to the development of self-learning behaviour in the context of language learning. It emphasizes the importance of strategic cognitive and metacognitive processes in improving students' language learning outcomes.

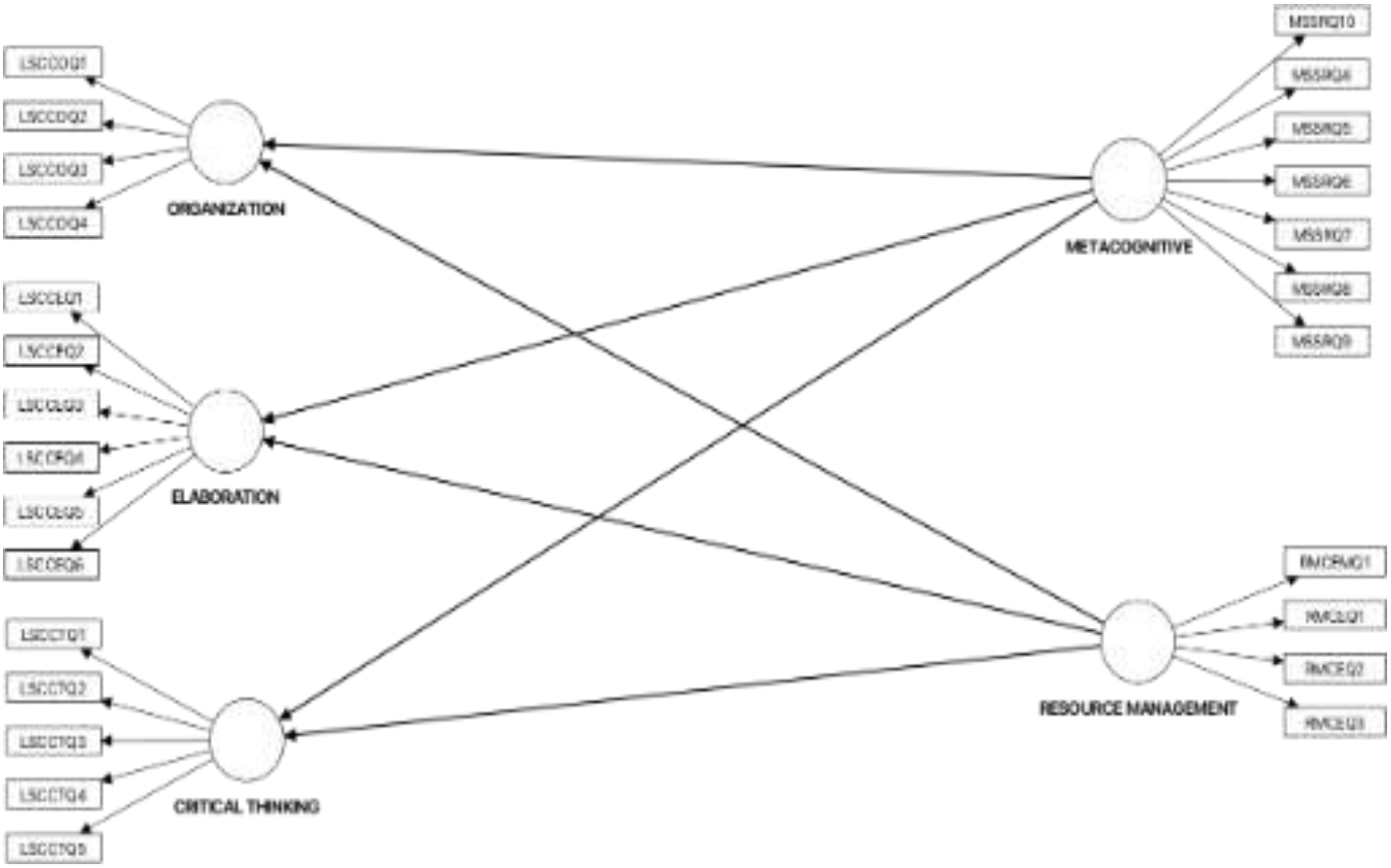

Figure 1 - The Conceptual Framework: Influence of Metacognitive Self-Regulation and Resource Management on Cognitive Components in Language Learning

Figure 1 illustrates a conceptual framework that positions metacognitive self-regulation and resource management as fundamental influences on the cognitive components of language learning. This framework highlights three main cognitive processes, i.e., organizing, elaborating, and critical thinking. The three processes represent the ability of learners to structure information, develop ideas in detail, and evaluate content with analytical depth. These processes are not independent. They are shaped by higher-level regulatory and management strategies. Through metacognitive self-regulation, learners plan, monitor, and adjust their learning approaches. And through resource management, learners use their time, effort, and external support effectively. Generally, these constructs provide a scaffolding that reinforces cognitive engagement. It shows that successful language learning does not rely only on cognitive skills. It also depends on learners' ability to regulate strategies and manage resources.

METHODOLOGY

Research Design

This study employs a quantitative design. This study uses a quantitative design. The research goal is to explore the extension of existing theories. The model (Figure 2) chosen for this study is a hierarchical component model, Type II, which uses a combination of reflective-reflective models. A reflective model is employed when the construct is a trait and explains the indicators (Fornell & Bookstein, 1982).

Population and Sample

The demographic analysis is presented in percentages. According to Ziegenfuss (2021), researchers report demographic data in percentages to establish sample representatives and allow for generalizability to a larger population. Presenting in percentages also provides an overview of participants' characteristics and offers a clear and understandable picture of the sample makeup.

