FUTURE-READY LEADERSHIP IN VUCA/BANI CONDITIONS: AN INTEGRATIVE FRAMEWORK AND BEHAVIORAL MEASURE

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ABSTRACT

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This dissertation develops and validates Future-Ready Leadership (FRL), a behaviorally grounded leadership framework designed for sustained disruption (VUCA/BANI). It addresses two gaps: the fragmentation of leadership theory and the lack of validated, behavior-specific tools that can inform leadership development and selection decisions.

FRL integrates four complementary domains: Trust-Driven Leadership, Continuous Personal Learning, Strategic Navigation, and Expansion by Value Creation. FRL is measured with a 5-point Behaviorally Anchored Rating Scale (BARS). The validation process employs a staged design combined expert content review and large-sample survey testing with managers. Analyses examined ordinal item functioning, internal structure using complementary structural methods, reliability and generalizability of scores, measurement invariance and differential item functioning across sex groups, external

validity with related leadership and psychological constructs, and leader profiling via k-means clustering.

Results supported a correlated four-domain framework and did not support a substantively interpretable single general leadership factor. The scale showed adequate composite-level precision for comparative and developmental interpretation, while domain-level dependability varied. Fairness evidence was acceptable, with limited and small-magnitude differential item functioning. External validity was modest yet broadly theory-consistent. Profiling yielded five interpretable leader configurations that differed meaningfully in their domain patterns.

In summary, FRL is regarded as a robust and pragmatic tool for leadership profiling, development, coaching, and organizational capability diagnostics. This dissertation establishes the foundational measurement of FRL with 52 items. Future research will extend item coverage to facilitate domain-level application in high-stakes decision-making. Future research priorities include scale expansion, replication, multi-source ratings, and predictive validation.

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INTRODUCTION

1.1 Introduction

Organizational leaders today face unparalleled challenges in adaptation owing to rapid technological progress, global economic transformations, increasing complexity, the proliferation of remote work, and evolving employee expectations. These circumstances additionally compel leadership to prioritize people-centered strategies while concurrently ensuring operational efficiency and cultivating innovative change management competencies. Future-Ready Leadership (FRL), as outlined in this dissertation, seeks to confront these challenges by proposing a theoretically grounded contemporary leadership framework, specifically devised to succeed amidst continual development, disruptions, and uncertainties.

Leadership is an expanding field of academic inquiry; however, prevailing theories are frequently applied in a disjointed manner. The disconnect and impracticality of leadership theories become apparent when leaders confront contemporary conditions, often characterized by the acronym VUCA (volatility, uncertainty, complexity, and ambiguity). More recently, these conditions are also referred to as BANI (Brittle, Anxious, Non-Linear, and Incomprehensible), emphasizing the profound internal repercussions of instability . This paradigm shift challenges conventional rational and cognitive leadership models. The FRL framework introduces a pragmatic leadership structure tailored to these conditions, thereby supporting organizational leaders in maintaining or achieving high performance over the long term, even in challenging circumstances.

Future-Ready Leadership (FRL) is defined within this dissertation as a multidimensional leadership framework that encompasses observable leader behaviors and

self-regulatory capabilities, which collectively support effective leadership in contexts characterized by sustained uncertainty, complexity, and rapid change. FRL conceptualizes leadership not as a singular style or trait but as a configuration of interconnected behavioral domains, including a human-centric orientation, continual personal learning, and strategic navigation. The framework is explicitly holistic, integrating interpersonal, intrapersonal, and directional capacities that enable leaders to maintain effectiveness across evolving environments. FRL is not presented as a normative ideal or a substitute for established leadership theories but rather as a complementary, integrative framework designed to capture leadership readiness for future-oriented and disruptive settings. This definition functions as the conceptual foundation for all theoretical, methodological, and empirical analyses detailed within the dissertation.

The fundamental principle of the Future-Ready Leadership (FRL) framework is building trust and fostering psychological safety. FRL is developed through the integration of validated leadership models, mindset patterns, and behaviors that support organizational leadership and development within a disruptive era. This dissertation presents and validates the architecture of such a holistic leadership model.

Future-Ready Leadership (FRL) is a relatively uncommon leadership framework, primarily because it considers technology as a catalyst of rapid organizational change. The swiftly evolving nature of technology, particularly artificial intelligence, is transforming business operations, expectations, and human behavior. Its impact extends beyond technological advancements, affecting numerous areas broadly. These effects are evident in customer expectations, information accessibility, work methodologies, teamwork, and automation development. A company that fails to comprehend or utilize the opportunities presented by technological advancements risks falling behind more agile and innovative

competitors. Additionally, it is crucial to identify the risks associated with new technology to effectively manage their impacts.

Traditional change management no longer aligns with the requirements of contemporary organizational leaders, as disruptive changes are ongoing rather than isolated incidents. The concept of change management lacking a specific definitive endpoint signifies that these transformations are continuous and ever-evolving. Disruptive changes inherently generate both winners and losers, with the most agile and adaptable organizations often emerging victorious. By embracing innovation, such organizations can provide greater value to their customers and expand their operations. Conversely, less flexible organizations tend to lose customers as their expectations evolve. Leaders are confronted with a dual challenge: they must utilize disruptive changes to enhance customer benefits, even when such changes threaten existing operations that are not aligned with reform initiatives. Despite these risks, it is imperative for leaders to motivate their staff, cultivate an inspiring environment, and foster confidence in a more promising future. These leadership challenges necessitate a level of maturity and leadership capability that surpasses traditional expectations within crisis and change management. Furthermore, leaders must possess a well-grounded conviction that their proactive leadership endeavours can instigate positive change.

1.2 Research Problem

The leadership research field continues to exhibit significant fragmentation. Commonly, each theory underscores a singular facet of effective leadership, which hampers the integration of diverse models. This study consolidates various leadership theories and models into a cohesive framework that delineates the principles of effective leadership in the context of today's disruptive environment. The lack of such a

comprehensive model or framework complicates the application of sound theoretical approaches to complex practical leadership scenarios. Furthermore, in the absence of a validated and empirically supported model, it becomes challenging to evaluate leaders' profiles during recruitment, to assess leadership maturity, or to develop effective leadership training programs.

To bridge this gap, the present study introduces the Future-Ready Leadership (FRL) framework, a leadership framework that is both theoretically validated and practically applicable. It is specifically designed to address the demands of contemporary disruptive change by considering evolving circumstances, leader qualities, and key factors driving organizational growth.

1.3 Purpose and Objectives of the Study

The purpose of this study is to conceptualize, operationalize, and empirically validate the Future-Ready Leadership (FRL) framework. The goal of the study is to create a scientifically validated construct that can be practically applied to leadership recruitment, leadership assessment, and leadership development. This goal is achieved through the following specific objectives:

1. The FRL framework is designed as an integrative theoretical framework that incorporates and combines elements from established leadership theories and behavioral science.
2. A behaviorally-based rating scale (BARS) is developed to measure and assess each domain and subdomain of the model.
3. The structural, convergent, and discriminant features of the FRL framework are validated with the results of an empirical survey.
4. The aim of the study is to identify distinctive leadership profiles derived using k-means clustering.

5. The external validity of the domains of the FRL frameowrk is verified by comparing their congruence with corresponding validated scales measuring leadership, cognition, and self-awareness.

1.4 Significance of the Study

This study provides both theoretical and practical insights. Theoretically, it advances the unification of leadership research, which has often been fragmented. The FRL framework functions as an integrated model that synthesizes Trust-Driven Leadership, Continuous Personal Learning, Strategic Navigation, and Expansion by Value-Creation. The empirical validation of this model's high-level constructs will enhance academic comprehension of the interaction among multiple dimensions, particularly in disruptive environments. Furthermore, the study contributes to psychometric leadership research by developing a novel behavioral assessment tool capable of identifying diverse leadership profiles across various disciplines.

From a practical perspective, the research provides organizations a validated framework for assessing leadership profiles, capabilities, and a supporting tool for recruiting new leaders. Furthermore, the model can bolster leadership development initiatives aimed at cultivating psychological safety, adaptive learning, growth, and innovation. By translating abstract leadership concepts into concrete behavioral models, FRL offers organizations a pragmatic instrument to steer through organizational uncertainties and perpetual environmental changes.

1.5 Research Questions and Hypotheses

The study adopts a bandwidth-oriented measurement philosophy, emphasizing broad behavioral coverage over narrow internal homogeneity. Validation is therefore pursued through a coordinated program of structural, reliability, profile-based, and external validity analyses.

RQ1**:** What is the latent structure of Future-Ready Leadership, and to what extent is it meaningfully represented at the domain and item levels?

- H1**:** A four-domain FRL structure will be supported at the parcel (planned subdomain composite) level, demonstrating acceptable global model fit and substantively interpretable domain loadings.
- H2: Item-level models will exhibit heterogeneous fit (e.g., reduced CFI/TLI but acceptable RMSEA), consistent with intentional broad behavioral sampling rather than narrowly interchangeable indicators.

RQ2: Do FRL domain scores demonstrate adequate reliability and defensibility for substantive interpretation despite intentional behavioral breadth?

- H3: FRL domain scores will demonstrate adequate composite reliability (ω_t, Coefficient H), while bifactor diagnostics (ω_h, ECV) will indicate limited general-evaluative variance, consistent with randomized BARS design and domain-specific behavioral measurement.

RQ3: Do distinct leadership profiles emerge from combinations of FRL domain scores?

- H4: Cluster analysis of FRL domain scores will yield more than one empirically distinct leader profile ($k > 1$), characterized by meaningful quantitative separation across domains and interpretable behavioral configurations (e.g., empowering-, strategic-, authenticity-driven patterns).

RQ4: How do FRL domain scores and leader profiles relate to adjacent leadership, learning, and self-regulation constructs?

- H5: FRL domain scores and leader profiles will show differential patterns of association with external validated or shortened constructs (FOS-8,

BiAS-9, DLS-7, SLBS-6, CSE-12, GTL-7, LGO-4) that are consistent with theoretical expectations. Specifically:

- Learning-oriented FRL patterns will align more strongly with LGO and feedback-related constructs.
- Human-centric FRL patterns will align with servant and digital leadership measures.
- Trust-related FRL domains will show stronger associations with transformational leadership and core self-evaluations.

1.6 Structure of the Dissertation

This dissertation comprises six chapters. Chapter I introduces the research problem, conceptual positioning, objectives, and hypotheses.

Chapter II reviews relevant leadership and learning literatures, identifies conceptual and measurement gaps, and articulates the theoretical foundations of the FRL framework.

Chapter III describes the research methodology including design, sample, and comprehensive validation strategy. Analysis includes content validation, structural analyses, reliability and generalizability studies, measurement invariance and fairness testing, external validity assessment, short-form development, and leader profile identification procedures.

Chapter IV presents the empirical results corresponding to the research questions and hypotheses without interpretive elaboration.

Chapter V discusses the findings in relation to theory and prior research, outlining implications and limitations.

Chapter VI provides an integrative summary of the study, synthesizes key theoretical and practical implications, and offers recommendations for future research and applied leadership development.

CHAPTER II:

REVIEW OF LITERATURE

2.1 Leadership in the Age of Disruption

2.1.1 Understanding the Disruptive Landscape: VUCA/BANI

The current business landscape is characterized by the complex VUCA/BANI operating environment where traditional operational methods are often inadequate, requires adaptability to maintain efficiency (Ployhart and Bliese, 2006). The Project Iceberg offers evidence regarding large-scale skill transformation, workforce exposure, and the systemic nature of AI-driven disruption (Chopra *et al*., 2025). Developing organizations capable of adapting within a dynamic operational environment is an essential competency for organizational leaders and a critical function of successful organizations (Boylan and Turner, 2017).

In the digital era, the overall phenomenon of leadership is evolving, as are the tools through which it is studied (Banks *et al*., 2022). As disruptions escalate, it is imperative for organizations to reassess their leadership paradigms. The rapid and substantial transformations within the operational landscape are now both internal and external, substantially impacting leaders and those they lead. This evolution necessitates that leaders adopt a comprehensive approach to leadership, enabling the organization to adapt effectively to change and sustain innovation (Kodama, 2019). Organizational innovativeness, encompassing creativity, openness, future orientation, risk-taking, and proactiveness, is regarded in contemporary literature as a favorable attribute of organizations due to its roles in invigorating them and increasing the likelihood of their survival and ongoing success (Ruvio *et al*., 2014).

Concurrently, organizations are required to cultivate flexibility and adaptive leadership to navigate the complex environment (Hatum and Pettigrew, 2006; Yukl and

Mahsud, 2010). Contemporary challenges necessitate that leaders adapt on an individual level and cultivate organizations comfortable with adapting to change. Leaders are required to establish adaptable organizations that do not seek or pursue certainty but are capable of thriving amid uncertainty and chaos. The organization most adept at adaptation will be the one that succeeds. The intricate difficulties of the present and future underscore that a vital attribute of effective organizational leadership is the promotion of organizational adaptability (Boylan and Turner, 2017).

2.1.2 Technological Development as a Driver of Modern Disruption

Although technological progress continues unabated, management practices remain fundamentally anchored in social influence mechanisms. Nevertheless, the swift progression of technology exerts a significant and influential impact that warrants careful consideration within modern management paradigms. Many contemporary disruptions originate from rapid market fluctuations propelled by innovations. These are primarily driven by factors such as the proliferation of big data, the accelerated increase in computational power, and advancements in artificial intelligence. The extensive adoption of natural language processing, large language models such as ChatGPT, and other breakthroughs in AI have revolutionized information utilization, thereby opening new avenues for innovation (Zhang *et al*., 2024). These developments influence various aspects such as customer expectations, the competitive landscape, required organizational skills, workforce size, and retraining needs. Essentially, they affect numerous factors directly connected to the organization's management and strategic decision-making processes. Advancements in technology have also revolutionized communication and operational methods. Leaders now utilize various digital platforms to communicate, facilitating rapid and often interactive exchanges. Visibility and communication are further enhanced by tools like social media, which obscure the boundary between official and informal

interactions. Additionally, leaders are increasingly evaluated based on their messages on social media, which can enhance transparency and expand communication channels. However, this progression also introduces challenges for leadership, as the distinction between leaders and followers becomes less clear (Banks *et al*., 2022).

2.1.3 How Disruption Reshapes Leadership Demands

Traditional leadership models were not designed for the degree of disruptive change we are experiencing today (Huston and Sherwood, 2025). Traditional leadership models are designed for stable environments. Rigid, hierarchical, and control-oriented leadership approaches find it challenging to provide the flexibility, adaptability, and innovative culture essential in a disruptive era. Furthermore, these models frequently neglect the mental and emotional requirements stemming from disruptive conditions. Consequently, leaders can no longer rely solely on linear problem-solving or conventional strategic planning (Khan *et al*., 2024)

When a leader comprehends that disruptions are persistent rather than merely short-term crises, their role shifts significantly from conventional leadership. Instead of concentrating exclusively on achieving specific objectives, they assume the role of navigators amid ongoing uncertainty. This evolving function necessitates the development of new personal qualities and a significant degree of maturity to lead effectively in a holistic manner. Systems thinking, future-oriented thinking, mental models, and adaptive change management enable leaders to proficiently steer through dynamic environments effectively (Abukalusa and Oosthuizen, 2025).

Leadership necessitates consideration of both organizational and personal factors. Organizational elements, including strategic agility, an adaptive culture, and leadership endorsement, cultivate an environment conducive to agility (Syamsir, Saputra and Mulia, 2025). Concurrently, individual factors, encompassing emotional intelligence, cognitive

adaptability, and resilience, indicate that the efficacy of leadership agility is significantly contingent upon the leader's ability to navigate complexity and uncertainty (Syamsir, Saputra and Mulia, 2025).

With advances in digitalization, technology, and automation, leaders now have access to entirely new tools. These tools can support leadership growth, personal training, business development, competitiveness, information access, and the facilitation of remote work. An effective leader should leverage these emerging opportunities to lead and develop themselves and their organization (Trenerry *et al*., 2021)

In summary, leading during a disruptive era significantly amplifies the challenges of leadership and imposes greater personal demands on leaders. Organizational executives encounter decreasing opportunities to influence external events, while the management of internal matters becomes increasingly complex and challenging. Nonetheless, the core principles of leadership and human needs persist unchanged.

2.2 Leader maturity framework

2.2.1 Constructive and developmental foundations of leader maturity

Leadership maturity is regarded as a capacity that develops at varying paces among leaders, shaped by time and experience. It encompasses self-awareness, comprehension of others, and the understanding of complex systems. Constructivist developmental theory, particularly Kegan's contributions, provides a well-established basis for this viewpoint (Kegan, 1982). Kegan's model elucidates the manner in which the "I" gradually advances in self-awareness, behavioral regulation, and social influence. Development, independent of age or IQ, pertains to the extent to which an individual nurtures this intricate and multifaceted capacity for cognition and analysis, which Robert Kegan describes as "mental complexity." In the realm of leadership studies, constructive development theory is inherently linked to leadership capability and efficacy (McCauley *et al*., 2006). Leadership

Developmental Level (LDL) is characterized as the ability to comprehend oneself, others, and various situations, as evaluated according to Kegan's Stages. Empirical data demonstrates that leaders possessing a higher LDL capacity tend to receive more favorable 360-degree leadership performance evaluations (Strang and Kuhnert, 2009). The study also revealed that LDL predicts leader performance ratings more effectively than the Big Five personality traits, suggesting that a leader's maturity holds greater significance than their personality characteristics.

2.2.2 The evolving self framework

Kegan's model delineates five developmental stages (Stages 1-5) and explicates the evolution of the "I". The model posits that adolescence and adulthood extend beyond mere skill improvement; rather, adulthood encompasses transformation that modifies one's worldview. Advancement to a higher stage necessitates a subject-object shift, wherein the subject represents the aspect that governs us ("I am"), and the object signifies what we can control ("I have").

For instance, the transition from "achievement-driven" (typically level 3) to "perceiving achievements as a component of life" (the inception of level 4) is noteworthy. Initially, achievement is embedded within the individual's identity and becomes an integral aspect of the self. At this juncture, praise enhances self-esteem, whereas criticism is regarded as a threat to the self. Success in the workplace influences mood, confidence, and interpersonal relationships. Conversely, failures may be perceived as a personal failure, given that performance is reflective of the self. Achievements are thus regarded not merely as external accomplishments but as intrinsic to the self, i.e., the subject.

Progressing to level 4, achievement transitions from being an innate trait to an active endeavor undertaken by the individual. They commence to perceive achievement as an external element that no longer defines their identity. For instance, they might consider,

“I notice how dependent I am on praise,” or “I see that I work too hard to avoid feeling inadequate.” While accomplishments remain significant, they are not the exclusive concern. Values such as family, honesty, and health attain equal importance, rather than solely success. Achievements serve as sources of motivation but no longer determine their self-perception. At this phase, achievements are regarded as objects that can be evaluated and modified.

Kegan's model describes the five balances of an adult:

- Stage 1 - Impulsive mind (typically early childhood)
- Stage 2 - Imperial mind (adolescence)
- Stage 3 - Socialized mind
- Stage 4 - Self-Authoring mind
- Stage 5 - Self-Transforming mind

Constructivist development assessments consistently indicate that higher levels of adult functioning are uncommon in the general population. Kegan's composite analysis revealed that approximately one-third of adults primarily operate at level four, while about half to two-thirds remain at level three. Only 3-6% are progressing towards level five, and no individuals in his sample had fully attained level five (Kegan, 1982). In Cook-Greuter's sample of nearly 2000 individuals, which she employed to examine the development of the mature ego, a comparable distribution is observable (Cook-Greuter, 2000). Fewer than 1% attained post-autonomous perspectives, corresponding to Kegan's level 5. These results imply that although developmental complexity generally increases with age, only a minimal proportion of adults attain the maturity linked to Kegan's self-transformation level 5.

2.2.3 Implications to leadership efficiency

Broader reviews of adult development and leadership highlight that the structural stages of meaning-making link a leader's maturity with their leadership effectiveness, encompassing enhanced management of complexity and uncertainty (Reams, 2017).

Developmental theory has been posited as a more profound explanation for why some leaders are more inclined or capable of exhibiting transformational leadership, whereas others tend to prefer transactional leadership (Strang and Kuhnert, 2009). Leaders with greater maturity are capable of managing long-term perspectives, navigating complex situations, and reconciling value conflicts. This maturity promotes transformative behaviors by allowing leaders to articulate more inspiring visions, engage followers intellectually, and address their individual needs more effectively, even when under pressure (McCauley *et al*., 2006). All of these positive impacts are essential for effective leadership in the VUCA/BANI era.