Table 2 - Percentage for Demographic Profile

Question	Demographic Profile	Categories	Percentage (%)
1	Gender	Male (111)	51%
		Female (107)	49%
2	Academic Field	Social Sciences & Humanities (61)	28%
		Science & Technology (157)	72%

Based on Table 2, the demographic profile is presented in two categories: gender and academic field. The participants were almost evenly split by gender, with 51% male and 49% female. In terms of academic background, a majority came from Science and Technology (72%), while the remaining 28% were from Social Sciences and Humanities.

Instrument

Table 3 presents the distribution of items included in the questionnaire. The instrument used a 5-point Likert scale, with scale 1 being never. Scale 2 represents rarely. Scale 3 represents sometimes, while scale 4 is often, and scale 5 is always.

Table 3 - Distribution for Item in Instrument

Sect	Variable		Construct	Item	Total Items
A	COGNITIVE COMPONENTS	(a)	Rehearsal	4	19
		(b)	Organization	4	
		(c)	Elaboration	6	
		(d)	Critical Thinking	5	
B	METACOGNITIVE SELF-REGULATION				11
C	RESOURCE MANAGEMENT	(a)	Environment Management	5	11
		(b)	Effort Management	4	
		(c)	Help-Seeking	2	
					41

The questionnaire, adapted from Wenden and Rubin (1987), comprises variables representing the model formed. Table 3 outlines the distribution of items within the instrument, categorizing them into cognitive components, metacognitive self-regulation, and resource management. The cognitive components include rehearsal (4 items), organization (4 items), elaboration (6 items), and critical thinking (5 items), totalling 19 items. Metacognitive self-regulation contains 11 items, resource management comprises environment management (5 items), effort management (4 items), and help-seeking (2 items), totalling 11 items. Altogether, there are 41 items, reflecting a balanced structure across cognitive, metacognitive, and resource management domains.

Data Collection and Data Analysis

Data is collected via a Google Form. The data is then analysed using SmartPLS 4 through two main stages. As suggested by Hair et.al. (2017), data analysis is done at two levels: the measurement and structural model. The first stage is the measurement model, which measures the outer model. The second stage is the structural model, which measures the inner model. The analysed data is used to answer the research questions and also to confirm the model chosen.

FINDINGS AND DISCUSSION

The model formed for this study is that of a lower-order construct (LOC). The reflective measurement model was chosen. A reflective measurement model is the formation of a single unobserved latent construct, and this construct influences multiple variables (indicators). Another key feature of LOC is that the indicators are interchangeable.

The findings are presented in two stages. The first stage presents the measurement model, and the third stage reveals the structural model and answers the research questions.

Measurement Model

In SmartPLS, the measurement model assesses the reliability and validity of the constructs. This is done by examining the relationships between them and their observable behaviour. The measurement model measures the outer model. Figure 2 below depicts the measurement model for this study. Further detailed explanation of this model is elaborated in the tables below.

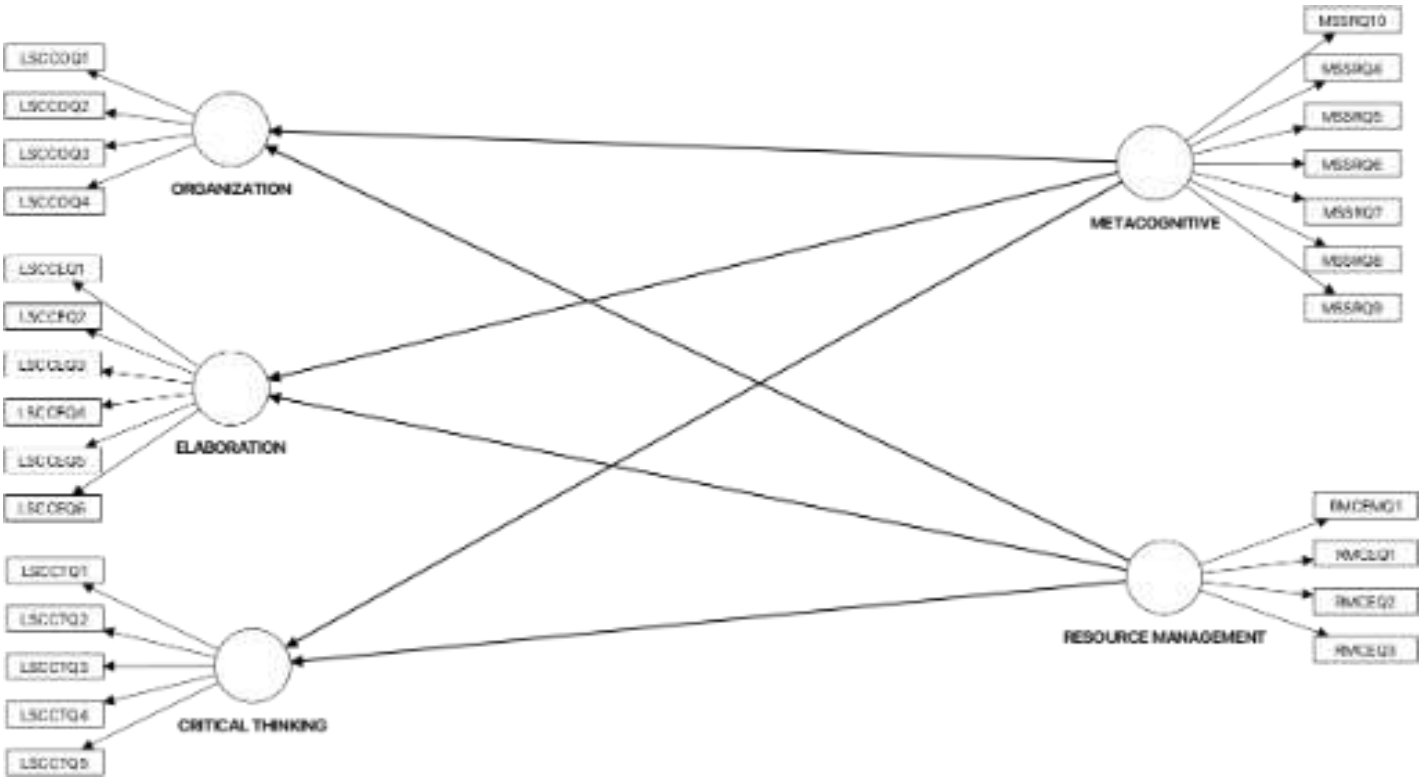

Figure 2 - Measurement Model for Cognitive and Metacognitive Strategies in Language Learning

Figure 2 demonstrates the measurement model that integrates five constructs (organization, elaboration, critical thinking, metacognitive strategies, and resource management), where each is represented by its respective observed items. The arrows indicate the relationships among these constructs. It shows how cognitive processes such as organizing, elaborating, and critical thinking are linked with higher-order regulation and management strategies. This model suggests that effective language learning involves cognitive skills and self-regulatory mechanisms. It provides a comprehensive picture of how learning strategies interact in the study.

Reliability

According to Ringle & Sarstedt (2016), reliability is assessed by checking indicator reliability and internal consistency reliability. Internal consistency is done using Composite reliability (rho_c) and Cronbach's Alpha. The cut-off value for Cronbach's Alpha is 0.70 to 0.90. The cut-off values for composite reliability (rho_c) are 0.70-0.90. For indicator reliability, the factor loadings cut-off values are >0.70 and squared loadings ≥0.50. Finally, the cut-off values for Average Variance Extracted (AVE) ≥0.50.

Table 4 - Results for Reliability: Metacognitive Strategies

Construct/Item	Factor Loading	Cronbach's Alpha	Composite Reliability (rho_c)	Average Variance Extracted (Ave)
		0.877	0.904	0.576
MSSRQ10	0.814			
MSSRQ4	0.711			
MSSRQ5	0.724			
MSSRQ6	0.733			
MSSRQ7	0.787			
MSSRQ8	0.755			
MSSRQ9	0.781			

Table 4 presents the reliability and validity results for the construct Metacognitive Strategies. The factor loadings for the seven items (MSSRQ4–MSSRQ10) range from 0.711 to 0.814, indicating that all items load adequately on the construct and exceed the commonly accepted threshold of 0.70. The construct demonstrates strong internal consistency with a Cronbach's Alpha of 0.877 and Composite Reliability (ρc) of 0.904, both surpassing the recommended value of 0.70. Additionally, the Average Variance Extracted (AVE) of 0.576 exceeds the minimum criterion of 0.50, confirming satisfactory convergent validity. Overall, these results indicate that the Metacognitive Strategies construct is reliable and valid for measurement in this study.

Table 5 - Results for Reliability: Resource Management

Construct/ Item	Factor Loading	Cronbach's Alpha	Composite Reliability (rho_c)	Average Variance Extracted (Ave)
		0.811	0.875	0.638
RMCEQ1	0.77			
RMCEQ1	0.745			
RMCEQ2	0.843			
RMCEQ3	0.832			

Table 5 delineates that the construct of Resource Management is measured with good reliability and validity. The Cronbach's Alpha value of 0.811 indicates that the items are consistent in capturing the same idea, while the composite reliability of 0.875 further confirms the strength of the measurement. The average variance extracted (AVE) is 0.638, which is above the recommended threshold of 0.50, meaning the construct explains more than half of the variance in its items. Looking at the factor loadings, all items (RMCEQ1–RMCEQ3) load strongly, ranging from 0.745 to 0.843, showing that each item contributes meaningfully to the construct. In simple words, this table tells us that the Resource Management scale is dependable and valid, making it a solid measure for the study.

Table 6 - Results for Reliability: Organization Strategies

Construct/ Item	Factor Loading	Cronbach's Alpha	Composite Reliability (rho_C)	Average Variance Extracted (Ave)
		0.82	0.881	0.649
LSCCOQ1	0.815			
LSCCOQ2	0.832			
LSCCOQ3	0.722			
LSCCOQ4	0.847			

Table 6 unveils that the construct of Organization Strategies is measured with strong reliability and validity. The Cronbach's Alpha value of 0.82 indicates that the items are consistent in capturing the same concept, while the composite reliability of 0.881 further confirms the robustness of the measurement. The average variance

extracted (AVE) is 0.649, which is well above the recommended threshold of 0.50, meaning the construct explains more than half of the variance in its items. Looking at the factor loadings, all four items (LSCCOQ1–LSCCOQ4) load strongly, ranging from 0.722 to 0.847, showing that each item contributes meaningfully to the construct. In simple words, this table tells us that the Organization Strategies scale is dependable and valid, making it a solid measure for the study.