2.3 Existing Leadership Theories and Gaps

2.3.1 Servant Leadership

2.3.1.1 Historical Origins and Theoretical Foundations of Servant Leadership

Servant leadership attained recognition as a distinctive leadership philosophy owing to the influential work of Robert K. Greenleaf in the 1970s (Sendjaya and Sarros, 2002). Greenleaf's concept was influenced by his philosophical reflections on Hermann Hesse's novel "The Journey to the East" (Hesse, Rosner and Hesse, 1956). This novel narrates the story of a servant named Leo, whose presence sustains the group during their long journey. When Leo mysteriously disappears, the group disintegrates and abandons its mission. This illustrates that genuine leadership arises from a commitment to service rather than from a position of authority. The narrative significantly influenced Greenleaf's understanding that the effectiveness of servant leadership resides not in influence, but in the development of those being served. Individuals who serve tend to become healthier,

wiser, freer, more autonomous, and increasingly inclined to serve others themselves (Song, 2019). Greenleaf authored his influential essay "The Servant Leader" in 1970, thereby introducing the concept of servant leadership (Greenleaf, 2008). He developed this concept throughout his extensive career at AT&T and at the Greenleaf Center for Servant-Leadership, an organization he founded.

Servant leadership is founded upon the principles of the Christian Gospel. However, its application and influence have expanded internationally, with practitioners originating from a variety of philosophical and religious backgrounds (Cravens, 2025). The philosophical roots of servant leadership have existed for thousands of years prior to Greenleaf's conceptualization, representing an alternative leadership philosophy that distinctly differentiates itself from traditional self-centered behavioral and leadership models (Thakore, 2013). Since Greenleaf's foundational work, the concept of servant leadership has evolved into a secular leadership philosophy. It is now implemented and scrutinized globally across diverse organizations and cultural contexts. As one of the most extensively researched leadership models, this trend underscores the wide-ranging appeal of servant leadership among practitioners and scholars representing various philosophical and religious traditions (Cravens, 2025).

2.3.1.2 Core Characteristics and Dimensions of Servant Leadership

Servant leadership is a holistic leadership style in which serving others is the primary goal, not a secondary outcome. In this dissertation we are using the following definition of servant leadership formulated by Eva, Robinb, Sendjayac, van Dierendonckd, Liden (Eva *et al*., 2019):

> Servant leadership is an (1) other-oriented approach to leadership (2) manifested through one-on-one prioritizing of follower individual needs and interests, (3) and

outward reorienting of their concern for self towards concern for others within the organization and the larger community.

The above definition has three features that make up the essence servant leadership, namely its motive, mode, and mindset (Eva et al., 2019)

Sendjaya and his colleagues have developed and validated a comprehensive and diverse scale for measuring servant leadership: Servant Leadership Behavior Scale (SLBS) (Sendjaya, Sarros and Santora, 2008). This scale has six dimensions and a total of 35 items. It can be used to measure and describe the psychometric properties of servant leadership. The six dimensions in the SLBS-35 scale are: Voluntary Subordination, Authentic Self, Covenantal Relationship, Responsible Morality, Transcendental Spirituality, and Transforming Influence.

Voluntary Submission describes a leader's willingness to serve and prioritize the needs of others. The Authentic Self describes a leader's authenticity and openness, and building trust through consistent character. A Covenantal Relationship describes a leader's long-term commitment and respect that is not contingent on transactional benefits. Responsible Morality describes a leader's commitment to ethical principles, honesty, and fairness in decision-making. Transcendental Spirituality describes the creation of meaning, purpose, and belonging, and the linking of immediate organizational goals to larger goals. Transforming Influence describes a leader's ability to inspire and empower others, enabling their personal and professional growth, and encouraging them to become servant leaders themselves (Sendjaya, Sarros and Santora, 2008).

Table 2.1
SLBS-35 Servant Leadership Behavior Scale
Source: Sendjaya (2015)

Dimensions	Values	Commitments
Voluntary Subordination	Being A Servant	1. Consider others' needs and interests above his or her own

	Acts of Service	2. Uses power in service to others, not for his or her own ambition 3. Is more conscious of his or her responsibilities than rights 4. Serves people without regard to their backgrounds (gender, race, etc) 5. Demonstrates his or her care through sincere, practical deeds 6. Listens to me with intent to understand 7. Assists me without seeking acknowledgement or compensation
Authentic Self	Humility	8. Is not defensive when confronted
	Integrity	9. When criticized, he or she focuses on the message not the messenger
	Accountability	10. Practices what he preaches
	Security	11. Gives me the right to question his or her actions and decisions
	Vulnerability	12. Is willing to let me take control of situations when appropriate 13. Is willing to say "I was wrong" to other people
Covenantal Relationship	Acceptance	14. Affirms his or her trust in me
	Availability	15. Accepts me as I am, irrespective of my failures
	Equality	16. Respects me for who I am, not how I make him or her feel
	Collaboration	17. Is willing to spend time to build a professional relationship with me 18. Treats people as equal partners in the organization 19. Has confidence in me, even when the risk seems great
Responsible Morality	Moral Reasoning	20. Take a resolute stand on moral principles
	Moral Action	21. Encourages me in moral reasoning 22. Enhances my capacity for moral actions 23. Employs morally justified means to achieve legitimate ends 24. Emphasizes on doing what is right rather than looking good
Transcendental Spirituality	Transcendental Beliefs	25. Is driven by a sense of a higher calling
	Interconnectedness	26. Helps me to generate a sense of meaning out of everyday life at work
	Sense of Mission	27. Helps me to find a clarity of purpose and direction
	Wholeness	28. Promotes values that transcend self-interest and material success
Transforming Influence	Vision	29. Articulates a shared vision to give inspiration and meaning to work

	Empowerment	30. Minimizes barriers that inhibit my success
	Modeling	31. Contributes to my personal and professional growth
	Mentoring	32. Leads by personal example
	Trust	33. Inspires me to lead others by serving
		34. Draws the best out of me
		35. Allows me to experiment and be creative without fear

This dissertation primarily employs the SLBS-35 scale and its definitions, in addition to the shorter SLBS-6 scale derived therefrom (Sendjaya *et al*., 2019). SLBS is comprehensive and validated, making it the most *f* choice for this study. Nonetheless, various other measures of servant leadership have been developed, and the most prominent among them are succinctly summarized herein to provide an overview.

Barbuto and Wheeler have developed The Servant Leadership Questionnaire (SLQ), which consists of five dimensions (Barbuto Jr and Wheeler, 2006). These include:

- altruistic calling, reflecting the leader's desire to serve others
- emotional healing, which involves showing sensitivity to others' personal concerns
- wisdom, encompassing the knowledge needed to effectively support followers
- persuasive mapping, the ability to influence others toward shared goals
- organizational stewardship, the responsibility to contribute to the broader community

Van Dierendonck and Nuijten have conducted the Servant Leadership Survey (SLS) (Van Dierendonck and Nuijten, 2011), where servant leadership is divided into eight dimensions:

- standing back, which involves acknowledging others' contributions and sharing credit for accomplishments

- forgiveness, describing the ability to understand others' perspectives and accept them despite mistakes
- courage, reflecting the willingness to challenge accepted approaches and take risks for new solutions
- empowerment, which aims at motivating followers to be proactive and self-confident
- accountability, ensuring followers understand their boundaries and performance expectations
- humility, the leader's ability to acknowledge their own limitations and seek others' contributions
- authenticity, reflecting the degree to which a leader is true to themselves
- stewardship, the ability to act as a caretaker and role model in accepting responsibility for the larger organization

Robert Greenleaf, in his original conceptualization, defined ten characteristics of servant leaders (Greenleaf, 2008). These are:

- Listening and Understanding
- Language and Imagination [Communication]
- Withdrawal - Finding One’s Optimum
- Acceptance and Empathy
- Know the Unknowable - Beyond Conscious Rationality
- Foresight -The Central Ethic of Leadership
- Awareness and Perception
- Persuasion-Sometimes One Man at a Time
- One Action at a Time - The Way Some Great Things Get Done
- Conceptualizing - The Prime Leadership Talent

In a study conducted by Lide and colleagues (Liden *et al*., 2008) they identified seven distinctive dimensions of servant leadership:

- Conceptual skills
- Empowering
- Helping subordinates grow and succeed
- Putting subordinates first
- Behaving ethically
- Emotional healing
- Creating value for the community

2.3.1.3 Individual and Organizational Outcomes of Servant Leadership

Research indicates that servant leadership at the individual level exerts a more positive influence on employee attitudes and behavior than transformational leadership (Brown, Marinan and Partridge, 2020). Servant leaders promote increased employee commitment and elevated job satisfaction. They facilitate a better work-life balance and markedly enhance the quality of Leader-Member Exchange (LMX). These strengthened relationships establish a solid basis of trust and respect, thereby augmenting both individual and organizational effectiveness. Numerous studies additionally demonstrate that servant leadership fosters innovation, enhances employee confidence, and encourages the presentation of creative ideas and innovative solutions (Chi *et al*., 2020, 2020; Khan *et al*., 2021).

Servant leadership at the organizational level has been demonstrated to significantly enhance overall performance and effectiveness. This approach results in a marked increase in Organizational Citizenship Behavior (OCB), wherein employees assist one another, undertake proactive initiatives, and speak favorably about their organization (Walumbwa, Hartnell and Oke, 2010). Teams become more focused on objectives, realize

greater potential through increased self-assurance, and achieve superior performance (Hu and Liden, 2011). Within the university setting, cynicism and negative attitudes diminish, whereas Organizational Citizenship Behavior (OCB) increases (Chi *et al*., 2020). Servant leadership typically promotes a positive organizational culture that sustains high levels of performance (Wesevich, 2022; Farhan Mirza *et al*., 2023).

Servant leadership embodies the qualities essential for future organizations in the VUCA/BANI era, applicable at both individual and organizational levels. It facilitates decision-making by decentralizing authority to employees, thereby promoting enhanced collaboration and engagement. These elements form the foundation of the FRL framework, which is built upon the well-established principles of servant leadership that have shown tangible positive outcomes across diverse contexts and cultures.

2.3.1.4 Mechanisms and Mediating Processes in Servant Leadership Effectiveness

Servant leadership is closely associated with trust. It involves behaviors that exemplify integrity, moral responsibility, and authentic concern for others. Empirical research suggests that servant leadership significantly predicts trust in immediate supervisors (Sendjaya and Pekerti, 2010). Studies have found a correlation between servant leadership and trust, with a coefficient of .84 (Reinke, 2003) and .86 (Dannhauser and Boshoff, 2006).

Although trust is a multidimensional concept, we can use the following definition: Trust is a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another (Rousseau *et al*., 1998). Recent research delineates two facets of trust: affective and cognitive. Affective trust pertains to the emotional aspect wherein subordinates perceive that leaders genuinely care about their welfare and act in their best interests. Conversely, cognitive trust is founded on subordinates' evaluations of the leader's competence and dependability. Empirical

evidence suggests that servant leadership notably impacts both dimensions of trust, with a more pronounced effect on affective trust (Saleem *et al*., 2020). This is a significant discovery due to the fact that affective trust is particularly vital in the relationship between a superior and a subordinate, and additionally plays a crucial role in psychological safety (Schaubroeck, Lam and Peng, 2011). Servant leadership seems to function primarily through affect-based trust and the enhancement of psychological safety within teams. Conversely, transformational leadership appears to manifest through cognitive-based trust and the augmentation of team potency (Liden *et al*., 2014).

Research based on social exchange theory has shown that servant leadership satisfies all three basic psychological needs: Autonomy, Competence, and Relatedness (Farhan Mirza *et al*., 2023). Subordinates respond to servant leadership with increased commitment and dedication, where trust acts as a psychological mechanism (Usman, Abdullah and Basit, 2024). Trust in leadership enhances the entire spectrum from servant leadership to workplace engagement, acting as both a direct outcome and an indirect motivator (Qudratzai and Gul, 2022). Furthermore, within the paradigm of servant leadership, trust extends beyond the leader-subordinate relationship to encompass trust among colleagues, thereby potentially augmenting factors such as job satisfaction and innovativeness (Rashid and Ilkhanizadeh, 2022).

Servant leadership enhances employees' capacity to manage stress and challenges, leading to higher engagement and better performance (Winarno *et al*., 2025). Servant leadership is perceived as empowering and emotionally restorative, mitigating emotional exhaustion and enhancing adaptability.

Work engagement, encompassing vigor, dedication, and absorption, constitutes one of the most consistent mediators identified across numerous studies. Furthermore, servant leadership enhances performance through the improvement of job satisfaction (Wang *et*

al., 2022). Servant leadership boosts engagement by offering greater encouragement and fostering autonomy, caring, and ethical conduct. Therefore, based on the Job Demands-Resources framework, it functions as a vital job resource that proactively strengthens work (Jiang *et al*., 2022). In the public sector, engagement mediates servant leadership, thereby improving work performance and strengthening employees' trust in their leaders (Usman, Abdullah and Basit, 2024).

2.3.2 Transformational Leadership

2.3.2.1 Historical Origins and Theoretical Foundations of Transformational Leadership

The origins of transformational leadership theory can be traced to the leadership model conceptualized by American political scientist James MacGregor Burns in the late 1970s, which he designated as Transforming Leadership (Burns, 1978). Burns defines leadership as a moral, relational, and fundamentally democratic process rather than a technique for managing organizations. He states that leadership cannot be reduced to power or transactional exchanges. Instead, it happens when leaders and followers interact in a way that elevates their motivation, values, and aspirations. Burns explains, transforming leaders "seek to satisfy higher needs and engage the full person of the follower," creating a relationship of mutual growth in which "followers are converted into leaders and leaders into moral agents" (Burns, 1978).

One of the key features of Burns' model is its democratic nature. Subordinates should have the ability, information, and freedom to select their leaders. This promotes a relationship grounded in voluntary and conscious commitment rather than coercion. Burns argues that leadership is legitimate only when it aligns with collective purpose, respects the autonomy of subordinates and fosters genuine social change that addresses real human needs. This focus makes democratic principles like participation, deliberation, and mutual

accountability fundamental to leadership (Burns, 1978). This democratic leadership style, influenced by Bursi's background in political science, showcased a fundamentally different approach to leadership compared to the previously dominant transactional leadership theories that preceded it (Indana, Patoni and Maunah, 2023; Eaton, Bridgman and Cummings, 2024).

After Burns published *Leadership (Burns, 1978)*, Bernald Bass adopted the same term but removed much of Burns' moral and political foundation from the concept of leadership (Bass, 1985). The contemporary concept of transformational leadership, particularly in organizational psychology, is mainly derived from Bass's framework. Bass distinguished it from Burns' normative approach, transforming it an operational and measurable model for organizational behavior. This model emphasizes key leader traits such as charisma, individual judgment, and intellectual stimulation, which are intended to boost effort, performance, and satisfaction.

The leadership models of Burns and Bass exhibit notable differences. Burns' approach emphasizes mutual growth between leaders and followers, while Bass's model centers on leader influence over followers. Although Burns' model considers the broader societal context, Bass's focus is on organizational effectiveness. In Burns' framework, transformative leadership departs from transactional leadership, but Bass incorporates both styles concurrently. Furthermore, Burns' model aligns with moral objectives, whereas Bass aimed to develop a value-neutral leadership concept applicable to both positive and negative outcomes (Chemers, 2000).

Although Burns and Greenleaf, who developed the concept of servant leadership, drew from different intellectual traditions, their leadership theories share similar moral and philosophical foundations. In Burns' framework, a leader's legitimacy hinges on addressing the genuine needs of subordinates, fostering their moral growth, and supporting their

development as leaders. Greenleaf's servant leadership emphasizes ethical practice over political theory, with the leader prioritizing the growth, autonomy, and well-being of subordinates above organizational or personal interests. Both models oppose utilitarian, exchange-based leadership and focus on strengthening the relationship between leader and followers as the core of ethical development. Conversely, Bass's definition of transformative leadership markedly differs from these models. Consequently, Burns' original concept of transformative leadership aligns more closely with Greenleaf's servant leadership than with Bass's transformative leadership (Greenleaf, 1977; Burns, 1978; Bass, 1985)

Transformational leadership development initially focused on leader characteristics and later shifted to studying leader skills. It then progressed to analyzing leader behaviors that define leadership style. The current model integrates various psychological and behavioral mechanisms through which leaders affect organizational results, involving both emotional and rational influence. Consequently, leadership is viewed as a complex and multifaceted psychological process, rather than a set of fixed, isolated behaviors. (Chemers, 2000).

2.3.2.2 Core Characteristics and Dimensions of Transformational Leadership

Transformative leadership consists of four main dimensions that work synergistically to influence subordinate behavior and organizational outcomes (Judge and Piccolo, 2004; Hinkin and Schriesheim, 2008). Nämä neljä ulottuvuutta ovat:

- idealized influence
- inspirational motivation
- intellectual stimulation
- individualized consideration

Idealized Influence, also called charisma, refers to a leader's ability to be admired, trusted, and respect, and to act as a role model who demonstrates strong ethical standards and commitment. Followers relate to this leader, adopt their values, and are motivated to put in extra effort. They support the leader's vision and see the leader as a role model (Milan Shrestha, 2020).

Inspirational Motivation means articulating a compelling organizational vision and setting high expectations for subordinates' performance. Inspirational leaders communicate meaning and purpose in a compelling and emotional way. This creates optimism and enthusiasm that motivate employees to work toward the organization's shared objectives, often going beyond their personal interests. Such leaders link individual motivation to organizational goals and tie subordinates' self-esteem to the group's mission. In this context, self-esteem is rooted in collective success and encourages self-motivation (Chemers, 2000; Farhan Mirza *et al*., 2023). Inspiring motivation significantly increases subordinates' commitment to the organization (O'Malley, 2025) and increases employee performance, especially in organizational changes and in cultures that value strong visionary authorities (Kebe, Liu and Kahl, 2025).

Intellectual Stimulation motivates subordinates to think independently and creatively, to question assumptions and approach problems from different angles. The leader fosters innovation by turning challenges into opportunities and encouraging employees to find new solutions (Bak, Jin and McDonald, 2022; Farhan Mirza *et al*., 2023; Karimi *et al*., 2023).

Individualized Consideration demonstrates a leader's commitment to the personal growth of each subordinate. Leaders offer mentoring, coaching, and support tailored to individual differences and needs. Recognizing each person's unique goals fosters psychological safety and enhances the relationship between leader and subordinates (Hoch

et al., 2018; Krywalski-Santiago, 2024), where employees feel valued and have opportunities for professional growth (Arnold, 2017).

2.3.2.3 Individual and Organizational Outcomes of Transformational Leadership

At the individual level, transformational leadership positively influences subordinates' satisfaction with the leader, their overall job satisfaction, and work motivation, with a corrected validity of approximately 0.40-0.45, which exceeds most transactional or laissez-faire dimensions (Judge and Piccolo, 2004). Transformational leadership is positively associated with job satisfaction, stronger organizational commitment, improved work motivation, and lower work stress (Arnold, 2017).

At the organizational level, transformational leadership has a significant impact on key performance drivers and organizational level (Schaubroeck, Lam and Cha, 2007; Irianti, Syarifuddin and Haerani, 2024). Research indicates that transformational leadership enhances employees' affective commitment to the organization and encourages organizational citizenship behaviors (Hoch *et al*., 2018; O'Malley, 2025). Learning in teams also enhances collaboration and facilitates knowledge sharing increase (Rahmadani *et al*., 2020).

2.3.2.4 Mechanisms and Mediating Processes in Transformational Leadership Effectiveness

Research indicates various mechanisms through which transformational leadership influences subordinates via different moderators. Nielsen et al. consider transformational leadership as a group-level construct and discover that both team efficacy and self-efficacy serve as mediators for employee job satisfaction and team psychological well-being. This underscores how collective and individual self-efficacy processes operate in parallel (Nielsen *et al*., 2009). Research indicates that the mechanisms of Transformational Leadership operate across multiple levels. Leaders establish a shared climate, uphold

values, and foster confidence in effectiveness, which consequently influence individuals' motivation, well-being, and behavior (Eisenbeiss, van Knippenberg and Boerner, 2008; Lee *et al*., 2023)

Work autonomy and work meaningfulness serve as mediators between transformative leadership and performance (Gözükara and Şimşek, 2015; Arnold, 2017; Han, Oh and Kang, 2020). The transformational leader's own work motivation also enhances the work motivation of subordinates (Kanat-Maymon, Elimelech and Roth, 2020).