Table 7 - Results for Reliability - Elaboration Strategies

Construct/Item	Factor Loading	Cronbach's Alpha	Composite Reliability (rho_c)	Average Variance Extracted (Ave)
		0.859	0.895	0.588
LSCCEQ1	0.702			
LSCCEQ2	0.724			
LSCCEQ3	0.785			
LSCCEQ4	0.736			
LSCCEQ5	0.842			
LSCCEQ6	0.802			

Table 7 lists the construct of Elaboration Strategies, which is measured with solid reliability and validity. The Cronbach's Alpha value of 0.859 indicates that the items are consistent in capturing the same concept, while the composite reliability of 0.895 further strengthens the measurement. The average variance extracted (AVE) is 0.588, which is above the recommended threshold of 0.50, meaning the construct explains more than half of the variance in its items. Looking at the factor loadings, all six items (LSCCEQ1–LSCCEQ6) load well, ranging from 0.702 to 0.842, showing that each item contributes meaningfully to the construct. In simple words, this table confirms that the Elaboration Strategies scale is dependable and valid, making it a trustworthy measure for the study.

Table 8 - Results for Reliability - Critical Thinking

Construct/Item	Factor Loading	Cronbach's Alpha	Composite Reliability (rho_c)	Average Variance Extracted (Ave)
		0.869	0.906	0.658
LSCCTQ1	0.78			
LSCCTQ2	0.761			
LSCCTQ3	0.853			
LSCCTQ4	0.84			
LSCCTQ5	0.819			

Table 8 reveals that the construct of Critical Thinking is measured with strong reliability and validity. The Cronbach's Alpha value of 0.869 indicates that the items are consistent in capturing the same concept, while the composite reliability of 0.906 further confirms the robustness of the measurement. The average variance extracted (AVE) is 0.658, which is well above the recommended threshold of 0.50, meaning the construct explains more than half of the variance in its items. Looking at the factor loadings, all five items (LSCCTQ1–LSCCTQ5) load strongly, ranging from 0.761 to 0.853, showing that each item contributes meaningfully to the construct. In simple words, this table confirms that the Critical Thinking scale is dependable and valid, making it a solid measure for the study.

Validity

According to Ramayah et.al. (2018), for validity, the Discriminant validity (HTMT) needs to be <0.85 or <0.90.

Table 9 - Discriminant Validity (HTMT)

	Critical Thinking	Elaboration	Metacognitive	Organization
CRITICAL THINKING				

ELABORATION	0.854			
METACOGNITIVE	0.765	0.782		
ORGANIZATION	0.687	0.873	0.73	
RESOURCE MANAGEMENT	0.706	0.717	0.717	0.59

Table 9 shows the discriminant validity of the model. The HTMT between Critical Thinking and Elaboration is 0.854, confirming validity. The HTMT between Critical Thinking and Metacognitive Strategies is 0.765, and between Critical Thinking and Organization is 0.687. For Critical Thinking and Resource Management, the HTMT is 0.706. Next, the HTMT between Elaboration and Metacognitive Strategies is 0.782, while Elaboration and Organization show 0.873, and Elaboration with Resource Management is 0.717. The HTMT between Metacognitive Strategies and Organization is 0.73, and between Metacognitive Strategies and Resource Management is 0.717. Finally, the HTMT between Organization and Resource Management is 0.59. All values fall below the recommended threshold of 0.90, confirming satisfactory discriminant validity across the constructs.

Structural Model

In SmartPLS, the structural model visualizes the hypothesized causal relationships between constructs. The structural model is thus formed after the researcher has established the reliability and validity in the measurement model. For the analysis of the structural model, the researcher runs bootstrapping and examines the collinearity, path coefficients of determination, effect size, PLS predict, and IPMA. In addition, the analysis in the structural model allows the researcher to answer research questions 1-6 and hypotheses 1-3. Figure 3 below showcases the structural model for this study. The detailed explanation is elaborated in the tables below.

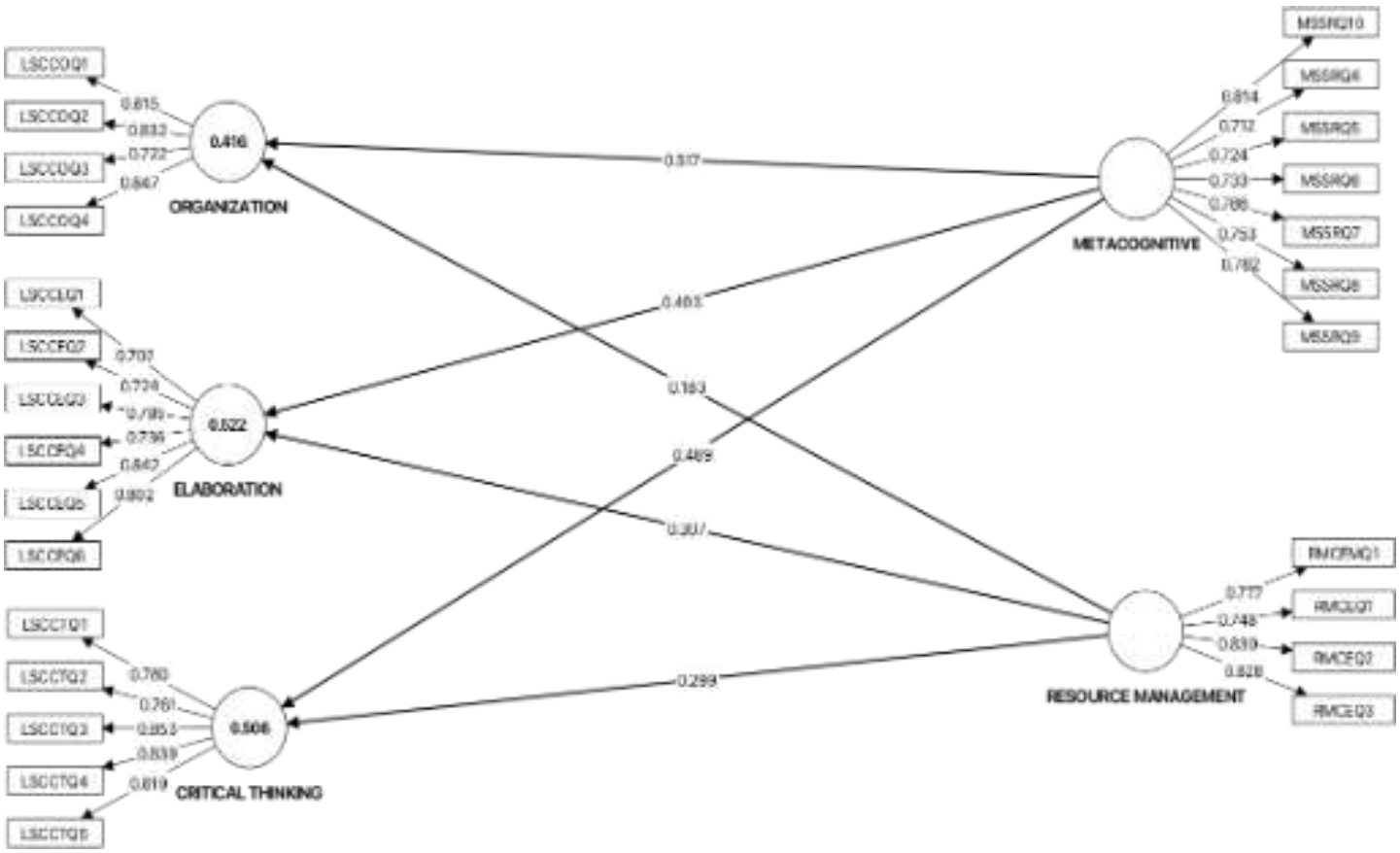

Figure 3 - Structural Model Composing through Socio-Cultural Theory

Figure 3 displays the structural model developed through the lens of socio-cultural theory. The model showcases how three core learning strategies (organization, elaboration, and critical thinking) contribute to higher-order processes such as metacognitive regulation and resource management. The path coefficients highlight the strength of these relationships, with organization and elaboration exerting notable influence on metacognitive

strategies, while elaboration also exhibits a strong link to resource management. Critical thinking contributes meaningfully to both outcomes, though with slightly lower coefficients compared to the other strategies. In simple words, the figure demonstrates that learners who organize, elaborate, and think critically are better able to monitor their own learning and manage resources effectively, reflecting the socio-cultural view that cognitive growth is shaped by interaction and regulation within a broader learning context.

Collinearity

According to Ringle & Sarstedt (2016), the cut-off value for the collinearity inner model VIF is ≤ 5.0.

Table 10 - Collinearity

	Original sample (O)
METACOGNITIVE -> CRITICAL THINKING	1.586
METACOGNITIVE -> ELABORATION	1.586
METACOGNITIVE -> ORGANIZATION	1.586
RESOURCE MANAGEMENT -> CRITICAL THINKING	1.586
RESOURCE MANAGEMENT -> ELABORATION	1.586
RESOURCE MANAGEMENT -> ORGANIZATION	1.586

Table 10 depicts the collinearity results for this study. According to Ringle et al. (2024), the inner model VIF values must be less than or equal to 5.0. All reported interactions meet this threshold, indicating that collinearity is not a concern in the model. This means the constructs are sufficiently independent from one another, and the relationships tested in the structural model are not distorted by overlapping predictors.

Coefficients of determination (R^2)

According to Ramayah et. al. (2018), the coefficients of determination (R^2) 0.2 to 0;7, depending on the field of study. Social Sciences & Economics follows the range above.

Table 11 - Coefficients of Determination (R^2)

	Original sample (O)
CRITICAL THINKING	0.506
ELABORATION	0.522
ORGANIZATION	0.416

able 11 informs the results for coefficients of determination (R^2). The findings indicate that the R^2 for Critical Thinking is 0.506, for Elaboration is 0.522, and for Organization is 0.416. These values suggest that the model explains around 50.6% of the variance in Critical Thinking, 52.2% of the variance in Elaboration, and 41.6% of the variance in Organization. In simple terms, the constructs are moderately well explained by the predictors in the model, confirming that the structural model provides meaningful explanatory power for these learning strategies.