Multiple psychosocial resources present in transformative leadership function as mediators. These encompass decision-making latitude, organisational culture, work-life equilibrium, overall self-efficacy, and a sense of meaningfulness (Zwingmann *et al*., 2014).

Multiple studies indicate that the efficacy of transformational leadership arises from its influence on relationship dynamics. Trust in the leader is inversely correlated with perceived stress and positively correlated with job satisfaction (Liu, Siu and Shi, 2010). Luottamus johtajaan parantaa myös työntekijöiden hyvinvointia (Kelloway *et al*., 2012; Arnold, 2017). Trust in the leader additionally enhances employee well-being (Lee *et al*., 2023). Transformational leaders dedicate resources to the development of their subordinates, fostering high-quality relationships that promote innovation (Karimi *et al*., 2023).

2.3.3 Adaptive Leadership

2.3.3.1 Historical Origins and Theoretical Foundations of Adaptive Leadership

The theoretical inception of adaptive leadership can be attributed to Ronald Heifetz's publication, *'Leadership Without Easy Answers*.' (Heifetz, 1994). Heifetz posited in his publication that contemporary societal issues are primarily related to adaptation

rather than technical challenges. Consequently, the conventional perception of a leader as merely a provider of solutions is insufficient. He asserts that leadership does not depend on authority, charisma, or rank, but is fundamentally a process of mobilizing individuals to confront challenging realities.

Adaptive leadership is profoundly aligned with systems theory. Heifetz underscored that adaptive challenges emerge from systemic imbalances. He articulated that leaders must comprehend interdependent relationships rather than concentrating solely on discrete behaviors. The notions of "regulating the heat" and "holding steady in disequilibrium" exemplify a systems-oriented perspective, whereby organizations oscillate between stability and productivity. This systemic foundation is further corroborated in subsequent organizational studies. Abukalusa and Oosthuizen substantiate Heifetz's systemic origins by describing adaptive leadership as a model necessitating mental models, feedback loops, and distributed responsibility within a VUCA environment (Abukalusa and Oosthuizen, 2025).

Adaptive leadership is also founded on principles of ethical and moral leadership. Hubbard et al. describe it as arising from virtue ethics, reciprocity, and moral courage (Eric Hubbard, Ph.D., Lisa Thatcher and Barrett, 2025). A leader must be capable of assisting their organization in recognizing conflicting values and making ethical compromises. Therefore, adaptive leadership constitutes an integral component of broader ethical leadership.

Although it is often misleadingly believed that adaptive leadership centers on the leader, it is in fact more focused on followers (Northouse, 2019). Adaptive leadership does not emphasize the position of the leader, but the behavior of the leader. Adaptive leadership assists others in identifying and modifying their own values. Adaptive leadership means

mobilizing, motivating, organizing, directing, and focusing the attention of others (Heifetz, 1994).

2.3.3.2 Core Concept of Adaptive Leadership

One of Heifetz's fundamental concepts is to differentiate between technical and adaptive challenges. Technical challenges are those for which established solutions are available. Adaptive challenges necessitate learning, value transformation, experimentation, and the development of new norms. Northouse offers one of the most comprehensive theoretical models of adaptive leadership (Northouse, 2019). It includes:

1. Situational challenges
    - Technical
    - Technical and adaptive
    - Adaptive
2. Leader behaviors
    - Get on the balcony. Refers to stepping back from the immediate situation to observe patterns, dynamics, and underlying issues.
    - Identify adaptive challenges. Diagnose whether the problem is technical or adaptive or both.
    - Regulate distress. Keeps people engaged in adaptive work.
    - Maintain disciplined attention. Helps the organization to face reality.
    - Give the work back to people. Develops the adaptive capacity of the group.
    - Protect voices of leadership from below. Ensures early detection of systemic issues.
3. Adaptive work

- The learning, experimentation, and value-orientation process that followers must engage in to move forward.

The adaptive leadership process encompasses four distinct perspectives. Initially, the systems perspective acknowledges that many problems are components of a complex, interacting system (Uhl-Bien and Arena, 2018). Problems are complex and multidimensional, capable of shifting within interconnected networks of relationships. Additionally, the biological perspective delineates how individuals develop and undergo change as they adapt to both internal states and external environments. Furthermore, adaptive leadership underscores a service-oriented approach, wherein the leader leverages their expertise and authority to serve others. Lastly, the psychotherapeutic perspective aids individuals in better adapting to new situations or environment (Northouse, 2019).

Nöthel with her collegues has developed and validated the Adaptive Leadership Behavior Scale (ALBS) (Nöthel *et al*., 2023). The four aspects of ALBS are:

- Maintaining a toolbox of behavioral strategies
- Accurately perceiving situational demands
- Appropriate and flexible application
- Balancing opposing demands

ALBS helps to get a measurable and deeper understanding of concrete leadership behaviors that are key in VUCA environments (Nöthel *et al*., 2023).

2.4 Theoretical Foundation for the FRL Model

2.4.1 Conceptual Rationale for FRL as an Integrative Model

The FRL framework is conceived as an effective instrument aimed at consolidating dispersed research concerning leadership. It is founded on the premise that leadership within BANI environments is inherently multi-tiered and necessitates that leaders possess a distinct maturity and the capacity to operate concurrently across various domains and

levels. Studies on disruptive leadership indicate that organizational success is achieved when leaders integrate human-centric relational behaviors (Hu and Liden, 2011; Liden *et al*., 2014), adaptive learning and experimentation (Heifetz, 1994; Northouse, 2019), and strategic agility supported by disciplined action cycles (Boylan and Turner, 2017; Uhl-Bien and Arena, 2018). The FRL framework integrates these elements into a cohesive structure that encompasses: (1) the moral and psychological foundations underpinning trust-based and people-centered leadership; (2) the leader's personal commitment to learning and capacity for ongoing self-improvement; (3) cognitive and behavioral skills necessary for managing uncertainty and developing adaptive strategies; and (4) value-creation abilities that empower organizations to innovate, expand, and compete effectively in dynamic and disruptive markets.

Researchers have consistently identified a disparity between theoretical frameworks and their practical implementations within management research (Alvesson and Sveningsson, 2003; Yukl and Mahsud, 2010; Uhl-Bien and Arena, 2018; Banks *et al*., 2022). It is evident that existing models cannot completely capture the intricacies of real organizational environments. Many current theories are conceptually sophisticated and comprehensive; however, they often remain at an abstract level and pose challenges for implementation in practical settings. FRL addresses this gap by subdividing each domain into specific subdomains and illustrating tangible cognitive, relational, and behavioral models. Consequently, FRL relies on the development and validation of the Behavioral Rating Scale (BARS).

2.4.2 Limitations of Existing Leadership Theories in a BANI Context

While well-established leadership theories offer valuable insights into leadership, they have been predominantly developed under the premise that the environment remains relatively stable. Their relevance to the leadership challenges of today’s VUCA and BANI

environments is considerably limited. These traditional leadership models tend to focus on predictable influence patterns, linear cause-and-effect relationships, and rational problem-solving. Such assumptions are not necessarily validated under conditions marked by rapid change, technological acceleration, and psychological pressures.

The BANI framework underscores the heightened anxiety and cognitive overload encountered by both leaders and subordinates (Nataliia and Olena, 2023). However, transactional, transformational (particularly following Bass) and most strategic leadership models primarily concentrate on cognitive processes and formal influence structures, thereby neglecting numerous psychological stressors associated with the BANI environment. For instance, affective states and psychological safety linked to leadership models are frequently depicted as consequences rather than initial factors in many leadership theory investigations. Likewise, research concerning leadership in the digital era indicates that many conventional leadership theories do not sufficiently consider how the swift development of technology and the disruptive changes it engenders escalate uncertainty and emotional tension (Banks *et al*., 2022).

2.4.3 Why FRL Requires a Four-Domain Structure

The Future-Ready Leadership (FRL) framework is segmented into four domains to comprehensively address the diverse interdependent capabilities required for effective leadership both presently and in the future, especially within increasingly unpredictable environments.

First, a distinct relational-ethical domain is essential because trust, psychological safety, and ethical grounding serve as foundational preconditions for effective leadership during periods of uncertainty. Research indicates that servant leadership significantly fosters affective trust, thereby enhancing team functioning, psychological safety, and overall performance (Sendjaya and Pekerti, 2010; Hu and Liden, 2011; Liden *et al*., 2014).

This domain, which delineates behavioral processes, is conceptually distinct from cognitive abilities and strategic competence; therefore, trust-driven leadership warrants its own distinct category.

Secondly, the rapid rate of change in contemporary business environments necessitates a focus on a leader's individual capacity and readiness to acquire new knowledge. Disruption research underscores that leaders must persistently update their understanding, question their presumptions, and modify their cognitive frameworks to sustain effectiveness in rapidly evolving settings (Heifetz, 1994; Boylan and Turner, 2017) Research on adaptability similarly emphasizes the importance of individual learning, willingness and effort to receive feedback, and cognitive flexibility in maintaining high performance in complex situations (Ployhart and Bliese, 2006). These mechanisms of personal development differ structurally from trust-building and strategic capabilities, which is the reason they are regarded as a distinct domain.

Thirdly, the realm of strategic navigation and adaptive decision-making is of paramount importance because strategic processes within VUCA and BANI environments diverge from conventional linear models. Quantitative research indicates that leaders who demonstrate proficiency in ambiguity tolerance, pattern recognition, and adaptive planning facilitate organizations in managing uncertainty with greater efficacy (Syamsir, Saputra and Mulia, 2025). These capabilities constitute a specific category of leadership behavior that functions more at a strategic level than at an interpersonal or internal personality level.

Finally, a domain focused on value creation, innovation, and ecosystem engagement to accommodate the ongoing generation of added value, technological disruptions, and cross-boundary collaborations within an increasingly interconnected environment. In the swiftly advancing era of digitalization and artificial intelligence, leaders are expected to maintain current knowledge, cultivate a culture that encourages

innovation, and leverage technological advancements as organizational advantages rather than threats (Trenerry *et al*., 2021; Banks *et al*., 2022). These behaviours extend beyond strategic navigation, personal learning, affective trust building and demand a focus on new value frontiers, making them conceptually distinct from the other FRL domains.

Together, these four capability clusters constitute the fundamental requirements that leaders must fulfill to operate effectively and sustainably in the future, particularly as they anticipate the potential growth of BANI. This framework embodies the findings that successful leadership in a disruptive environment is comprehensive and multi-tiered, integrating interpersonal skills, internal development, strategic agility, and organizational dimensions (Yukl and Mahsud, 2010; Kodama, 2019).

2.5 Conceptualization of the Four FRL Domains

2.5.1 Trust-Driven Leadership (F1)

The first domain of the FRL framework, Trust-Driven Leadership, establishes the ethical and relational foundation upon which all other leadership capabilities depend. Especially within VUCA and BANI environments, trust, psychological safety, and moral foundations are essential conditions for motivation, adaptation, learning, and innovation. This domain is founded upon the servant leadership theory, as servant leadership offers a robust, comprehensive, clear, and empirically validated leadership framework. Servant leadership was selected as the conceptual basis for this domain for three primary reasons.

Firstly, the servant leadership model is comprehensive and supportive, emphasizing moral responsibility, humility, interpersonal care, and the long-term development of followers (Sendjaya, Sarros and Santora, 2008; Eva *et al*., 2019). This breadth of scope aligns with the requirements of BANI contexts, wherein leaders are required to concurrently address affective needs, ethical dilemmas, and relationship quality. Empirical research indicates that servant leadership enhances emotional trust and fortifies

relationships, which subsequently improves psychological safety, team effectiveness, and organizational citizenship behavior (Sendjaya ja Pekerti, 2010; Hu ja Liden, 2011; Liden ym., 2014).

Secondly, servant leadership aligns with the principles of adaptive leadership and Burns's foundational work, *Transforming Leadership*. Both perspectives regard leadership as a relational and moral process, rather than a hierarchical or leader-centric activity. Burns (1978) characterized transformative leadership as a mutual elevation of the motivations and values of both the leader and followers, grounded in democratic and strongly ethical principles. Similarly, adaptive leadership encompasses the mobilization and support of individuals to address challenges through the promotion of learning, openness, and shared responsibility (Heifetz, 1994; Northouse, 2019). These principles align with established definitions of servant leadership and foster the development of trust. Conversely, Bass's reinterpretation of transformational leadership shifted the emphasis towards leader-centered influence processes (Bass, 1985), which, according to several researchers, undermines the positive effects of leadership in VUCA/BANI environments. For instance, the objective of transformational leadership to deliver explicit instructions and articulate an inspiring vision necessitates the leader's accuracy in forecasting the future (Wanasika and Krahnke, 2018; Wong and Chan, 2018).

Thirdly, the Servant Leadership Behavior Scale (SLBS-35) and its abbreviated version, the SLBS-6, serve as the empirical foundation for trust-based leadership due to their status as among the most comprehensive and psychometrically validated instruments for assessing servant leadership. The SLBS-35 delineates six interconnected dimensions: Voluntary Subordination, Authentic Self, Covenantal Relationship, Responsible Morality, Transcendental Spirituality, and Transforming Influence (Sendjaya, Sarros and Santora, 2008; Sendjaya *et al*., 2019). These dimensions offer a sufficiently comprehensive

foundation for evaluating ethical, relational, and developmental behavioral models of trust cultivation. Furthermore, they are directly aligned with mechanisms that have been demonstrated to influence trust (Dannhauser and Boshoff, 2006; Saleem *et al*., 2020; Klemp, 2023).

Within the FRL framework, trust-based leadership constitutes the foundational basis and initial step for the entire model, as it establishes the psychological safety and moral groundwork that facilitate the development of the subsequent components F2-F4 enabling the organization to maintain high levels of innovation, a consistent vision of goals, facilitate continuous renewal, and promote a growth-oriented mindset. Empirical research consistently demonstrates that trust and ethics enhance adaptation, innovation, and the efficacy of strategic change (Schaubroeck, Lam and Peng, 2011; Kodama, 2019). Trust, therefore, functions as a stabilizing mechanism amidst uncertainty and anxiety, aiding leaders and subordinates in managing uncertainty constructively.

2.5.2 Continuous Personal Learning (F2)

The second domain of the FRL model, continuous personal learning, delineates a leader's readiness and capacity to adapt, develop, and revise their cognitive frameworks even amid VUCA/BANI conditions, where persistent change is prevalent. Under such conditions, information remains incomplete, problems are often ambiguous, and solutions must frequently be discovered through experimentation. The effectiveness of leadership is profoundly influenced by a leader's willingness and ability to learn at a pace exceeding the environmental changes. This domain emphasizes personal learning rather than organizational learning systems. It encompasses aspects such as feedback orientation, cognitive flexibility, awareness of biases, and intentional skill development.

Research in leadership and organizational psychology demonstrates that a leader's capacity for learning is a fundamental determinant of their ability to adapt within complex

environments. Ployhart and Bliese (2006) define adaptability as a construct that encompasses a learning orientation, openness, and the capacity to modify cognition and behavior in response to evolving demands. Their findings endorse the perspective that leaders who proactively revise their mental frameworks and pursue new information tend to perform more effectively under volatile conditions (Ployhart and Bliese, 2006). Similarly, Boylan and Turner (2017) demonstrate that cultivating organizational adaptability necessitates that leaders serve as role models for personal learning, challenge obsolete assumptions, and cultivate a capacity for ongoing reassessment (Boylan and Turner, 2017).

This domain also encompasses perspectives on adaptive leadership, where learning functions as a core mechanism for adaptation. Heifetz (1994) underscores that adaptive challenges necessitate leaders to critically assess established assumptions, recognize conflicting viewpoints, and facilitate and steer others towards cultivating an experimental culture (Heifetz, 1994). Northouse (2019) similarly emphasizes that the effectiveness of adaptive leadership depends on the leader's willingness to face discomfort, engage in self-reflection, and continually adapt their behavior based on new knowledge and insights (Northouse, 2019). These principles are consistent with the behavioral expectations delineated in the FRL framework. Leaders are required not only to foster an environment conducive to learning among others but also to embody a commitment to continuous self-improvement.

The domain of continuous personal learning encompasses measurable elements derived from validated assessment tools. The Feedback Orientation Scale (FOS) conceptualizes feedback-seeking as a disposition that involves clarity, accountability, and the perceived utility of feedback (Linderbaum and Levy, 2010). Leaders with high scores in feedback orientation demonstrate greater self-regulation, improved decision-making,

and stronger developmental trajectories. Similarly, the BiAS scale measures simplification, verification, and regulation biases when facing ambiguous, high-stakes ethical dilemmas where there is no single right answer (Watts *et al*., 2020). For leadership it is important to detect cognitive tendencies that can blind otherwise capable leaders to the ethical implications of their decisions. This helps to prevent ethical scandals and improve the quality of ethical judgment.

This domain includes also principles of deliberate practice, emphasizing that leaders must actively cultivate new leadership and other skills to keep them relevant rather than rely solely on accumulated experience. Research on skill development demonstrates that improvement requires purposeful, structured practice combined with clear feedback loops (Ericsson, Krampe and Tesch-Römer, 1993). This initiative aims to promote the acquisition of new skills and the cessation of outdated and detrimental leadership behaviors that are no longer appropriate in a rapidly evolving and technologically advanced environment.

Continuous personal learning constitutes the cognitive and developmental foundation for future-ready leaders, facilitating strategic navigation (F3) and growth through value creation (F4).

2.5.3 Strategic Navigation (F3)

The third domain of the FRL model is strategic navigation. It delineates a leader's capacity to comprehend complex environments, tolerate uncertainty, and strategically direct an organization amidst a continuum of change. While the antecedent domains underscore ethical principles (F1) and individual learning ability (F2), strategic navigation concentrates on cognitive and strategic competencies essential for an organization to function sustainably and efficiently in an environment characterized by scarce information and rapid fluctuations, rendering long-term linear planning highly uncertain. In VUCA and

BANI contexts, leaders must maintain goal flexibility, recalibrate direction as necessary, and steer the organization through uncertainty.

The core competency of this domain is strategic sensemaking. Traditional strategy tools assume the world is fundamentally ordered, knowable, and driven by rational, intentional actors. These assumptions are invalid in many modern contexts requiring new skills and mindset for more efficient sensemaking (Weick and Weick, 1995; Kurtz and Snowden, 2003). Leaders who are skilled and engage deeply in sensemaking are better equipped to detect emerging threats and opportunities, integrate diverse information sources, and formulate more efficient strategic hypotheses.

Strategic navigation also encompasses a leader's capacity to tolerate ambiguity, which is consistently highlighted as a fundamental prerequisite in environments characterized by uncertainty. Cognitive adaptability, along with the ability to act persistently and efficiently in ambiguous situations, constitutes a challenging yet critically essential competence. In the absence of tolerance for ambiguity, leaders are prone to oversimplification, premature conclusions, or inflexible adherence to obsolete thinking paradigms (Syamsir, Saputra and Mulia, 2025). This type of leader behavior is detrimental in intricate and dynamic circumstances that necessitate swift and recurrent adjustments.

Another essential element of this domain is directional flexibility. This means the ability to maintain strategic focus while adjusting plans as new insights emerge. In an era characterized by uncertainty and disruption, leaders must perceive strategy as an iterative experiment rather than a fixed plan (Uhl-Bien and Arena, 2018). Effective leadership in such circumstances relies on cycles of action, observation, feedback, and recalibration. Likewise, Boylan and Turner (2017) demonstrate that organizational adaptability is enhanced when leaders are capable of balancing conviction and flexibility, and are willing

and able to revise their assumptions to incorporate new information from the environment (Boylan and Turner, 2017).

Strategic Navigation is further supported by the leader's learning-by-doing mindset. Research on adaptive leadership underscores that experiments, pilot projects, and reversible decisions enable leaders to evaluate hypotheses within real-world environments (Heifetz, 1994; Northouse, 2019). Such iterative experimentation holds particular value in nonlinear contexts, where minor interventions can lead to disproportionately significant effects.

Furthermore, the domain encompasses change stamina, which refers to the emotional and cognitive flexibility required to sustain strategic focus and implement modifications. In VUCA and BANI environments, change is not treated as a finite project but rather as an ongoing state, with repeated changes anticipated. It is imperative for the leader to recognize the organization's capacity for change and to enhance it accordingly. The leader's personal resilience, perseverance, optimism, and emotional regulation are crucial when guiding organizations in the midst of uncertainty (Boylan and Turner, 2017; Syamsir, Saputra and Mulia, 2025).

2.5.4 Expansion by Value-Creation (F4)

The fourth domain of the FRL framework is Expansion by Value-Creation. It reflects outward-facing capabilities and behaviors that focus on growth and expansion through value creation. Growth and expansion are not ends in themselves, but rather occur through creating value for customers, employees, and the broader ecosystem. A disciplined commitment to value creation ties the pursuit of growth to ethical choices (F1), continuous personal development (F2), and brings meaning to strategic navigation (F3).

Banks et al. contend that contemporary leadership necessitates generating value within digital ecosystems, rather than solely focusing on optimizing internal operations

(Banks *et al*., 2022). This is comprehensible in the context of today's era, in which digital technology is advancing at a rapid pace and possesses significant potential for creating additional value. A leader must be capable of recognizing the opportunities presented by emerging technologies and converting them into business benefits. Research on leadership in the digital age underscores that the ongoing technological transformation constitutes not merely a technical challenge but also a strategic one (Banks *et al*., 2022). Trenerry et al. (2021) similarly contend that digital transformation necessitates leaders to oversee multi-tiered technological, cultural, and organizational elements in order to sustain competitiveness (Trenerry *et al*., 2021). These findings indicate that effective leaders should possess a curiosity for technology and the capacity to identify opportunities for substantial value generation. Leaders who fail to stay abreast of technological advancements or who exhibit enthusiasm for technology merely for its own sake may potentially undermine the organization.

Creating added value in contemporary organizations increasingly depends on the leader's capacity to operate across diverse ecosystems and collaborative networks. These encompass partnerships, clients, complementary actors, and even competitors. In structured environments, value is derived from efficiency, optimization, and expertise, where competition primarily involves rivals. Conversely, in complex environments, value is generated through effectiveness, adaptability, and innovation. Competition entails the ability to sense and influence emerging patterns more swiftly than others (Kurtz and Snowden, 2003). In complex VUCA/BANI environments competition is less against rivals and more to detect and remove growth obstacles hindering to add value.

Creating added value necessitates an internal culture of innovation, wherein employees feel psychologically secure to experiment, share ideas, and challenge established assumptions. Psychological safety, reinforced by F1’s trust-based leadership,

underpins an innovative organizational culture (Hu and Liden, 2011; Liden *et al*., 2014). Adaptive leadership research also emphasizes experimentation and innovative problem-solving in uncertain circumstances (Heifetz, 1994; Northouse, 2019).

This domain also considers a leader's comprehension and motivation towards achieving profitable and sustainable expansion. Yukl and Mahsud (2010) contend that effective leadership within complex environments necessitates balancing growth initiatives with resource limitations and long-term sustainability (Yukl and Mahsud, 2010). Practically, this entails managing ongoing operations, fostering innovation, and maintaining a growth orientation. Such a perspective is corroborated by research on strategic adaptability, which indicates that organizations must reconcile opportunity seeking with operational profitability (Boylan and Turner, 2017). Some innovations may also be perceived as disruptive, and that is not a reason to reject them. From this perspective, creating added value involves not only innovating, but also ensuring that innovations contribute to long-term stability, both operationally and financially.

2.6 Summary and Identified Research Gap

2.6.1 Need for a Holistic and Measurable FRL Framework

Current leadership research is extensive, encompassing numerous theories and paradigms. Particular emphasis is placed on servant, adaptive, and transformative leadership, as well as leadership within the digital age. Additional prominent and emerging research domains connected to this theme include Authentic Leadership, Ethical Leadership, Leader-Member Exchange (LMX) Theory, Distributed or Shared Leadership, Complexity Leadership Theory, and Strategic Leadership. As previously mentioned, these and various other frameworks are generally beneficial within specific contexts but are limited when viewed from a holistic leadership perspective. In the VUCA/BANI era,

however, leaders must possess the capability to simultaneously and harmoniously integrate multiple dimensions.

Furthermore, current leadership models are frequently highly abstract, a characteristic that is academically justified; however, it hampers their practical application in real leadership scenarios. This discrepancy between theory and practice is extensively documented in leadership research (Zaccaro and Horn, 2003; Middlehurst, 2008; Reichenpfader, Carlfjord and Nilsen, 2015). Leadership research has encountered difficulties in developing metrics that sufficiently encapsulate the complexity and variability inherent in leadership behavior. In the absence of precise behavioral indicators, organizations encounter obstacles in evaluating leadership influence and effectiveness, diagnosing developmental requirements, or substantiating interventions.

The Future-Ready Leadership (FRL) framework addresses these challenges by integrating four distinct yet interdependent core leadership competencies that are increasingly vital in disruptive VUCA/BANI environments. By structuring these competency domains within a cohesive framework, FRL seeks to mitigate the fragmentation of leadership models and establish a robust theoretical and practical foundation for leaders prepared for the future.

2.6.2 Lack of Validated Behavioral Measurement Tools (BARS)

Many widely utilized leadership assessment tools primarily rely on self-evaluations or questionnaires completed by followers, which gauge perceptions or general tendencies rather than tangible, observable behaviors. Scholars have cautioned that this dependence may introduce systematic biases, particularly as self-evaluations may be affected by social desirability bias, and subordinate ratings can be influenced by their idealized perceptions of leadership, potentially not accurately representing the leader's actual conduct (Moorman and Podsakoff, 1992; Peck and Hogue, 2018).

Behaviurally Anchored Rating Scales (BARS) present a promising alternative as they delineate concrete and observable behaviors within real-world contexts. This approach facilitates a more consistent and accurate assessment of leadership across different raters and settings (Campbell *et al*., 1973; Schwab, Heneman and DeCotiis, 1975; Jacobs, Kafry and Zedeck, 1980). The BARS scale is regarded as more objective and dependable because it is founded on tangible behavioral examples rather than on abstract numerical Likert scales (Marin-Garcia, Bayarri and Huerta, 2015).

Despite their psychometric strengths, BARS scales are laborious and costly to develop. The development of high-quality behavioral measures necessitates expert input, iterative refinement, and typically spans several months of work (Marin-Garcia, Bayarri and Huerta, 2015). This may explain why only a limited number of BARS measures have been developed for leadership assessment, and why even fewer have undergone systematic content validation, factor analytic testing, or assessments of generalizability. The absence of such tools has created a substantial methodological gap in leader evaluation, particularly in endeavors aiming for objectivity, including assessments of individual leaders. The FRL framework was explicitly designed from its inception to be used with behavioral indicators.

2.6.3 Summary of Research Gap Leading to Instrument Development

The preceding sections highlight one conceptual gap and one methodological gap that together create a clear need for developing a new behavioral instrument for Future-Ready Leadership (FRL). Conceptually, contemporary leadership theories remain fragmented and are primarily designed for relatively stable conditions.

Also methodological gap is equally significant. Most leadership assessments are vulnerable to the influence of social approval, commonly referred to as the halo effect. Consequently, there is presently no validated behavioral instrument that delineates leadership in a manner that is simultaneously comprehensive, behaviorally grounded,

psychometrically reliable, and aligned with contemporary leadership theories and the requirements of a disruptive era.

CHAPTER III:
METHODOLOGY

3.1 Overview

The development and validation of the FRL framework necessitate a research design that addresses two interconnected issues. Firstly, the requirement to construct a conceptual model that aims for holisticity. Secondly, to implement a measurement approach that minimizes assessment biases while remaining straightforward to execute. Additionally, during the pilot phase of this study, it was observed that the traditional Likert scale is highly vulnerable to the halo effect, thereby limiting the diagnostic value of the results, particularly at the individual level. This observation prompted a transition to a behaviorally-based rating scale (BARS), wherein observable behavior constitutes the basis for assessment, thereby mitigating the halo effect and enabling more discriminative psychometric modeling.

The methodological challenge, therefore, was not only to validate the new leadership framework but also to develop an instrument suitable for use as a support tool, for example, in manager recruitment. It must withstand multi-disciplinary structural testing and validity assessment by comparison with other already validated scales. Additionally, it must be capable of identifying the leadership profile. Addressing this challenge required a multi-stage research strategy: selection of leadership domains based on management research and literature, preliminary formulation of questions and answer options, content validation by experts, extensive structural analysis, and subsequent validation through comparison with other validated scales. This chapter delineates in detail the methodological logic guiding these steps and the procedures employed to ensure that the final instrument offers a reliable, valid, and practically applicable FRL tool.

3.2 Conceptualization and Operationalization

The decision to redesign the FRL model using Behaviorally Anchored Rating Scales (BARS) follows the classical methodological tradition established by Smith & Kendall and formalized by Campbell et al., who demonstrated that BARS reduces halo effects, increases rater accuracy, and enables assessments based on concrete behavioral cues rather than impressions (Smith and Kendall, 1963; Campbell *et al*., 1973).

The operationalization of the BARS-based FRL model began with the development of a structured construct-to-item mapping system. Each domain and subdomain was defined and documented in a hierarchical specification. This specification served as the formal blueprint for item generation by linking theoretical constructs to their behavioral expressions. For every domain was specified:

(a) the conceptual definition

(b) theoretical sources

(c) distinctiveness relative to other domains, and

(d) multiple subdomains with detailed behavioral descriptions.

These structured subdomains provided the foundation for developing behavioral indicators. For each subdomain, three observable behaviors were derived directly from its description and academic rationale. This mapping ensured that item creation was driven by conceptual coverage and that each behavioral indicator represented an intentional and theoretically justified component of the construct.

The behavioral indicators were established through the application of structured rules for formulating questions and answer options. These guidelines ensured linguistic clarity, behavioral specificity, and conceptual consistency across various disciplines and leadership roles. The subsequent rules were employed in the formulation of the questions and answers options:

- The question or situation description should be short (less than 20-22 words) and generalizable. Items were written to apply to leaders across functions, industries, and organizational levels, avoiding jargon, double-barreled phrasing, and ambiguous constructs.
- Both questions and answers describe what leaders do, rather than what they believe, prefer, or value.
- Social desirability bias should be avoided. Lower-level responses were designed to reflect understandable leadership behaviors under pressure rather than incompetence e.g., avoiding conflict or to maintain workflow. Higher-level responses emphasized increased scope and impact, not heroism.
- Response options followed a developmental ordered structure in behavioral sophistication:
    - Level 1: Avoidance or defensive coping
    - Level 2: Basic, low-effort compliance
    - Level 3: Active and intentional engagement
    - Level 4: Systematic, planned behavior
    - Level 5: Transformational influence with extra effort
- Successive levels were written to reflect incremental and equal psychological distance in behavioral complexity, ensuring that the scale functioned as an interval-level measure appropriate for statistical modeling.

The response options were randomly presented to survey participants to prevent their ascending order from being immediately apparent.

3.3 Research Design

3.3.1 Overall Research Design Logic

The overall logic of the research design reflects an instrument-development pipeline. The pilot phase revealed challenges, which led to a transition to a Behaviorally Anchored Rating Scale (BARS) as the research methodology. Subsequently, the development and validation of the BARS scale content were undertaken, with expert assistance to ensure conceptual accuracy and representativeness. In the third phase, a comprehensive questionnaire survey was administered on a large scale, during which the structural properties of the model were analyzed, the latent domain structure was examined, and reliability assessments were performed. Lastly, the model was validated through comparisons with other scales that have already been validated.

The hypotheses delineated in Chapter I implicitly guided the methodology and sequence of the study. The structural hypotheses (H1-H2) necessitated a sufficiently extensive and diverse dataset to evaluate latent constructs. The reliability hypothesis (H3) mandated a stable instrument with consistent behavioral anchors. The profiling hypothesis (H4) required domain-specific scores appropriate for pattern analysis. The external validity hypothesis (H5) involved the collection of comparative data on established reference scales. Consequently, the research design assured that each empirical phase generated the requisite data of appropriate quality to test the hypotheses.

Also, the analytical strategy was aligned with the study's hypotheses.

- Hypotheses H1 and H2 were examined through a combination of Confirmatory Factor Analysis (CFA) and composite-based structural modeling to evaluate the internal structure of the FRL domains.

- Hypothesis H3 was assessed using reliability analyses, including omega coefficients and Generalizability Theory estimates. These evaluate the stability and score quality of domains and subdomains.
- Hypothesis H4 was tested using cluster analysis to explore whether distinct leadership profiles emerged from the FRL domain scores.
- Hypothesis H5 was evaluated through external validity analyses, including polyserial correlations and structural equation modeling (SEM). These determine the nomological and discriminant relationships between FRL domains and established leadership and psychological constructs.

3.3.2 Phase 1: Pilot Study

The initial empirical phase was executed as a pilot study, with the objective of examining the appropriateness of existing leadership and cognitive behavioral assessment tools for incorporation into the Future-Ready Leadership (FRL) framework. The pilot also assessed an initial prototype predicated on the 37-item FRL Likert scale. A total of 199 leaders and supervisors from various organizations participated in this pilot. The response count was adequate to facilitate a definitive analysis. Participants completed a preliminary FRL-37 questionnaire along with six established scales self-assessments:

- Global Transformational Leadership Scale (GTL-7) (Carless, Wearing and Mann, 2000)
- Digital Leadership Scale (DLS-21) (Abbu *et al*., 2025)
- Servant Leadership Behaviour Scale (SLBS-35) (Sendjaya, Sarros and Santora, 2008)
- Decision Biases in the Context of Ethics Scale (BiAS-32) (Watts *et al*., 2020)
- Feedback Orientation Scale (FOS-20) (Linderbaum and Levy, 2010)

The pilot phase was not designed to carry out definitive psychometric validation; rather, its purpose was to establish an empirical foundation for the instrument's development. An especially notable observation during the pilot study was the presence of a discernible halo effect in the initial FRL-37 instrument. Consequently, this prompted a revision of the FRL model utilizing the BARS scale. The data collected from the pilot study were thereby utilized solely for the purpose of developing more concise questionnaires for phase 5, where the outcomes of the actual FRL model are to be compared with other validated instruments scales.

3.3.3 Phase 2: Instrument Redesign Using BARS

Based on the limitations observed in the pilot study, the initial 37-item Likert-format FRL instrument was redesigned entirely using Behaviorally Anchored Rating Scales (BARS). Each domain was divided into theoretically grounded subdomains, and each subdomain was represented by three behaviorally specific items, each accompanied by five anchor levels.

Item construction followed the operationalization principles and item-writing rules described in Section 3.2. The resulting 63-item FRL-model using BARS was then prepared for expert content validation in Phase 3.

3.3.4 Phase 3: Expert Content Validation (CVA)

Following the redesign of the FRL items into a behaviorally anchored format, a two-round expert Content Validation Analysis (CVA) was conducted. The purpose of CVA is to ensure linguistic clarity, conceptual accuracy, and representativeness in management, as assessed by experts.

The expert panel comprised seven members, representing a balanced spectrum of academic expertise, professional proficiency, and practical management skills. The panel

included a professor of management, a human resources director, a subject-matter specialist, a doctoral management expert, and three senior managers.

Experts assessed all 63 FRL mini-scenarios/questions along with their corresponding five response options. The evaluation standards adhered to established practices (Polit, Beck and Owen, 2007):

1. Conceptual relevance (alignment with the intended subdomain)
2. Clarity (precision and unambiguity of the anchor descriptions)
3. Representativeness (coverage of meaningful leadership behavior within the subdomain)

Responses followed a 4-point ordinal scale with no neutral midpoint, consistent with (Aiken, 1985; Lynn, 1986) recommendation for CVI:

1 = Not relevant / Not clear / Not representative

2 = Somewhat relevant / Needs major revision / Some gaps

3 = Quite relevant / Clear with minor edits / Reasonably representative

4 = Highly relevant / Very clear / Clearly representative

The experts conducted the evaluation independently utilizing an online form. They assigned both a quantitative rating and a qualitative comment to each criterion. Following the evaluation process, the assessments provided by the experts were analyzed. Six questions failed to meet the established quality criteria and were consequently reformulated.

The secondary validation phase comprised six reformulated questions along with their respective answer choices. This evaluation was carried out in a manner consistent with the initial round, utilizing identical evaluation criteria. All six questions successfully satisfied the predetermined quality standards.

3.3.5 Phase 4: Main Validation Survey

The main validation survey constituted the central empirical phase of the study. The survey was completed by 392 respondents. To ensure high-quality responses, responses were screened based on predetermined exclusion criteria, including:

- The survey was either incompletely or only partially completed.
- Responses were submitted in an excessively rapid manner.
- The normalized standard deviation, which indicates the inconsistency of responses within the same subdomain, exceeded 0.6.

Alongside the profile information, the survey encompassed 63 FRL items, each offering five response options. These response options were presented in a randomized sequence, thereby obscuring their mutual order.

Item functioning and ordered-category assessment were conducted using the Graded Response Model (Samejima, 1968), which is the most widely accepted IRT model for polytomous ordinal data (Flora and Curran, 2004; Embretson and Reise, 2013). Threshold ordering, category probability curves, and item information curves were interpreted according to psychometric standards (Baker, 2002; Embretson and Reise, 2013). Interpretations of threshold distances and category functioning follows the Rasch-family guidance (Masters, 1982; Linacre and others, 2002).

3.3.5 Phase 5: External Validation Survey

The concluding empirical phase concentrated on validating the external validity of the FRL model through a comparative analysis with other established scales. An invitation to participate in the survey was extended to all 366 participants from the preceding phase, of whom 287 responded.

The external validation survey incorporated the following established measures as well as abbreviated versions of longer forms measures:

- GTL-7 - Global Transformational Leadership Scale
- DLS-7 - Short form of the Digital Leadership Scale
- SLBS-6 - Short form of the Servant Leadership Behaviour Scale
- BiAS-9 - Short form of the Decision Biases in Ethical Contexts scale
- FOS-8 - Short form of the Feedback Orientation Scale
- CSE-12 - Core Self-Evaluations Scale
- LGO-4 - Learning Goal Orientation short scale

These measures were selected because they are theoretically related to the FRL domains.

3.4 Preparing shortened versions of scales

During the external validation phase of the study, several validated leadership and psychological scales were incorporated. To prevent respondent fatigue and ensure the integrity of responses, three condensed scales, FOS-8, BiAS-9, and DLS-7, were specifically developed for this research. It is important to note that these abbreviated versions are not intended nor validated for general application beyond this study.

The original 20-item Feedback Orientation Scale was reduced to eight items to ensure efficient administration while maintaining coverage of the four underlying dimensions: Utility, Accountability, Social Awareness, and Feedback Self-Efficacy (Linderbaum and Levy, 2010). Item selection was based on corrected item-total correlations, inspection of factor loadings, and content representativeness. A balanced two-items-per-subscale structure was used to preserve theoretical fidelity.

The original 21-item Human-Centric Digital Leadership Scale assesses seven distinct dimensions (Abbu *et al*., 2025). A seven-item short form was created by selecting the strongest item from each dimension. Item selection followed quantitative criteria including item-total correlations, primary factor loadings, and avoidance of cross-loadings,

supplemented by content considerations to ensure representativeness. The resulting DLS-7 retains the conceptual breadth of the full measure while reducing respondents time.

The original 32-item Decision Biases in Ethical Context Scale was reduced to a nine-item short form representing its three conceptual domains: Simplification, Verification and Regulation (Watts *et al*., 2020). Item selection was guided by an item information analysis, corrected item-total correlations, and theoretical coverage. Reverse-scored items were retained.

3.5 Data Collection

All data were collected through self-reported online surveys administered via the Prolific research platform. Each empirical phase employed distinct survey links and recruited participants who satisfied predetermined eligibility criteria. Respondents were required to possess current or recent management or supervisory experience. Prior to participation, individuals provided informed consent for the use of their responses in academic research. Participants received a modest compensation in accordance with Prolific's remuneration policies.

Data were collected in three phases: a pilot study, a main validation survey, and an external validation survey. All surveys adhered to identical meticulous protocols concerning anonymity, voluntary participation, and data security. Quality control of responses was conducted immediately following data collection.

3.6 Statistical Analysis Procedures

All statistical analyses were conducted using a custom command-line interface (CLI) tool which utilized both python and R libraries and scripts. Python was used primarily for data preprocessing, answer quality diagnostics, and automation of item-level computations. R was used for structural modeling, reliability estimation, and validity testing. This statistical analysis approach ensured flexibility and computational efficiency.