P-Value

Table 12 - Interpretation for p-value

Thresholds	**Interpretation**	**Decision**
$p \leq 0.05$	Often considered statistically significant	Reject H_0
$p \leq 0.01$	Indicates very strong evidence against H_0	Reject H_0
$p > 0.05$	Weak or no evidence against H_0	Fail to reject H_0

According to Goodman (1999), a threshold of p-value is the cut-off for determining statistical significance, most commonly set at 0.05. Below is the table that interprets the threshold. Table 12 manifests the interpretation for

p=value. Goodman (1999) stated that, if the p-value is $p \leq 0.05$, the data is often considered statistically significant, and the null hypothesis is rejected. If it is $p \leq 0.01$, then it indicates very strong evidence to reject the null hypothesis ($H_{0)}$. However, a $p > 0.05$ is considered weak, and there is no evidence to reject the null hypothesis.

Table 13 - Path Coefficient for the Current Study

	T Statistics (|O/STDEV|)	P Values
METACOGNITIVE -> CRITICAL THINKING	7.807	0
METACOGNITIVE -> ELABORATION	6.765	0
METACOGNITIVE -> ORGANIZATION	7.513	0
RESOURCE MANAGEMENT -> CRITICAL THINKING	4.698	0
RESOURCE MANAGEMENT -> ELABORATION	4.008	0
RESOURCE MANAGEMENT -> ORGANIZATION	2.413	0.016

Table 13 discloses data to answer the research questions and hypotheses. Path coefficients are reported with t-statistics and p-values. For significance, the t-statistic must be greater than 1.65 and the p-value less than 0.05. The results show that Metacognitive → Critical Thinking is significant (p=0, t=7.807); Metacognitive → Elaboration is significant (p=0, t=6.765); and Metacognitive → Organization is significant (p=0, t=7.513). Similarly, Resource Management → Critical Thinking is significant (p=0, t=4.698); Resource Management → Elaboration is significant (p=0, t=4.008); and Resource Management → Organization is significant (p=0.016, t=2.413). Hence, all paths indicate significant relationships, confirming that both metacognitive strategies and resource management play important roles in influencing critical thinking, elaboration, and organization.

Effect Size (f^2)

According to Ramayah et. al. (2018), the cutoff values for effect sizes (f^2) are 0.02 (small), 0.15 (medium), and 0.35 (large). This section presents data to answer research questions and hypotheses.

RQ5- Is there a significant effect of connectivism on diversity, openness, connectedness, and autonomy?

H_{05}- There is no significant effect of connectivism on diversity, openness, connectedness, and autonomy

According to Ringle et al. (2024), for effect size, values from 0.02 to 0.15 are considered small. Values between 0.15 to 0.35 are considered medium, while values 0.35 and above are considered large.

Table 14 - Effect Size (f^2)

	Original sample (O)
METACOGNITIVE -> CRITICAL THINKING	0.305
METACOGNITIVE -> ELABORATION	0.321
METACOGNITIVE -> ORGANIZATION	0.289
RESOURCE MANAGEMENT -> CRITICAL THINKING	0.114
RESOURCE MANAGEMENT -> ELABORATION	0.125
RESOURCE MANAGEMENT -> ORGANIZATION	0.036

Table 14 divulges the effect size (f^2) results for this study. According to Ramayah et al. (2018) and Ringle et al. (2024), values between 0.02–0.15 are considered small, 0.15–0.35 are medium, and 0.35 and above are large. The results show that Metacognitive → Critical Thinking (0.305), Metacognitive → Elaboration (0.321), and Metacognitive → Organization (0.289) all fall within the medium range, indicating meaningful effects. In contrast, Resource Management → Critical Thinking (0.114) and Resource Management → Elaboration (0.125) are small effects, while Resource Management → Organization (0.036) is very small. This means metacognitive strategies have a stronger influence on learning outcomes compared to resource management. Therefore, H05 is rejected, but the strength of effects varies, medium for metacognitive paths and small for resource management paths.

PLS Predict (Q^2)

In PLS-SEM, it is stated that $Q^2 \geq 0$ (Ringle et.al., 2024). Table 18 below reveals the PLS Predict (Q^2) for the dependent variable. The analysis reveals the Q^2 for all items in the dependent variable -connectedness.

Table 15 - PLS Predict (Q^2)

	Q^2 Predict	RMSE	MAE
CRITICAL THINKING	0.491	0.721	0.537
ELABORATION	0.502	0.713	0.556
ORGANIZATION	0.396	0.786	0.6

Table 15 enlightens the PLS Predict (Q^2) results for the dependent variables. According to Ringle et al. (2024), Q^2 values greater than zero indicate predictive relevance, while Cohen (1988) suggests that 0.02 reflects small relevance, 0.15 medium, and 0.35 large. The results show that Critical Thinking has a Q^2 of 0.491, Elaboration has 0.502, and Organization has 0.396. All values are well above 0.35, indicating large predictive relevance. This confirms that the model has strong predictive power for these constructs, thereby supporting the robustness of the study's structural model.

IPMA

IPMA or Importance-Performance Matrix Analysis. According to Ringle & Sarstedt (2016), IPMA is used to evaluate the performance and importance of the chosen constructs or indicators within a model. In this study, individual IPMA analyses were conducted for each construct and reported in Table 17.

IPMA or Importance-Performance Matrix Analysis. According to Ringle & Sarstedt (2016), IPMA is used to evaluate the performance and importance of the chosen constructs or indicators within a model. In this study, individual IPMA analyses were conducted for each construct and reported in Table 17.