3.6.1 Measurement Stance

Leadership is understood as a multifaceted and holistic competence. Therefore, the FRL model assesses broad leadership competencies using multiple behaviorally anchored indicators, and the study adopted a composite-oriented measurement stance (Cronbach and Gleser, 1957). Consistent with the theoretical intent of FRL, the analytical strategy adopted a bandwidth-first measurement stance, prioritizing broad behavioral coverage and domain representativeness over maximization of internal consistency. Each FRL-domain is treated as a composite of its subdomains. Each subdomain is conceptualized as a bandwidth-oriented composite formed from three distinct behavioral indicators. Therefore leadership behaviors within a domain are meaningfully related but not interchangeable. Accordingly:

- Unit-weighted means were used for scoring at item → subdomain → domain levels.
- Internal consistency was not required to be high, as redundancy would contradict the conceptual design.
- Analyses combined composite-validity evidence (e.g., collinearity checks, discriminant validity, redundancy analysis) with reflective checks (e.g., ordinal CFA) reported transparently but interpreted appropriately for this measurement model.
- This stance aligns with modern recommendations on complex behavioral concepts such as holistic leadership models.

Treating leadership domains F1-F4 as composites rather than reflective latent factors is consistent with recommendations by Bollen & Bauldry (2011), who argue that formative or composite constructs are appropriate when indicators represent non-interchangeable aspects of a conceptual whole (Bollen and Bauldry, 2011). This approach aligns also with classical views of construct validation emphasizing substantive meaning

and theoretical coherence over narrow item homogeneity (Loevinger, 1957). Causal indicators are not expected to be interchangeable or highly correlated, because each taps a different part of the construct. They share conceptual unity but do not need psychometric unity.

3.6.2 Data Preparation and Quality Diagnostics

The raw datasets were processed using Python to calculate several respondent-level quality indicators, including:

- missing data patterns
- intra-respondent variability
- person-level elevation (leniency/severity)
- normalized standard deviation (NSD) across responses

Cases with NSD > 0.6 or other signs of careless responding were excluded before any modeling. This process ensured that only high-quality data were used for structural estimations.

3.6.3 Evaluation of BARS Functioning

Because FRL uses Behaviorally Anchored Rating Scales (BARS), item functioning was examined before structural evaluation modeling:

- Category usage and distributions
- Monotonicity checks to ensure higher categories reflected higher behavioral readiness
- Threshold ordering with ordinal IRT models, such as graded response or partial credit model
- Item-subdomain associations using polyserial item-total correlations

These analyses ensured that the anchors performed in a manner consistent with their intended developmental progression.

3.6.4 Internal Structure Assessment

Internal structure was evaluated using both composite-friendly and reflective-style methods. Composite-Oriented Structural Assessment was used as the primary approach:

- Confirmatory Composite Analysis (CCA) was used to model subdomains as composites of items and domains as composites of subdomains.
- Variance Inflation Factors (VIF) were used to assess collinearity among indicators.
- HTMT ratios among domain composites provided evidence of discriminant validity (Henseler, Ringle and Sarstedt, 2015).
- Redundancy validity was evaluated using theoretically relevant external criteria (e.g., feedback orientation for learning-related subdomains).

CCA was conducted using variance-based partial least squares modeling (Thompson, 1984; Hair *et al*., 2021; Hair Jr *et al*., 2023). As composite models do not assume a common-cause latent variable, global covariance fit indices were not evaluated (Diamantopoulos and Winklhofer, 2001). Model assessment focused on indicator collinearity, composite adequacy, and cross-domain distinctiveness.

Initial composite models were estimated using larger indicator sets. However, solutions with more than 24 indicators showed increasing estimation instability and unfavorable indicator-to-sample ratios. With the available sample size, a 24-item configuration with six indicators per domain was selected as the largest empirically stable solution that preserved domain coverage while maintaining reliable composite estimation.

Exploratory Graph Analysis (EGA) was used as an initial data-driven method for identifying the dimensional structure of the item pool based on network estimation principles (Golino and Epskamp, 2017).

Ordinal CFA was used as a secondary measurement for transparency, and it was conducted separately for each domain using WLSMV estimation in R:

- correlated subdomains (each reflective with three items)
- assessment of factor loadings and model fit (CFI, TLI, RMSEA, SRMR)
- examination of modification indices to identify local dependencies

Given the deliberately heterogeneous nature of behavioral indicators, modest internal consistencies and varied loadings were expected and deemed theoretically appropriate.

To rule out the possibility that domain scores reflected a single "ideal leader" tendency, a halo and common-rater checks were added to selected CFA models:

- a random-intercept (person) factor
- or a latent methods factor

The use of ordinal CFA with WLSMV estimation is aligned with best practices for categorical indicators (Muraki, 1992; De Ayala, 2009). CCA follows modern measurement recommendations for bandwidth-oriented constructs, where indicators are not interchangeable.

3.6.5 Reliability and Score Quality

Multiple reliability frameworks were used to reflect the composite nature of the measure:

- Composite reliability (omega total) for subdomains and domains
- McDonald's ω and Cronbach's α for transparency, interpreted in the context of intended breadth
- Generalizability Theory (G-study) to estimate variance components across persons and items, and to generate G-coefficients for domain-level scores (Cronbach, 1972; Brennan, 2021)

- Bifactor-based indices, including omega hierarchical and Explained Common Variance (ECV), to evaluate multidimensional influences

This combination provided a robust picture of score stability and conceptual coherence.

Reliability estimation followed (McDonald, 2013) omega framework, which is preferred for multidimensional and congeneric scales. It was complemented with Generalizability Theory (Shavelson and Webb, 1991) to evaluate variance components across persons and items. To evaluate the presence or absence of a dominant general factor bifactor indices ωh and ECV were interpreted (Reise and Waller, 2003).

3.6.6 Measurement Invariance and Differential Item Functioning

To assess the stability of the FRL structure across groups (e.g., gender), multi-group ordinal CFA was conducted:

- configural model
- threshold and loading equality
- intercept/mean equality where feasible

Because strict invariance was not attainable, partial invariance was used to ensure interpretability of domain comparisons. The multi-group invariance testing procedure followed the widely used recommendations (Vandenberg and Lance, 2000; Millsap, 2012). Configural and metric invariance were treated as essential prerequisites while applying partial scalar invariance when full invariance is not theoretically expected for behavioral indicators.

Differential item functioning (DIF) was examined to identify items exhibiting group-specific bias after controlling for the latent trait (Zumbo, 1999).

3.6.7 External Validity and Nomological Network

External validity was evaluated using the Phase 5 survey dataset. The use of convergent and discriminant validity through correlations and SEM follows classical psychometric validation procedures and is still the standard practice in modern organizational measurement (Cronbach and Meehl, 1955). Analyses conducted in R included:

- polyserial and Spearman correlations between FRL domains and external measures (GTL-7, DLS-7, SLBS-6, BiAS-9, FOS-8, CSE-12, LGO-4)
- multiple regression and SEM-based models examining incremental validity
- unique predictive variance contributed by FRL domains over and above established leadership measures

These analyses tested convergent, discriminant, and criterion-related validity as specified in Hypothesis 5.

3.6.8 Profile Identification (H4)

To explore whether FRL domain scores produced distinct leadership readiness profiles, K-means clustering was conducted using domain-level composites using the adjusted Rand index (ARI), a chance-corrected measure of agreement between clustering solutions (Steinley, 2004). Model selection relied on:

- within-cluster sum of squares
- elbow plots
- silhouette scores
- interpretability and theoretical coherence
- entropy $\geq .80$ as an indicator of meaningful profile separation

This analysis was guided by a person-centered perspective, emphasizing patterns of domain configurations rather than variable-level effects (Meyer and Morin, 2016).

3.7 Ethical considerations

All study procedures adhered to established ethical academic standards for research involving human subjects. Participation in all phases of the study was entirely voluntary. Respondents were duly informed of the study's purpose, the nature of the tasks, details about the study organizer, and their right to withdraw at any time without penalty. Informed consent was secured prior to participants completing the questionnaire.

Data collection was conducted using the Prolific platform, which guarantees participant anonymity. The platform facilitates the recruitment of individuals who satisfy the specified eligibility criteria. No personal information was obtained from participants. All responses were processed and stored anonymously. Data security was maintained in accordance with industry best practices. Participants received a modest monetary compensation consistent with Prolific's recommendations.

The study involved no deception and no manipulation. The risk associated with the data was minimal since all responses consisted of self-assessment. The study adhered to the ethical principles and guidelines of both Prolific and the Swiss School of Business and Management (SSBM).

3.8 Methodological Limitations

Several methodological limitations should be considered when interpreting the results of this study. First, self-report questionnaires may introduce potential biases, such as seeking social approval or a tendency to self-aggrandize. To reduce these risks, response quality assessment and halo effect analysis were performed, but these potential biases cannot be completely avoided.

Secondly, recruiting respondents via the Prolific platform may constrain the generalizability of the findings to managers occupying highly specialized roles or

industries. Although the sample was representative of a broad spectrum of sectors, thereby mitigating, but not entirely eliminating, this concern.

Third, the Behaviorally Anchored Rating Scale (BARS) selected for deployment presents methodological challenges. While it was chosen to mitigate the halo effect and enhance behavioral specificity, it simultaneously introduces additional complexities to the analysis. BARS items typically exhibit lower internal consistency due to their intentional heterogeneity. Also reflective analyses (e.g., CFA) must be interpreted accordingly. Therefore, conventional psychometric expectations (e.g., high alpha) are not directly applicable.

3.9 Conclusion

This chapter delineates the methodology employed in the development and investigation of the FRL framework. The research is structured into five empirical phases. A phased approach was adopted to guarantee that each stage yielded the requisite evidence for subsequent phases. For each phase, suitable methods were meticulously selected to systematically evaluate the functionality and validity of the developed FRL model.

The chapter further elaborates on the data collection process, the procedures implemented to verify response quality, and the adaptation of statistical methods to serve the conceptual objectives of the FRL framework. These methodological considerations and decisions establish a transparent foundation for evaluating the psychometric attributes of the FRL framework.

CHAPTER IV:

RESULTS

4.1 Overview of Analytical Strategy

This chapter reports a comprehensive, sequential validation of the Future-Ready Leadership (FRL) framework. Analyses were conducted on N = 366 complete cases with full FRL responses, using 5-point behaviorally anchored rating scale (BARS) items treated as ordinal indicators.

4.2 Phase 2 Expert Analysis CVA Metrics (Content Validity)

Seven experts were recruited to review the FRL items. Content validity was evaluated using the expert-rating method (Lynn, 1986). Each item in the FRL model was quantified using the three recommended indices: the Item-Level Content Validity Index (I-CVI), the Scale-Level Content Validity Index (S-CVI/Ave and S-CVI/UA), and Aiken's V. The results are in Appendix A.

Across the 189 items evaluated, the scale-level indices for all three dimensions were:

- S-CVI/Ave = 1.00 for Clarity, Relevance, and Representativeness
- S-CVI/UA = 0.98-1.00

At the item level, the vast majority of items achieved:

- I-CVI = 1.00 (all experts rated item as ≥3: "quite" or "highly" valid)
- Aiken's V ≥ .80, with only a very small number of items falling below the .75 threshold (e.g., FRL_F1.4_Q3_relevance, V = .72)

These few flagged items were retained for revision and re-evaluation. Six items that did not meet all acceptance criteria in the first round were rewritten and re-evaluated by a new expert panel:

- All six items achieved I-CVI = 1.00 across dimensions

- Aiken's V values improved into the acceptable range (.81-.95)
- S-CVI/Ave and S-CVI/UA reached 1.00 for all dimensions

After revision and re-evaluation, all six rewritten items achieved I-CVI = 1.00 and Aiken's V values in the acceptable range.

4.3 Item Response and BARS Category Diagnostics

4.3.1 Item Reduction (63 → 52 Items)

The original 63-item pool contained 11 items that failed to meet the quality thresholds. Removal decisions were based solely on empirical evidence from the Category Usage and Threshold Diagnostics in the full GRM model (Clark and Watson, 2016; DeVellis and Thorpe, 2022).

Items were removed due to overlapping thresholds, highly skewed category use (e.g., 80-90% concentrated in a single category), low information across θ, low polyserial item-domain correlations ($r < .15$), or apparent redundancy. The retained set comprised 52 items meeting the prespecified diagnostics.

4.3.2 Category Usage, Threshold Ordering and Domain Information

To evaluate whether the FRL BARS response categories functioned as intended, all items were examined using the Graded Response Model (GRM). Category diagnostics focused on three aspects:

a) the distributional use of the five BARS categories
b) the ordering of latent trait thresholds, and
c) the substantive interpretability of the progression between categories.

This analysis was used to evaluate whether respondents used the BARS scale meaningfully and whether the ordered categories reflected increasingly higher levels of the underlying leadership behaviors.

Across the 52 retained items, the five categories were consistently used, with no items exhibiting empty or near-empty categories. Most items displayed a unimodal distribution, with Categories 3-4 used most frequently, with non-trivial endorsement of other categories.

Threshold ordering was evaluated as an indicator of ordinal category functioning. Across the 52 retained items, all four GRM thresholds were strictly ordered and monotonic ($\theta_1 < \theta_2 < \theta_3 < \theta_4$), with no reversals. For example:

- FRL_F1.1_Q1: thresholds at -5.98, -3.35, -0.65, 2.71
- FRL_F1.2_Q2: thresholds at -5.08, -3.12, -0.99, 2.10
- FRL_F1.3_Q2: thresholds at -3.31, -1.58, -0.47, 2.19

These values indicate that:

- Category 1 → 2 transitions occur around $\theta \approx$ -6 to -3.
- Category 2 → 3 transitions occur around $\theta \approx$ -2 to -1.
- Category 3 → 4 transitions cluster around $\theta \approx$ -1 to 0.
- Category 4 → 5 transitions occur at clearly higher levels ($\theta \approx$ 1.9-3.0).

Thresholds were strictly ordered ($\theta_1 < \theta_2 < \theta_3 < \theta_4$) across retained items, with transitions occurring from very low θ for Category 1→2 to higher θ for Category 4→5.

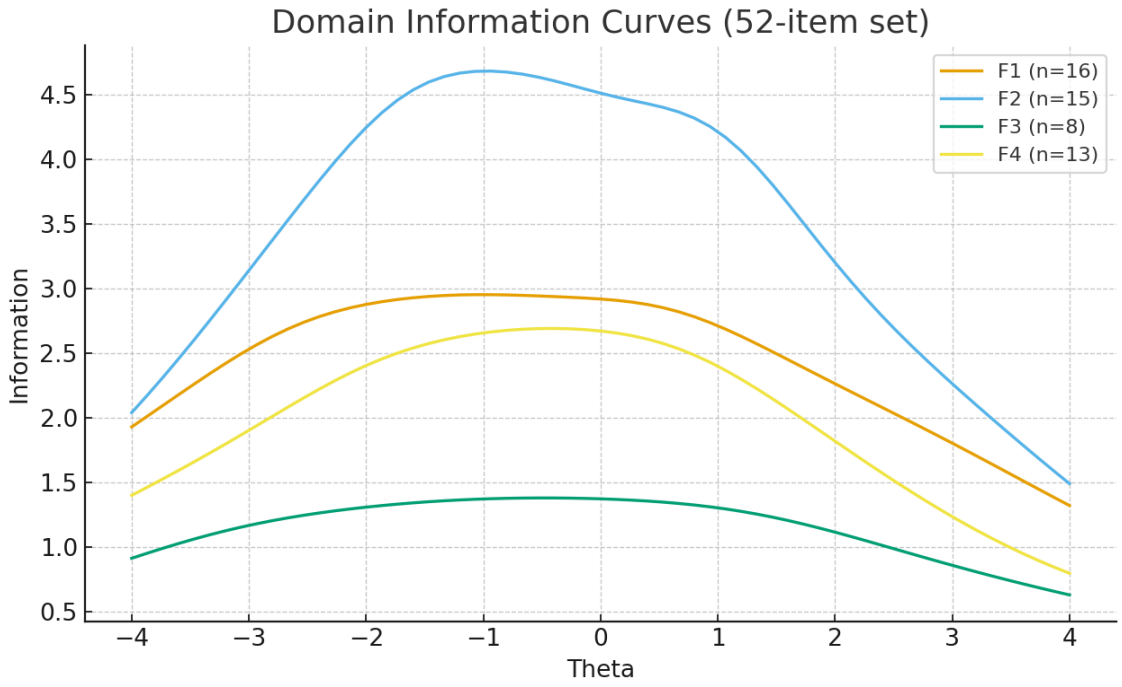

Figure 4.1
FRL Domain Information Curves. Domain information functions peaked in the mid-to-high θ range and showed non-zero information across a broad θ interval.
Source: Author's own calculations

4.3.3 Item Information Curves (IIC)

Item information curves (IICs) were examined to evaluate how effectively the FRL items discriminate among respondents across the latent leadership continuum. Item information varied across θ, with different items peaking at different trait levels.

The IICs demonstrated that items collectively provide broad coverage across the latent trait, with different items contributing information at low, mid, and high θ levels. Items such as FRL_F1.4_Q3 peaked at the lower end of θ. Items like FRL_F3.2_Q2 provided maximal information around $\theta \approx 0$, aligning with the central tendency of the sample. At the higher end, items such as FRL_F2.4_Q1 and FRL_F4.3_Q1 peaked well above $\theta = 1$. Information peaks were distributed across θ rather than concentrated at a single level.

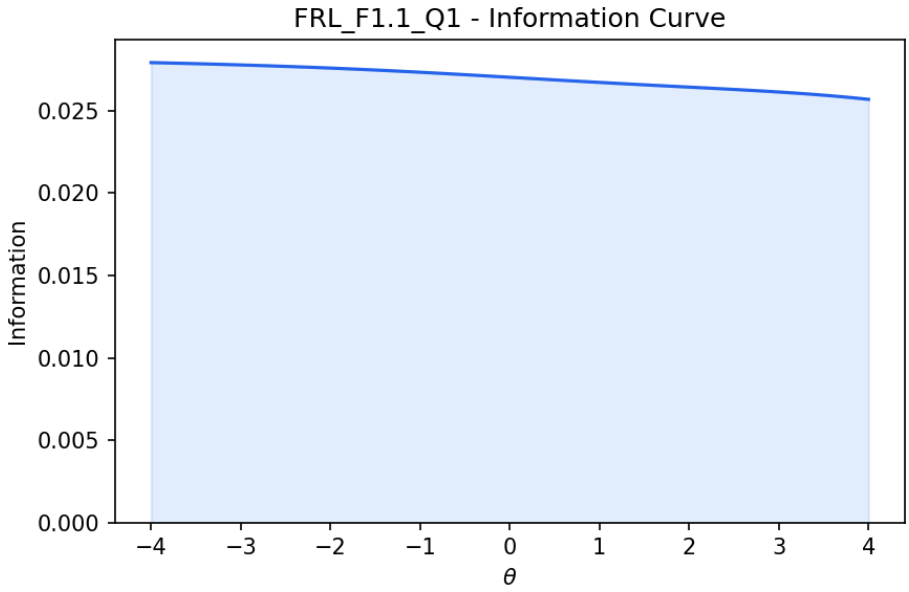

Figure 4.2
Item F1.1 Q1 Information Curve. θ of max information = -4. Information concentrated at lower θ.
Source: Author's own calculations

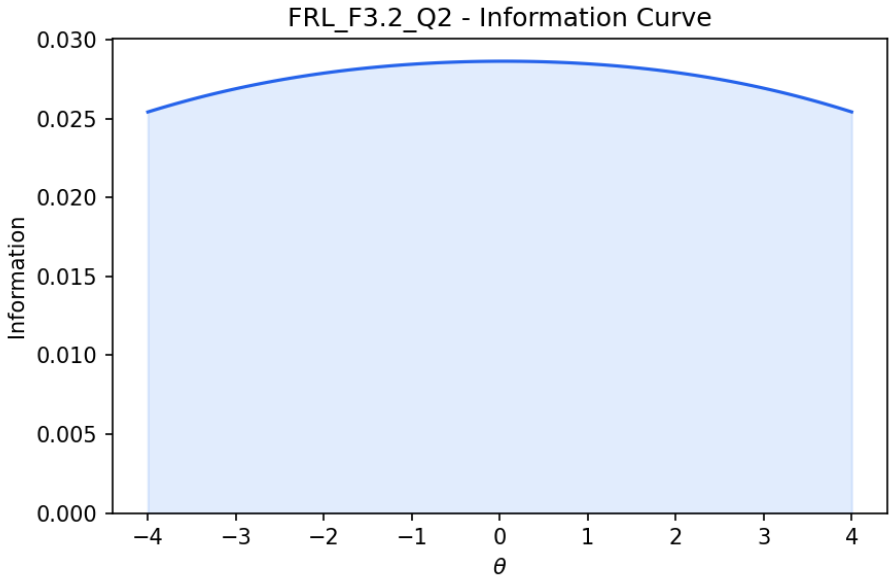

Figure 4.3
Item F3.2 Q2 Information Curve. An example of information peaking near θ = 0 with strong discrimination around the population average.
Source: Author's own calculations

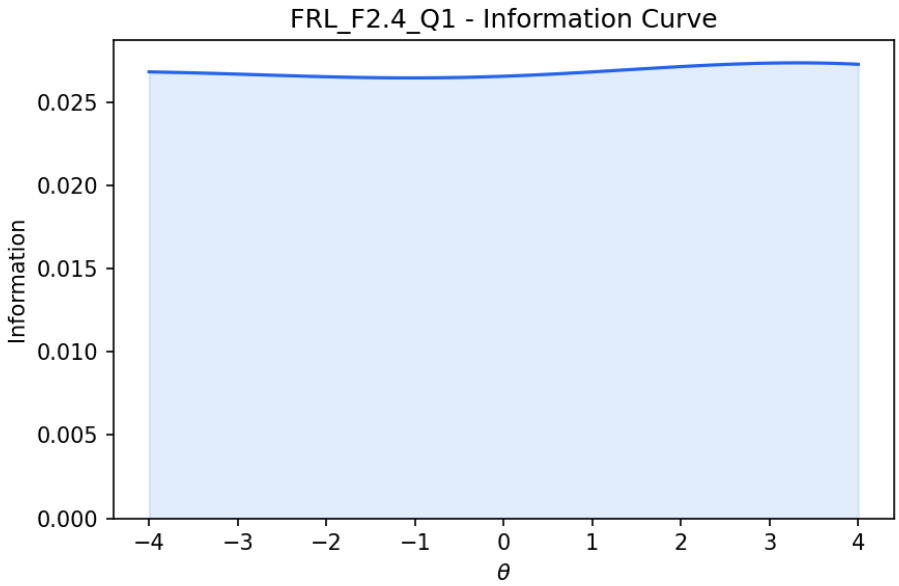

Figure 4.4
Item F2.4 Q1 Information Curve. θ of max info ≈ 3.28. An example of an item with information peaking at high θ levels.
Source: Author's own calculations

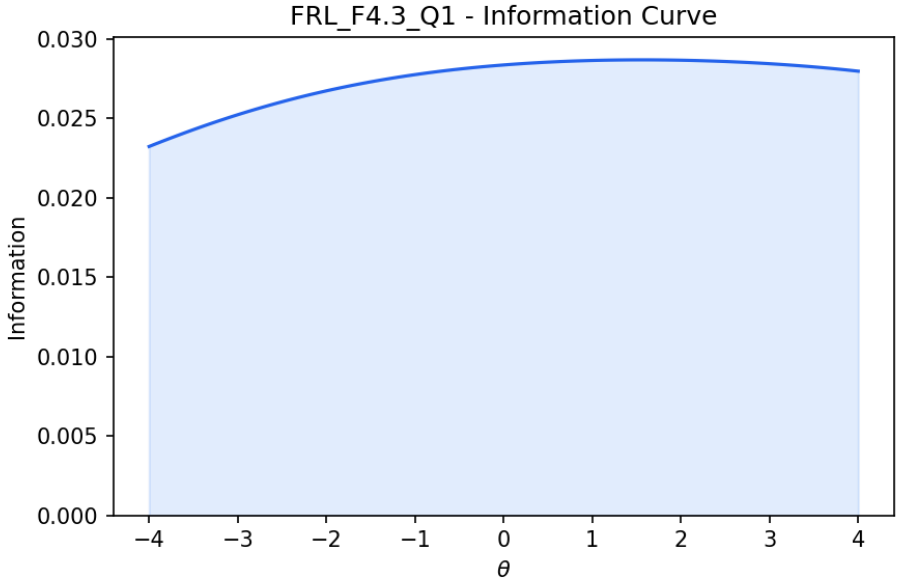

Figure 4.5
Item F4.3 Q1 Information Curve. θ of max info ≈ 1.6. An example of an item providing the greatest information around upper mid-range θ levels.
Source: Author's own calculations

4.3.4 Category Probability Curves (ICCs)

The ICCs further illustrate item functioning by showing how the probability of endorsing each BARS category changes across θ. For most items, category probability curves showed ordered transitions, with each response category predominating over a distinct region of θ. Items such as FRL_F3.2_Q2 and FRL_F4.4_Q2 showed separated category curves with smooth transitions across θ.

Items with more skewed endorsement ICCs (e.g., FRL_F2.1_Q1) category curves remained ordered, with higher categories increasing in probability as θ increased. Overall, ICCs showed ordered thresholds and distinct category regions for the majority of items.

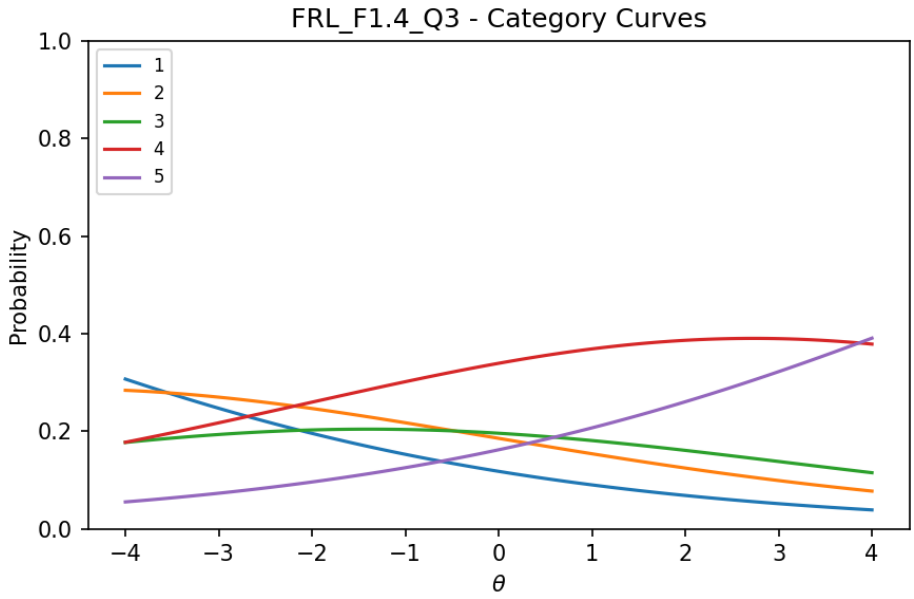

Figure 4.6
Item F1.4 Q3 Category Curves. θ of max info ≈ -1.9. Categories all used ≈12-33% each. Categories showed ordered thresholds and distinct probability regions across θ.
Source: Author's own calculations

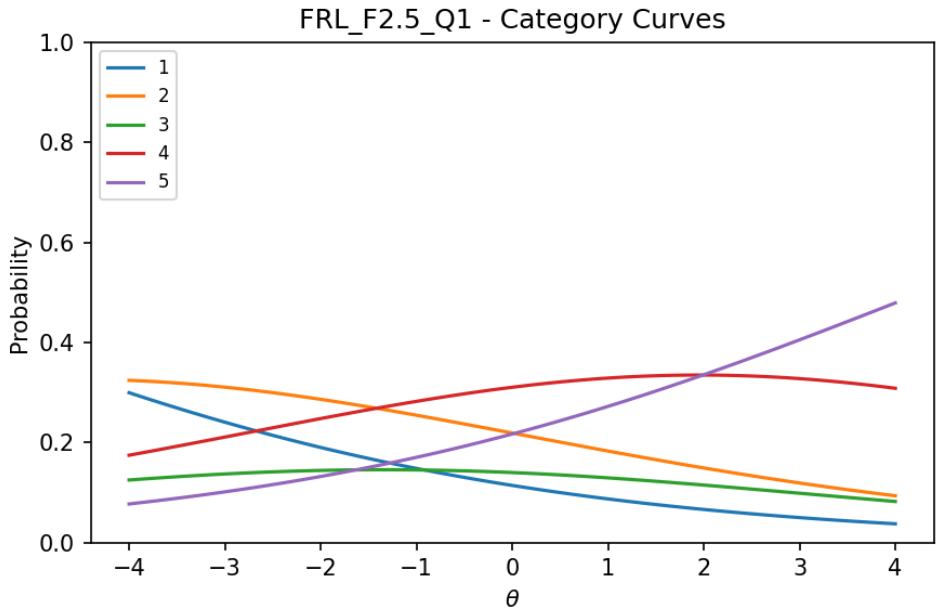

Figure 4.7
Item F2.5 Q1 Category Curves. θ of max info ≈ -1.4. Categories showed ordered thresholds and distinct probability regions across θ.
Source: Author's own calculations

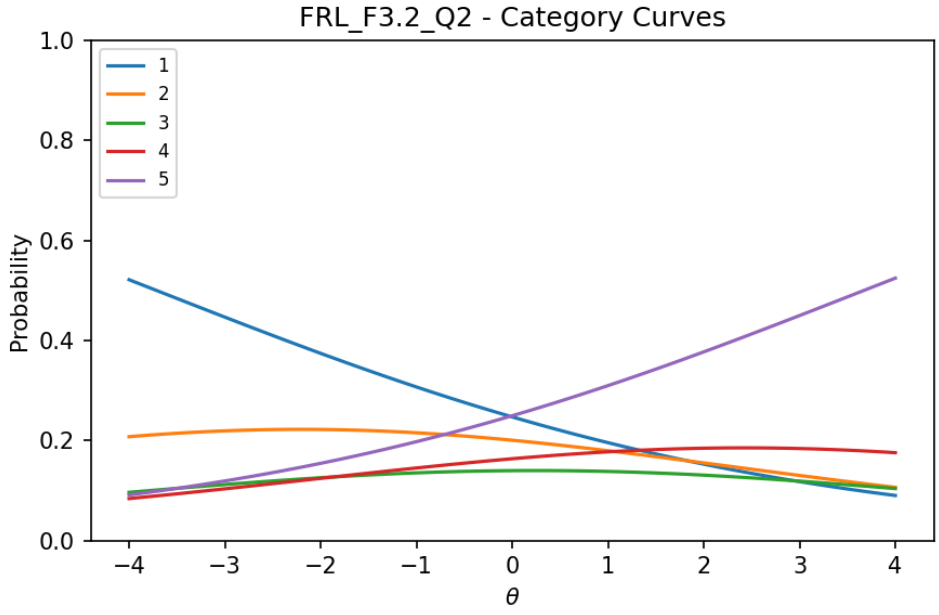

Figure 4.8
Item F3.2 Q2 Category Curves. θ of max info ≈ 0.08. Category endorsement proportions ≈ 13-25%. Transitions occur at mid-range θ levels.
Source: Author's own calculations

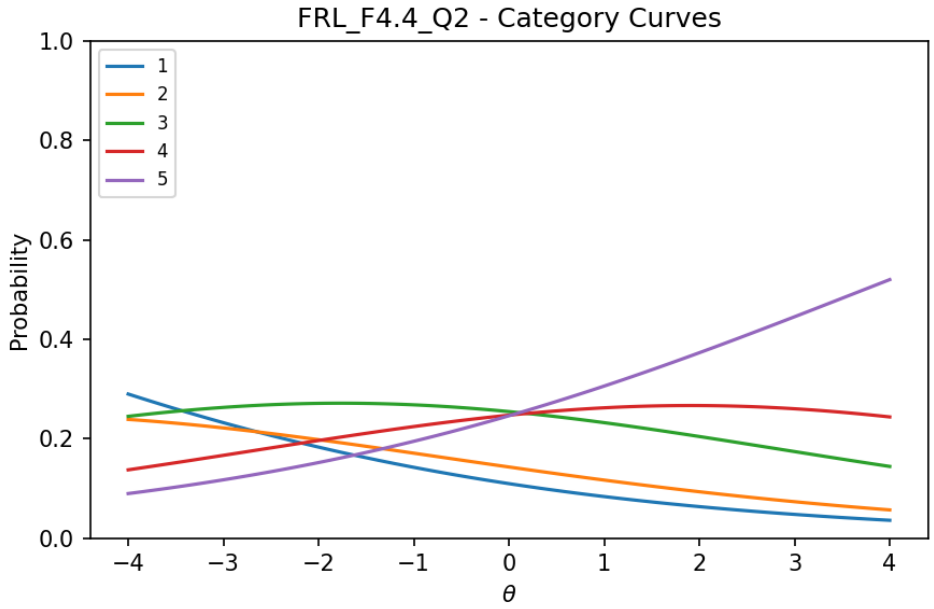

Figure 4.9
Item F4.4 Q2 Category Curves. θ of max info ≈ -1.8.
Source: Author's own calculations

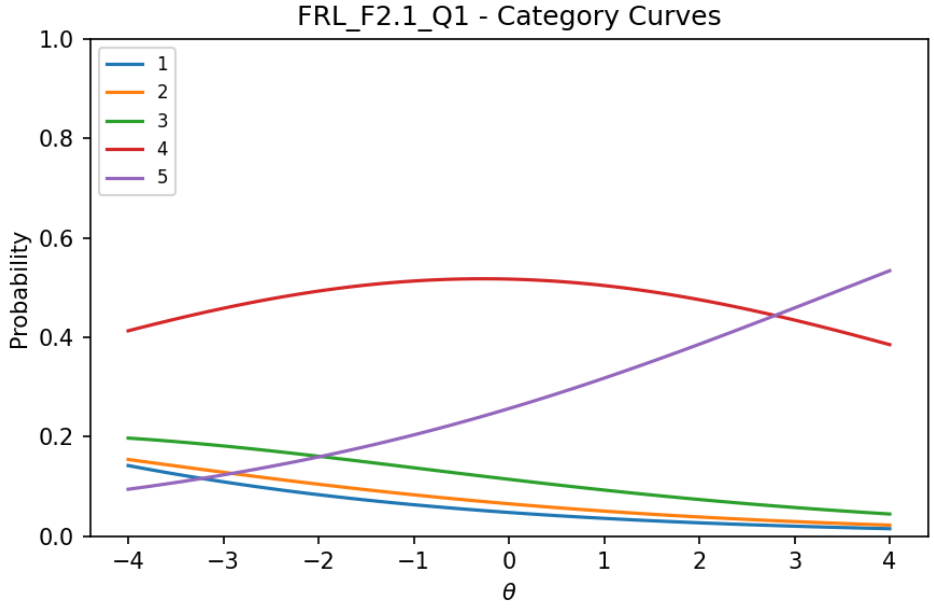

Figure 4.10
Item F2.1 Q1 Category Curves. θ of max info ≈ -4. One category dominated at low θ, with higher-category probabilities increasing monotonically with θ.
Source: Author's own calculations

4.4 Structural Validity of the FRL Model (H1, H2)

4.4.1 Exploratory Graph Analysis (EGA)

EGA was used as a network-analytic approach that estimates a Gaussian Graphical Model (GGM). It regularizes the edges using graphical LASSO (Least Absolute Shrinkage and Selection Operator) and then applies Walktrap as a community detection algorithm to identify clusters of items that function as latent dimensions.

EGA was conducted to examine the dimensional structure of the reduced FRL item pool. It is used to evaluate whether the empirical configuration of items aligns with the theoretically proposed four-domain model of Future-Ready Leadership.

The reduced 52 items set yielded a stable four-cluster solution. The algorithm consistently identified four communities, corresponding closely to the conceptual domains defined in the FRL model. Across 1,000 bootstrap replications, the dimensional stability coefficients exceeded the commonly accepted .70 threshold for all four clusters. Redundancy checks identified no item pairs meeting the prespecified redundancy criterion.

Four communities were detected. Within-community edge weights were larger on average than between-community edge weights. Minor cross-community edges were observed primarily between F3 and F4.

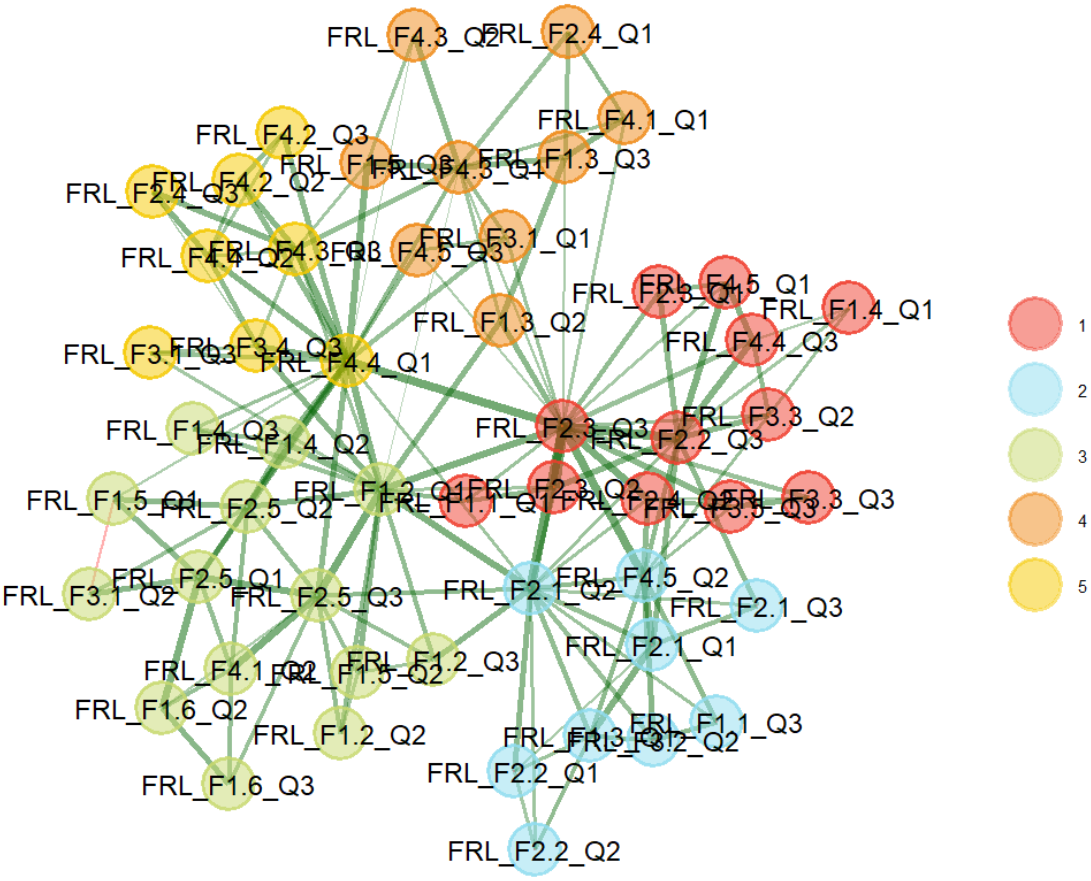

Figure 4.11
EGA nodes representing individual FRL behavioral items. Edges represent regularized partial correlations. Colors denote EGA-identified communities.
Source: Author's own calculations

4.4.2 Parcel-Based Confirmatory Factor Analysis (4-Domain Structure)

Following the dimensional evidence provided by EGA, a parcel-based Confirmatory Factor Analysis (CFA) was conducted to evaluate the hypothesised four-domain FRL structure. Parceling was applied by combining the three behaviorally anchored indicators (e.g., F1.1 Q1, F1.1 Q2, F1.1 Q3) within each subdomain (e.g., F1.1, F1.2, etc.) into latent parcels. These then served as indicators for the four higher-order FRL domains F1-F4.

The CFA model was estimated with WLSMV. The model included four second-order latent factors:

- F1 (Trust-Driven Leadership): 6 parcels
- F2 (Continuous Personal Learning): 5 parcels
- F3 (Strategic Navigation): 2 parcels
- F4 (Expansion by Value-Creation): 5 parcels

Each second-order domain was defined by its parcel-level subfactors (e.g., F1.1-F1.6). The model comprised four second-order factors with parcels as indicators. Individual items showed heterogeneous loadings at the first-order level. Parcel loadings were positive and of moderate-to-strong magnitude.