Table 16 - Latent Variables Average Performance (Performance)

	LV Performance Value (Average)
CRITICAL THINKING	58.553
ELABORATION	65.679
METACOGNITIVE	61.026
ORGANIZATION	59.923
RESOURCE MANAGEMENT	63.96

Table 16 imparts the average performance scores for the latent variables in the study. In IPMA (Importance-Performance Map Analysis), performance values are rescaled between 0–100, with higher scores reflecting stronger attainment, but interpretation depends on their relative importance (Hauf, 2024). The results show that Elaboration has the highest performance score (65.679), followed by Resource Management (63.96), Metacognitive (61.026), Organization (59.923), and Critical Thinking (58.553). These findings suggest that learners demonstrate relatively stronger performance in elaboration and resource management strategies, while critical thinking shows the lowest performance among the constructs. In practical terms, this highlights critical thinking as a potential area for improvement, depending on its importance in the model, while elaboration and resource management represent areas of relative strength.

CONCLUSION

Summary of Findings and Discussions

In this section, findings are discussed by explaining the data according to research questions and hypotheses. The purpose is to present the relationship of the factors related and whether they are aligned with the data. Table 18 shows the summary of the outcome of the results and explained either the null hypothesis is accepted or rejected. The table reveals the connection between metacognitive strategies and resource management with

organization, elaboration, and critical thinking. This provides a foundation to examine the significance of this relationship in the bigger structural model.

Table 17 - Outcome of Research Hypothesis

No	Research Question	Research Hypothesis	Outcome
1	Is there a significant relationship between Metacognitive and Organization Strategies?	Ho1: There is no significant relationship between Metacognitive and Organization Strategies	Reject the null hypothesis There is a relationship between Metacognitive and Organization Strategies.
2	Is there a significant relationship between Metacognitive and Elaboration Strategies?	Ho2: There is no significant relationship between Metacognitive and Elaboration Strategies	Reject the null hypothesis There is a relationship between Metacognitive and Elaboration Strategies
3	Is there a significant relationship between Metacognitive Strategies and Critical Thinking?	Ho3: There is no significant relationship between Metacognitive Strategies and Critical Thinking	Reject the null hypothesis There is a relationship between Metacognitive Strategies and Critical Thinking
4	Is there a significant relationship between Resource Management and Organization Strategies?	Ho4: There is no significant relationship between Resource Management and Organization Strategies	Reject the null hypothesis There is a relationship between Resource Management and Organization Strategies
5	Is there a significant relationship between Resource Management and Elaboration Strategies?	Ho5: There is no significant relationship between Resource Management and Elaboration Strategies	Reject the null hypothesis There is a relationship between Resource Management and Elaboration Strategies
6	Is there a significant effect between Metacognitive and Organization Strategies?	Ho7: There is no significant difference between Metacognitive and Organization Strategies	Reject the null hypothesis There is an effect between Resource Management and Organization Strategies
7	Is there a significant effect between Metacognitive and Elaboration Strategies?	Ho8: There is no significant difference between Metacognitive and Elaboration Strategies	Reject the null hypothesis There is an effect between Resource Management and Elaboration Strategies
8	Is there a significant effect between Metacognitive Strategies and Critical Thinking?	Ho9: There is no significant difference between Metacognitive Strategies and Critical Thinking	Reject the null hypothesis There is an effect between Metacognitive Strategies and Critical Thinking
9	Is there a significant effect of Resource Management and Organization Strategies?	Ho10: There is no significant difference between Resource Management and Organization Strategies	Reject the null hypothesis There is an effect between Resource Management and Organization Strategies
10	Is there a significant effect of Resource Management and Elaboration Strategies?	Ho11: There is no significant difference between Resource Management and Elaboration Strategies	Reject the null hypothesis There is an effect between Resource Management and Elaboration Strategies
11	Is there a significant effect between Resource Management and Critical Thinking?	Ho12: There is no significant difference between Resource Management and Critical Thinking	Reject the null hypothesis There is an effect between Resource Management and Critical Thinkings

Table 17 details that every null hypothesis was rejected, which indicates that each studied relationship and effect is statistically significant. Organization, elaboration, and critical thinking are revealed to have been positively influenced by metacognitive strategies. This highlights the metacognitive strategy's role in improving the cognitive regulation and strategic skills of learners. Likewise, organization, elaboration, and critical thinking are revealed to have been significantly influenced by resource management. This underlines resource management as an important factor in encouraging meaningful learning processes. These findings proved that both metacognitive strategies and resource management are vital catalysts in encouraging successful learning outcomes, improving overall validity as well as explanatory potential of the structural model chosen.

Metacognitive strategies and resource management emerge as vital components for improving Japanese language proficiency. Learners who actively apply self-regulation through planning and evaluation show a much stronger command over cognitive skills like organization and critical thinking (Zhang & Seepho, 2013; Karbalaei, 2011). Efficiently managing time, effort, and materials provides the necessary foundation to sustain this motivation over time (Chamot, 2005). This combination of internal control and external organization creates a unified environment for absorbing and applying linguistic knowledge. Backed by PLS-SEM analysis, these confirmed structural relationships firmly establish both dimensions as essential catalysts for successful language acquisition.