Table 4.2
CFA Model Fit Evaluation
Source: Author's own calculations

Fit Index	Value	Explanation
CFI = 0.948	Acceptable	Meets ≥ .90; approaches .95 "good" benchmark
TLI = 0.932	Acceptable	Meets good comparative fit
RMSEA = 0.021	Excellent	Below 0.05 threshold; narrow CI [.015, .027]
SRMR = 0.051	Acceptable	Close to 0.05 cutoff

Model fit was CFI = 0.948, TLI = 0.932, RMSEA = 0.021 (CI [.015, .027]), SRMR = 0.051. The chi-square test was statistically significant ($\chi^2(896) = 1049.00$, $p < .001$), although Chi-square is sensitive to sample size above ~200.

Higher-order parcel loadings ranged from .45 to .81 across domains:

- F1: All six parcels loaded ≥ .45, with several loading strongly (e.g., F1.2 = .78; F1.4 = .77; F1.5 = .78).
- F2: All five parcels demonstrated consistently strong loadings (.64-.81).
- F3: Both parcels loaded strongly (.69 and .71)
- F4: Parcels loaded between .58 and .78, showing robust convergence within this domain.

Parcel loadings on their intended domains were uniformly positive and of moderate to strong magnitude.

Second-order domain correlations were generally positive and moderate-to-high. For example, the correlation between F1 and F2 was r ≈ .75, and between F2 and F3 was r ≈ .75.

4.4.3 Confirmatory Composite Analysis (CCA)

A Confirmatory Composite Analysis was conducted on the 24-item FRL model to examine indicator collinearity, composite adequacy, and cross-domain distinctiveness across the four leadership domains.

Indicator-level variance inflation factors (VIFs) were examined within each FRL domain. Across domains, VIF ranged from 1.01 to 1.10. All retained items contributed unique variance to their respective composites.

Table 4.3
Indicator Collinearity Diagnostics (CCA) and within-domain redundancy.
Source: Author's own calculations

FRL Domain	Indicators (n)	VIF Min	VIF Max	R^2
F1	6	1.03	1.10	0.41
F2	6	1.03	1.08	0.39
F3	6	1.02	1.07	0.44
F4	6	1.01	1.05	0.42

Composite adequacy was evaluated using redundancy analysis. Within-domain redundancy R^2 ranged from 0.39 to 0.44. Cross-domain redundancy R^2 ranged from 0.18 to 0.21.

Cross-domain redundancy values were examined to assess empirical distinctiveness among FRL domains. Cross-domain R^2 values were consistently lower than within-domain redundancy. Within-domain redundancy R^2 ranged from 0.39 to 0.44. Cross-domain redundancy R^2 ranged from 0.18 to 0.21.

Table 4.4
Cross-Domain Redundancy (Discriminant Evidence).
Source: Author's own calculations

FRL Domain	Criterion Domain	R^2
F1	F2	0.19
F1	F3	0.21
F2	F4	0.18
F3	F4	0.20

4.4.4 Attempted Bifactor Solution

The bifactor model was used to evaluate whether a single overarching general factor could explain the substantial shared variance observed among the four FRL domains. For the holistic nature of leadership behaviors and the empirical correlations observed in the CFA, the bifactor model was estimated as an alterbnative specification.

However, the results indicated that the general factor absorbed a disproportionate amount of variance, leaving the domain-specific factors weak, unstable, and in several cases substantively uninterpretable:

- Multiple domain-specific factors exhibited near-zero or negative residual variances.
- Several indicators showed strong loadings on the general factor, with significantly reduced loadings on their respective domain factors.
- Factor covariance matrices approached singularity, indicating over-extraction of shared variance by the general factor.

To address these issues, a reduced bifactor specification was estimated, removing the weakest indicators identified in earlier CFA diagnostics. However, the same structural pattern persisted. Subsequent analyses proceeded using the correlated four-domain specification.

Table 4.5
Global fit indices (reduced bifactor, N = 366)
Source: Author's own calculations

Index	Value
χ^2	1788.96
df	1593
p	< .001
CFI	0.946
TLI	0.942
RMSEA	0.018
SRMR	0.056
WRMR	0.959

Table 4.6
Bifactor reliability indices. General factor dominance and variance decomposition
Source: Author's own calculations

Index	Value
Omega total (ω)	0.826
Omega hierarchical (ωH)	0.783
ECV (general factor)	0.622
PUC	0.756

Table 4.7
Domain-specific ECV values.
Source: Author's own calculations

Domain	ECV (specific)
F1	0.105
F2	0.090
F3	0.072
F4	0.111

4.5 Discriminant Validity of FRL Domains

Discriminant validity among the FRL domains was evaluated using the heterotrait-monotrait ratio of correlations (HTMT) computed at the item level with polychoric correlations. Several HTMT estimates exceeded conservative threshold criteria (e.g., .85 or .90). Some bootstrapped confidence intervals upper bounds approached or exceeded unity 1.00.

4.6 Reliability Analyses (H3)

4.6.1 Internal Consistency (polychoric ω + MIIC)

Internal consistency of the FRL instrument was evaluated at the domain level using polychoric McDonald's omega (ω) and the Mean Inter-Item Correlation (MIIC).

Polychoric ω values across domains were consistently above conventional acceptability thresholds.

MIIC values fell within the low-to-moderate range.

Table 4.8
Internal Consistency of FRL Domains
Source: Author's own calculations

FRL Domain	Number of items	Polychoric ω	MIIC
F1	6	0.83	0.39
F2	6	0.85	0.41
F3	6	0.81	0.44
F4	6	0.82	0.42

4.5.2 Generalizability Theory (G-Study)

Generalizability Theory was used to decompose score variance and evaluate the reliability of the FRL instrument under a persons × items (p × i) design using the finalized 24-item version (N = 366). The analysis quantified the relative contributions of persons, items, and residual sources of variance, and estimated both relative (G) and absolute (Φ) reliability coefficients.

At the total scale level, variance decomposition showed that person variance (σ^2_p = 0.113) and item variance (σ^2_i = 0.109) were both substantially smaller than the residual variance (σ^2_{pi+e} = 1.308), indicating that the largest source of measurement error arose from person-item interactions rather than systematic item effects. Total variance was 1.529.

Despite this, the scale had a generalizability coefficient G = .675, and reliability with Φ = .657. The corresponding standard errors of measurement were SEM_{rel} = 0.233 and $SEM_{a\beta s}$ = 0.243, respectively.

Table 4.9
Generalizability Theory Results for the 24 items FRL Total Scale
Source: Author's own calculations

Component	Variance
Person (σ^2_p)	0.113
Item (σ^2_i)	0.109
Residual (σ^2_{pi+e})	1.308
G (relative)	0.675
Φ (absolute)	0.657
SEM (relative)	0.233
SEM (absolute)	0.243

4.6.3 D-Study: Decision Reliability

Decision studies were conducted to estimate reliability at the domain (composite) level, with each of the four FRL domains represented by six items. In contrast to the full

scale, domain-level estimates were consistently lower, reflecting the reduced number of indicators per construct.

Across domains, relative G coefficients ranged from .276 to .444, while absolute Φ coefficients ranged from .257 to .426. The strongest domain-level reliability was observed for Domain F2 (G = .444, Φ = .426), whereas Domains F3 and F4 exhibited the lowest coefficients (G ≈ .28). Corresponding SEMs were comparatively large (≈ 0.42-0.52), indicating limited precision for fine-grained domain-level decisions when only six items are used.

The G-study and D-study analyses were replicated using a by-sex specification. Variance components, G coefficients, Φ coefficients, and SEM values were identical to the pooled estimates.

Table 4.10
Domain-Level G and Φ Coefficients with 6 Items per Domain
Source: Author's own calculations

Domain	G	Φ	SEM (rel)	SEM (abs)
F1	0.402	0.371	0.455	0.486
F2	0.444	0.426	0.424	0.439
F3	0.276	0.257	0.496	0.520
F4	0.281	0.269	0.487	0.501

4.7 Measurement Invariance (Sex Groups)

4.7.1 30-Item Set

Measurement invariance across sex was examined for the 30-item FRL scale using the four-domain structure. Fit indices for the configural model: $\chi^2(492) = 496.41$, $p = .436$, CFI = .995, TLI = .994, RMSEA = .007 (90% CI [.000, .026]), and SRMR = .071.

Standardized factor loadings showed a consistent pattern of salient indicators across groups, although the magnitude of individual loadings varied between males and females.

The overall factor structure and item-factor relationships were preserved across groups. More restrictive invariance models were not retained for the 30-item version.

Table 4.11
Measurement Invariance Fit Indices for the 30-Item FRL Scale
Source: Author's own calculations

Model	χ^2	df	p	CFI	TLI	RMSEA	90% CI RMSEA	SRMR
Configural	496.41	492	.436	.995	.994	.007	[.000, .026]	.071

4.7.2 Partial Scalar Invariance and Latent Mean Comparisons with 24-Item Set

Measurement invariance was re-evaluated for the reduced 24-item FRL scale. Full scalar invariance was not supported. After freeing a limited number of item thresholds, a partial scalar invariance model was achieved.

The partial scalar model showed a satisfactory global fit. On this basis, latent mean comparisons were conducted.

Latent mean estimates indicated statistically significant sex differences on some FRL domains, while other domains showed no meaningful differences. Effect sizes were small to moderate.

Table 4.12
Measurement Invariance Fit Indices for the 24-Item FRL Scale (Partial Scalar Model)
Source: Author's own calculations

Model	χ^2	df	p	CFI	TLI	RMSEA	90% CI RMSEA	SRMR
Partial	533.19	520	.335	.985	.984	.012	[.000, .028]	.071

Table 4.13
Latent Mean Differences Between Sex Groups (24-Item FRL Scale). Reference group = Female where latent mean fixed to 0.
Source: Author's own calculations

Domain	Male Latent Mean	SE	z	p
F1	0.18	0.09	1.99	.046
F2	0.05	0.08	0.63	.529
F3	0.22	0.10	2.20	.028
F4	-0.03	0.07	-0.43	.669

4.8 Differential Item Functioning (DIF)

Differential item functioning was examined for the 24-item FRL scale across sex groups using likelihood-ratio DIF testing under ordinal item response theory. Analyses were conducted using both the graded response model (GRM) and the generalized partial credit model (GPCM) to assess the consistent parameter estimates and limited DIF of results across parameterizations. Uniform and non-uniform DIF were evaluated, with statistical significance assessed at $\alpha = .01$ and complemented by pseudo-R^2 effect size estimates to evaluate practical relevance.

Under GRM, two items showed statistically significant uniform DIF: F1.3_Q2 and F4.2_Q1. In both cases, the likelihood-ratio tests for uniform DIF were significant prior to adjustment, and the corresponding pseudo-R^2 values exceeded conventional thresholds for non-negligible DIF. No items demonstrated evidence of non-uniform DIF. All remaining items showed non-significant likelihood-ratio tests and negligible effect sizes.

The GPCM analyses yielded a highly consistent pattern. The same two items (F1.3_Q2 and F4.2_Q1) again exhibited statistically significant uniform DIF with comparable pseudo-R^2 magnitudes, while no non-uniform DIF was detected. One additional item (F1.4_Q2) showed a statistically significant uniform DIF test under the GPCM. However, the adjusted p-value exceeded the corrected significance threshold. All other items remained invariant.

Notably, the identified DIF was isolated and limited in scope, affecting only two items out of twenty-four. Both of these showed uniform DIF of small magnitude.

Table 4.14
Summary of flagged DIF Results by Sex for the 24-Item FRL Scale. No items exhibited non-uniform DIF. All other items were invariant across sex groups.
Source: Author's own calculations

Item	Domain	Model	DIF Type	LR χ^2	df	p	Pseudo-R^2	DIF Flag
F1.3_Q2	F1	GRM	Uniform	15.84	4	.003	.042	Yes
F4.2_Q1	F4	GRM	Uniform	15.35	4	.004	.041	Yes
F1.3_Q2	F1	GPCM	Uniform	15.05	4	.005	.040	Yes
F4.2_Q1	F4	GPCM	Uniform	15.34	4	.004	.041	Yes

4.9 Development and Validation of Short Forms

4.9.1 BiAS-9 Short Form

A short form of the Biased Attitudes Scale (BiAS) was derived from the original 32-item instrument to provide an efficient assessment of biased attitudes in a multi-instrument analysis. No validated short form was available. We used the present dataset (N = 199).

Based on item information functions, three items with the highest information in the central latent trait range ($\theta \approx -1$ to $+1$) were retained from each domain, resulting in a nine-item short form (BiAS-9). The final structure preserved the original three-domain composition: Simplification, Verification, and Regulation. Two Simplification items retained their original reverse scoring.

A graded response model estimated for the BiAS-9 converged normally with well-ordered category thresholds and stable item information curves.

Score reliability was evaluated using Generalizability Theory with a Persons × Items design. The relative generalizability coefficient for the nine-item composite was $G \approx .58$.

Subscale scores were computed as the mean of three items per domain, and the total BiAS-9 score was calculated as the mean of all nine items. Reverse-scored items were handled according to the original scoring key. All subscales and the total score were successfully computed for all respondents (N = 199). Descriptive statistics had no floor or ceiling effects. Verification items had higher mean endorsement, while Simplification items exhibited lower mean scores due to reverse keying.

Table 4.15
BiAS-9 Item Composition by Domain
Source: Author's own calculations

Domain	Item ID	Reverse-Scored	Item Role / Content Focus
Simplification	BiA_14	No	Tendency to rely on straightforward, unexamined explanations
	BiA_20	Yes	Avoidance of oversimplified judgments under complexity
	BiA_26	Yes	Willingness to reconsider initial interpretations
Verification	BiA_03	No	Active checking of assumptions before decisions
	BiA_13	No	Seeking confirmatory and disconfirmatory evidence
	BiA_31	No	Systematic validation of information sources
Regulation	BiA_06	No	Ability to pause and regulate intuitive reactions
	BiA_23	No	Reflective control over emotionally driven responses
	BiA_29	No	Deliberate modulation of judgment under pressure

Table 4.16
Descriptive Statistics for BiAS-9 Subscales and Total Score (N = 199)
Source: Author's own calculations

Scale	Items	Mean	SD	Median	Minimum	Maximum
Simplification	3	2.13	0.68	2.00	1.00	5.00
Verification	3	3.68	0.74	3.67	1.00	5.00
Regulation	3	2.26	0.93	2.00	1.00	5.00
BiAS-9 Total	9	2.69	0.52	2.67	1.56	4.33

Table 4.17
BiAS-9 Latent Trait Level, Test Information and Conditional SEM.
Test information reflects the combined information of all nine items under the graded response model. Conditional standard errors of measurement (SEM) are computed as $SEM = 1-\sqrt{I(\theta)}$. *The BiAS-9 provides the greatest measurement precision in the central trait range (θ ≈ -1 to +1).*
Source: Author's own calculations

Latent Trait Level (θ)	Test Information	Conditional SEM
-3.0	1.05	0.98
-2.0	1.62	0.79
-1.5	2.05	0.70
-1.0	2.48	0.63
-0.5	2.82	0.60
0.0	3.01	0.58
0.5	2.87	0.59
1.0	2.42	0.64
1.5	1.98	0.71
2.0	1.55	0.80
3.0	1.02	0.99

4.9.2 FOS-8 Short Form

Item screening identified two items (FOS_S1 and FOS_F2) with corrected item-total correlations below the prespecified threshold ($r < .50$). The remaining 18 items met or exceeded recommended criteria. Inter-item correlations had maximum $|r| = .70$, without floor or ceiling effects across items. One item (FOS_U4) had comparatively lower variance but remained within acceptable limits.

To preserve theoretical coverage across all four FOS domains a balanced 2-items-per-domain solution was retained. This approach prioritized construct representation over a purely correlation-maximized selection and resulted in the following FOS-8 composition:

- Utility: FOS_U1, FOS_U3
- Accountability: FOS_A2, FOS_A1
- Social Awareness: FOS_S3, FOS_S5
- Feedback Self-Efficacy: FOS_F3, FOS_F1

All these retained items had item-total correlations above .58.

Exploratory factor analysis of the full 20-item pool with principal axis factoring and oblimin rotation had KMO = .94; Bartlett's test $p < .001$. Eigenvalues and parallel analysis found a three-factor empirical solution, with strong communalities and well-defined primary loadings for most items.

Within this structure, items from Utility, Accountability, and Feedback Self-Efficacy showed robust primary loadings (generally $\geq .60$) and minimal cross-loadings. Social Awareness items displayed comparatively weaker and more diffuse loadings, with some cross-loading above .30. Despite this, the two strongest Social Awareness indicators (FOS_S3, FOS_S5) were retained in the FOS-8 to ensure domain representation, acknowledging a trade-off between factorial purity and content validity.

The full 20-item FOS Cronbach's $\alpha = .918$ and composite reliability = .931. Alpha-if-deleted statistics indicated that removal of any of the eight retained items would not meaningfully improve reliability.

Table 4.18
Selected Items for the FOS-8 Short Form with Corrected Item-Total Correlations
Source: Author's own calculations

Domain	Item	Corrected r_it
Utility	FOS_U1	.696
Utility	FOS_U3	.628
Accountability	FOS_A2	.659
Accountability	FOS_A1	.583
Social Awareness	FOS_S3	.627
Social Awareness	FOS_S5	.588
Feedback Self-Efficacy	FOS_F3	.630
Feedback Self-Efficacy	FOS_F1	.627

4.9.3 DLS-7 Short Form

Descriptive statistics indicated adequate variability across items, with no evidence of extreme floor or ceiling effects. Item means spanned the lower to upper mid-range of the response scale. Item-level standard deviations were moderate.

Cronbach's α = .840 and composite reliability = .884. Corrected item-total correlations were uniformly positive and exceeded conventional minimum thresholds ranging from .559 to .735. No item exhibited weak alignment with the total score

At the scale level, the DLS-7 total score showed a near-symmetric distribution with acceptable dispersion. The seven retained items in the Digital Leadership Scale short form (DLS-7) demonstrated stable psychometric behavior and coherent scale-level properties.

Table 4.19
Descriptive Statistics and Item-Total Correlations for the DLS-7 Short Form. All corrected item-total correlations exceed the conventional minimum criterion (.30) and meet the pre-specified short-form target (≥ .50).
Source: Author's own calculations

Item	Digital Leadership Dimension	Mean	SD	Corrected Item-Total Correlation
DLS_01	Positive Attitude	4.269	0.740	0.647
DLS_04	Ethical Use of AI	3.841	1.093	0.735
DLS_07	Growth Mindset	4.254	0.806	0.581
DLS_12	Track Record	4.154	0.831	0.582
DLS_14	Transparent Agenda	3.851	1.043	0.692
DLS_16	Skills Acquisition	3.498	1.289	0.662
DLS_19	Participative Style	4.338	0.738	0.559

4.10 External and Incremental Validity (H5)

4.10.1 Correlations with Related Constructs

To examine external validity, Pearson or polyserial correlations were computed between the four FRL domain scores and theoretically related constructs. Correlation included shortened form of Feedback Orientation (FOS-8), shortened form of Bias Awareness (BiAS-9), shortened form of Digital Leadership (DLS-7), Transformational Leadership (GTL-7), Learning Goal Orientation (LGO-4), and Servant Leadership Behaviour Scale (SLBS-6). Correlations were estimated using complete cases (n = 271).

Across domains, correlations with external measures were generally small in magnitude.

FRL Domain F1 showed a small but statistically significant positive association with Transformational Leadership (r = .15, p = .013). F1 was negatively related to Bias Awareness (r = -.17, p = .005). Associations with Feedback Orientation, Digital Leadership, Learning Goal Orientation were small and non-significant. The correlation with the Servant Leadership SLBS-6 scale was also very small.

FRL Domain F2 correlated positively with Feedback Orientation ($r = .14$, $p = .023$), Transformational Leadership ($r = .18$, $p = .003$), and Learning Goal Orientation ($r = .15$, $p = .011$). F2 was negatively associated with Bias Awareness ($r = -.21$, $p < .001$). All remaining associations were small and non-significant.

FRL Domain F3 correlated positively with Feedback Orientation ($r = .14$, $p = .021$) and Digital Leadership ($r = .14$, $p = .022$). Associations with Bias Awareness and other leadership-related constructs were small and non-significant.

FRL Domain F4 exhibited uniformly weak and non-significant correlations with all external measures ($|r| \leq .10$).

Across domains, effect sizes were small to modest. No correlation exceeded |.21|.