Implications and Suggestions for Future Research

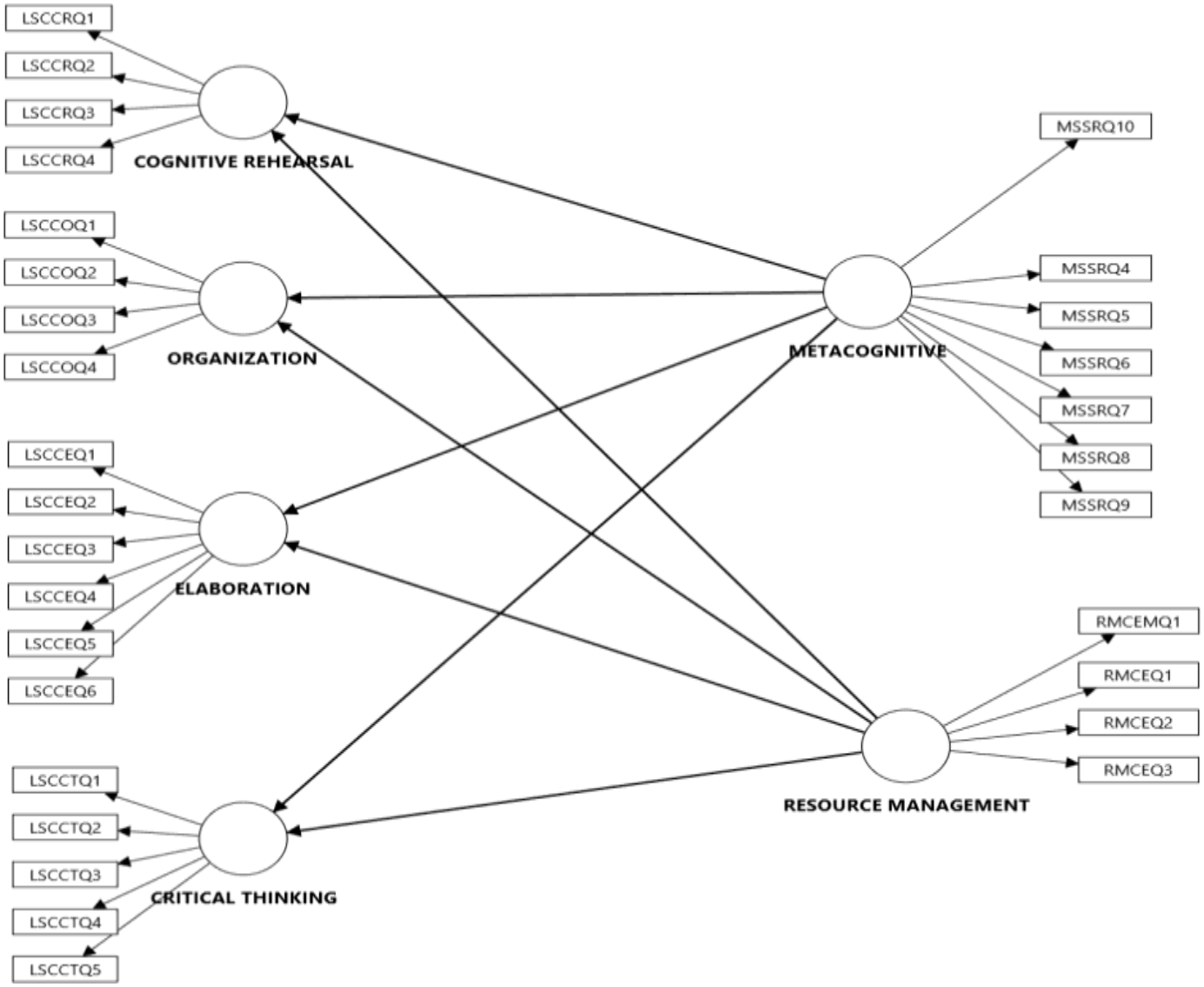

Figure 4 - The Proposed Model

Figure 4 models six interconnected constructs from a social cognitive theory perspective (cognitive training, organization, elaboration, critical thinking, metacognitive strategies, and resource management). The framework illustrates the fluid interactions through which these learning strategies guide student behaviour and cognitive development. A major contribution of this model is the integration of cognitive training, which highlights how targeted practice can strengthen the bond between metacognitive regulation and processing skills such as organization and elaboration. This structural map not only encourages future studies to test these pathways in varied learning contexts but also yields a functional tool for analysing how learners use strategic resources to navigate public speaking anxiety.

This research delivers vital insights for both theoretical frameworks and pedagogical design. Theoretically, merging Piaget's cognitive theory (1964) with Zimmerman's self-regulated learning model (2002) outlines the fluid relationship between knowledge building and behavioural control. Pedagogically, the results challenge educators to integrate explicit metacognitive and resource strategies directly into daily lessons. Utilizing reflective tasks and structured planning exercises proves highly effective for fostering student resilience and independence (Conley, 2014; Ruiz & Smala, 2020). Furthermore, managing institutional pressures, such as workload distribution and resource availability, is essential to protect students from burnout (Amali et al., 2024). Ultimately, these combined strategic improvements not only elevate short-term academic outcomes but also anchor the lifelong competencies needed to successfully navigate language acquisition.

Future research should expand on this study by examining the longitudinal effects of metacognition and resource management on language development. There are major opportunities to explore how these strategic choices evolve across different skill levels and cultural contexts (Liang, 2022; Gamage, 2026). In addition, incorporating qualitative tools, such as interviews and reflective journals, will provide a clearer picture of how students navigate self-regulation in real time. Exploring modern variables such as digital resources and collaborative spaces can also reveal how technology influences cognitive planning. Ultimately, this research direction will enrich our understanding of strategic learning, guiding the development of highly adaptive, student-centred frameworks for Japanese language programs.

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