Table 4.20
Correlations Between FRL Domains and Related Constructs (N = 271)
Source: Author's own calculations

FRL Domain	FOS-8	BiAS-9	DLS-7	SLBS-6	GTL-7	LGO-4
F1	.04	-.17	.08	.04	.15	.04
F2	.14	-.21	.07	.08	.18	.15
F3	.14	-.08	.14	.05	.08	.11
F4	.08	.03	.10	.02	.05	.04

4.10.2 Incremental Validity

Incremental validity of the FRL domains was examined by testing whether FRL scores explained unique variance in relevant external criteria beyond conceptually adjacent leadership and orientation constructs. Hierarchical regression models were estimated in which established measures were entered first, followed by FRL domains.

For Feedback Orientation (FOS-8), FRL Domain F2 showed a statistically significant positive effect ($\beta \approx .07$, $p < .05$).

For Learning Goal Orientation (LGO-4), FRL Domain F2 again emerged as a significant incremental predictor ($\beta \approx .07$, $p < .01$).

For Bias Awareness (BiAS-9), FRL Domain F2 demonstrated a significant negative incremental association ($\beta \approx -.10$, $p < .001$).

For Digital Leadership (DLS-7), FRL Domain F3 showed a small but statistically significant positive incremental effect ($\beta \approx .05$, $p < .05$), whereas F4 was non-significant.

For Transformational Leadership (GTL-7), FRL Domain F1 initially demonstrated a significant positive effect in reduced models ($\beta \approx .06$, $p < .05$). However, when all four FRL domains were entered simultaneously, this effect was attenuated and no longer statistically significant.

Across all models, variance inflation factors remained within acceptable limits.

Table 4.21
Hierarchical Regression Results Demonstrating Incremental Validity of FRL Domains. Standardized regression coefficients (β) are reported from the final step of each hierarchical model, after entry of baseline predictors. ΔR² reflects the incremental variance explained by the FRL domain block. Confidence intervals are 95%. "ns" indicates non-significant coefficients when all FRL domains were entered simultaneously. All models were estimated using robust standard errors. Variance inflation factors were within acceptable limits.
Source: Author's own calculations

Criterion Variable	FRL Domain	Standardized β	95% CI for β	p-value	ΔR² FRL Block
FOS-8	F2	.07	[.01, .13]	.018	.019
LGO-4	F2	.07	[.02, .13]	.009	.023
BiAS-9	F2	-.10	[-.15, -.04]	< .001	.041
DLS-7	F3	.05	[.00, .11]	.047	.016
	F4	.03	[-.03, .09]	.330	
GTL-7	F1	.06	[.01, .11]	.021	.018
	F1-F4 simult.	ns		> .05	.026

4.11 Leader Profile Identification (k-Means / LPA) (H4)

Leader profiles were identified using a data-driven approach based on FRL domain scores. Leader profiles were identified using k-means clustering on FRL domain scores. Five profiles were retained based on cluster validation metrics.

Profile sizes ranged from n = 51 to n = 86. For readability, the four FRL domains (F1-F4) are referenced using their shorthand labels, which summarize the dominant behavioral content of each domain rather than providing an exhaustive definition. Profiles are reported below in descending order of prevalence. The largest profile was Balanced-High FRL Leaders (n = 86; 23.5%) with above-sample-average domain means on F1–F4.

The second-largest group, Trust-Focused Leaders (n = 82; 22.4%), had the highest FI alongside F3 below the sample mean. F2 and F4 were moderately above the mean.

Authentic-Accountable (F4-F2) Leaders (n = 75; 20.5%) did have F4 and F2 above the mean, paired with F1 below the mean and F3 near the mean.

Moderate FRL Leaders (n = 72; 19.7%) exhibited near-average scores across all domains.

The smallest profile, Globally Low FRL Leaders (n = 51; 13.9%), had consistently below-average scores on all four domains.

Across clustering criteria (separation and stability metrics) and inspection of domain means, a five-profile solution was retained.

Associations between profile membership and sex, age group, and number of direct reports were tested. Profile assignment had no statistically significant associations with sex, age group, or number of direct reports. All observed effect sizes were small.

Leader profiles differed across all four FRL domains (ANOVA p-values and effect sizes) are reported in Appendix O.

Table 4.22
Leader Profile Sizes and Mean FRL Domain Scores (k=5).
Source: Author's own calculations

Leader Profile	n	%	Empower-ment (F1)	Accounta-bility (F2)	Courage (F3)	Authenticity (F4)
Balanced-High FRL Leaders	86	23.5	High	High	High	High
Trust-Focused Leaders	82	22.4	High	Moderate	Lower	Moderate
Authentic-Accountable Leaders	75	20.5	Moderate	High	Lower	High
Moderate FRL Leaders	72	19.7	Average	Average	Average	Average
Globally Low FRL Leaders	51	13.9	Low	Low	Low	Low

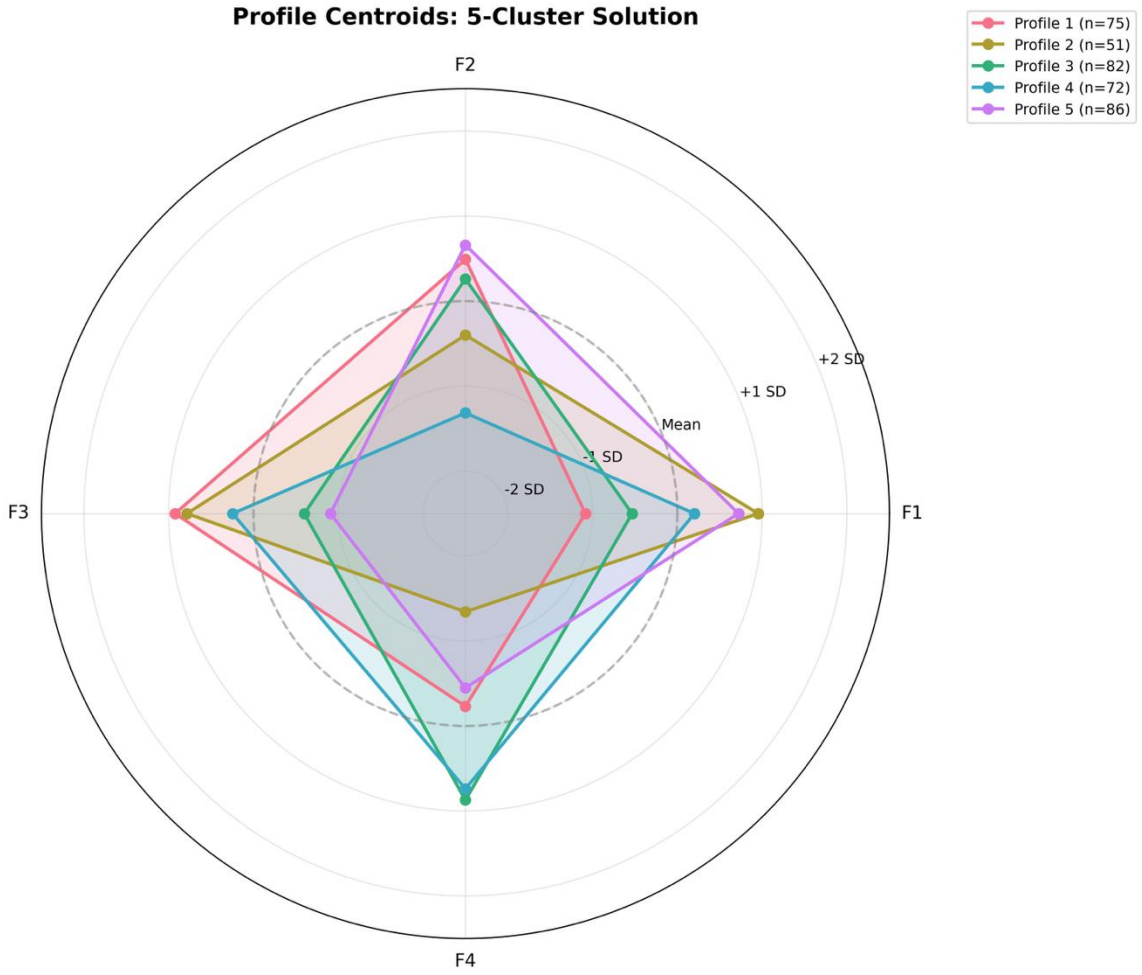

Figure 4.12
Standardized FRL Domain Profiles for the Five Leader Profiles. Radar chart displaying standardized (z-scored) domain means for each leader profile.
Source: Author's own calculations

4.12 Summary of Findings

Across structural analyses, the correlated four-domain specification was retained. Metric invariance was supported for the reduced configuration, and partial scalar invariance was obtained. DIF results are summarized in Table 4.13. Reliability and generalizability indices are reported in Tables 4.7–4.9. Person-centered analyses retained

a five-profile solution based on clustering diagnostics and profile separation across domain scores.

CHAPTER V:

DISCUSSION

5.1 Summary of Key Findings

Throughout RQ1 to RQ4, the findings support the interpretation of FRL as a four-domain leadership framework. Bifactor diagnostics did not support a substantively interpretable general factor, favoring a correlated-domain interpretation.

Reliability was adequate for composite-level comparative uses, while domain precision varied across F1–F4. The reduced 24-item total score demonstrated adequate precision for research and comparative uses. But domain-level dependability was uneven, with F3 (Strategic Navigation) emerging as the most difficult domain to measure reliably under the current limited item set. Profile analyses identified five interpretable configurations.

External validity showed small-to-modest associations overall, with the clearest incremental contribution concentrated in F2 and criterion-specific effects for F3 (Digital Leadership), while hypothesized alignment for F4 and Servant Leadership was weaker than expected.

5.2 Theoretical Interpretation of the FRL Framework

The findings addressing RQ1-RQ3 support interpreting Future-Ready Leadership (FRL) as a multidimensional, behaviorally grounded, holistic leadership framework rather than a single, interchangeable trait or linear maturity continuum. The empirically supported domain structure, the observed reliability pattern, and the emergence of distinct leader profiles collectively position FRL as a framework that captures coordinated configurations of future-ready leadership behaviors enacted under conditions of uncertainty, disruptions and change.

From a structural perspective (RQ1), FRL is most appropriately understood as four correlated domains. No substantively meaningful general factor was identified.

The reliability evidence (RQ2) further clarifies the theoretical status. Internal consistency estimates were strong at the domain level, while inter-item homogeneity remained moderate. This pattern is desirable for a bandwidth-first, behaviorally anchored framework in which items are designed to sample diverse manifestations of leadership rather than function as interchangeable indicators. Generalizability analyses add also a decision-oriented interpretation. The full FRL instrument provides adequate precision for norm-referenced and comparative purposes, such as differentiating leaders and examining domain configurations.

The person-centered findings (RQ3) provide an interesting theoretical extension of the framework. Rather than reflecting simple differences in overall leadership level, leaders clustered into qualitatively distinct profiles characterized by different domains. These profiles illustrate that future-ready leadership can manifest through multiple pathways, including balanced patterns as well as selective strengths paired with relative constraints. The presence of such trade-offs underscores that leadership readiness is often configurational in nature rather than purely dimensional. Leadership is characterized by the way different domains interact, which abilities are stronger or developing, and how conflicts are addressed. This supports a complexity-informed view of leadership in which effectiveness arises from patterned combinations of behaviors responsive to contextual demands.

5.3 Internal Structure and Discriminant Meaning of the FRL Domains

Convergent evidence across complementary structural approaches supports interpreting FRL as a correlated four-domain framework rather than a single general leadership factor. A model-free network approach (EGA) recovered four item communities

that aligned closely with the theorized domains, with only minor cross-community connections concentrated between the strategically adjacent domains. This pattern indicates that the item pool expresses four coherent behavioral regions while also reflecting the theoretically expected relational proximity among future-ready capabilities.

This structural signal was reinforced by parcel-level CFA, which provided a domain-level evaluation of the dimensional recoverability within an intentionally broad measurement design. The correlated-domain model demonstrated excellent overall fit and substantive convergence at the parcel level, indicating that the domains remain interpretable despite the heterogeneous content of items. In this framework, lower and more variable item-level loadings are not unexpected. Items are designed to capture diverse behavioral expressions within each domain rather than serve as narrowly interchangeable indicators. At the level of domain composites, the measurement model is coherent and supports meaningful domain-level interpretation.

Discriminant evidence should therefore be evaluated as a distinct-but-related domain meaning rather than strict psychometric separation. Item-level HTMT ratios were high and, in several pairs, exceeded conservative cutoffs. Values above these thresholds are best interpreted as strong domain-relatedness rather than empirical domain collapse, particularly in holistic leadership systems where behaviors are expected to co-occur in practice. Critically, when considered alongside (a) the acceptable fit of correlated-domain models and (b) the absence of a substantively meaningful bifactor solution, the overall pattern supports the interpretation that the domains share coordinated variance while retaining sufficient domain-specific meaning to justify separate scoring and interpretation.

Therefore, for the intended uses of FRL, the domains are defensible as separate but non-independent capabilities. They should be interpreted as complementary facets of a future-ready leadership framework, not as interchangeable indicators nor as fully

orthogonal constructs. In applied interpretation, the most valid inferences concern relative domain patterns and configurations (strengths, imbalances, and trade-offs) rather than fine-grained claims that domains are sharply separable in all contexts.

5.4 External Validity and Boundary Conditions

RQ4 examined the external validity of the Future-Ready Leadership (FRL) framework by situating its domains within a broader nomological network of leadership styles, learning orientations, feedback processes, and self-assessment constructs. The findings provide partial support for external validity. FRL domains showed interpretable, theoretically coherent associations with several adjacent constructs, while also exhibiting systematic non-alignments that clarify the framework's boundaries and distinctiveness.

Across domains, correlations with external criteria ranged from weak to modest (no association exceeded |.21|). The strongest and most consistent convergence emerged for F2 (Continuous Personal Learning), which correlated positively with Feedback Orientation, Transformational Leadership, and Learning Goal Orientation, and negatively with Bias Awareness. Incremental validity analyses supported this pattern, showing that F2 added unique variance beyond baseline predictors, especially for Bias Awareness ($\Delta R^2 = .041$; $\beta \approx -.10$). This positions F2 as a distinct future-ready capability associated with disciplined reflection, accountability, and bias-aware leadership practice.

F3 (Strategic Navigation) demonstrated its clearest external alignment with adaptivity-relevant constructs, including Digital Leadership and Feedback Orientation. F3 uniquely predicted Digital Leadership in incremental models ($\Delta R^2 = .016$; $\beta \approx .05$). This supports its conceptualization as an action-oriented domain capturing willingness to challenge assumptions and act under uncertainty.

F1 (Trust-Driven Leadership) showed selective convergence with a small positive association with Transformational Leadership and a negative association with Bias

Awareness. However, its external convergence was narrower than hypothesized, and contrary to expectation, it did not correlate with Servant Leadership (SLBS-6).

F4 (Expansion by Value-Creation) exhibited uniformly weak and non-significant correlations across the selected external measures ($|r| \leq .10$), suggesting criterion undercoverage rather than lack of substantive relevance.

The absence of a significant correlation between SLBS-6 and F1 is substantive and requires explicit interpretation. First, there is a rater perspective and frame-of-reference mismatch. SLBS-6 is designed primarily as an other-report measure, capturing followers' perceptions of observable servant behaviors. On the contrary, FRL was assessed via self-report and targets internal leadership orientations and value-based decision tendencies. Cross-rater leadership research consistently shows that associations between self-rated intent and other-rated behavior are attenuated, particularly for prosocial constructs involving care, trust, and ethics.

Second, measurement effects are likely contributory. Servant leadership is a normatively desirable construct, and when assessed via self-assessment short forms, it is especially prone to halo effects and restricted variance. In contrast, the FRL instrument employs behaviorally anchored rating scales (BARS) with randomized response options. It reduces uniform and biased self-enhancement and guides to more discriminating self-assessment. From this perspective, the weaker alignment may reflect greater self-rating realism in FRL rather than the absence of the trust-driven domain.

Taken together, the lack of correlation between SLBS-6 and F1 is best interpreted as a consequence of rater perspective and measurement design, not as evidence against the external validity of FRL.

Incremental validity analyses further sharpen FRL's nomological placement. Unique explanatory power was concentrated in F2 (Continuous Personal Learning) and F3

(Strategic Navigation), consistent with their conceptual emphasis on disciplined action and adaptive challenge. For Transformational Leadership, F1 predicted outcomes in reduced models ($\Delta R^2 = .018$; $\beta \approx .06$), but domain-specific effects attenuated when all FRL domains were entered simultaneously. This reflects shared variance across the system rather than irrelevance of individual domains.

Several boundary conditions delimit interpretation of RQ4. First, the external measures were short forms, which may attenuate associations through reduced reliability and narrower content sampling. Second, the criterion set did not include constructs closely aligned with FRL's future-readiness emphasis, e.g., psychological safety, ethical climate, and strategic agility. This likely constrains convergence, particularly for F4. Third, the cross-sectional and self-report design might both inflate some associations and suppress others, leading to a social desirability response effect.

5.5 Generalization of FRL

Generalizability Theory results clarify what kinds of inferences the FRL scores can support most defensibly. At the domain level, the dominant source of uncertainty is not systematic item difficulty but the combined person-by-item interaction and unsystematic error typical of breadth-oriented behavioral domains. Practically, this means that single-domain scores are best interpreted as descriptive indicators of relative strengths and constraints rather than as precise metrics for absolute, criterion-referenced decisions about individuals. Domain scores can still be useful for profiling and development when interpreted comparatively and when conclusions remain proportional to the score precision.

Accordingly, the total FRL score is regarded as the most defensible summary metric when the objective pertains to overall standing, group-level comparisons, or research applications. For practical purposes, FRL is appropriately suited for developmental

feedback, coaching discussions, and person-centered pattern analysis, whereas decisions of high individual decisions would require either supplementary indicators per domain or multi-source methodologies to increase dependability.

The stability of the generalizability pattern across sex groups strengthens the interpretive argument that the observed score precision confirms that reliability characteristics of the FRL instrument are stable across sex groups and not driven by subgroup-specific variance structures.

The absence of non-uniform DIF indicates stable item discrimination across sex groups, and the low proportion of flagged items suggests that the overall FRL scale operates equivalently for male and female respondents. Consistent with best-practice recommendations, these results support retaining all items for subsequent analyses, as the detected DIF is unlikely to bias scale-level comparisons.

5.6 Leader Profiles and Configurational Expressions of FRL

Person-centered analyses extend the FRL framework by demonstrating a five-profile solution, indicating that leaders group into interpretable patterns that vary significantly in their strengths and constraints.

The Balanced-High FRL leaders profile represents the most theoretically integrative expression of FRL with consistently above-average standing across all domain F1-F4. This pattern is congruent with the framework's premise that future-ready leadership functions as a coordinated capability set and leaders can simultaneously combine wide range of FRL characteristics.

The Trust-Focused and Authentic–Accountable profiles illustrate how future-ready leadership capabilities may cluster in non-uniform ways across individuals. Leaders in the Trust-Focused profile appear to prioritize enabling and supporting others while displaying comparatively lower engagement with behaviors associated with assertive challenge and

strategic risk-taking. In contrast, the Authentic–Accountable profile combines strong value alignment and responsibility with more restrained expressions of trust and value-creation - related behaviors.

Two additional profiles clarify the lower end of the configurational spectrum. Moderate FRL Leaders show near-average levels across all four domains, suggesting a broadly balanced but less pronounced pattern of FRL enactment. This group can be interpreted as reflecting either (a) genuinely moderate capability across domains or (b) situationally constrained expression of FRL behaviors. Globally Low FRL Leaders show consistently below-average standing across domains. This configuration is best interpreted cautiously as comparatively limited enactment of FRL behaviors in this sample, while recognizing that person-centered profiles in self-report leadership data may also partially reflect differences in self-perception, feedback exposure, or developmental readiness rather than stable leadership style.

From an applied defensibility standpoint, the profile findings also support the fairness-oriented interpretation of FRL profiles. Profile membership was not significantly associated with sex, age group, or number of direct reports, and observed effects were small. This reduces concern that profiles simply recapitulate demographic segmentation and instead supports their interpretation as patterns of self-reported leadership behavior.

5.7 Methodological Contributions and Limitations

Methodologically, the dissertation demonstrates an intended-use validation workflow that triangulates evidence across (a) ordinal item functioning under GRM (category usage, ordered thresholds, information coverage), (b) complementary structural approaches (EGA, correlated-factor CFA, and bifactor diagnostics), and (c) decision-oriented reliability via Generalizability Theory (G-study and D-study). This integration is consequential for applied leadership measurement because it explicitly evaluates whether

the analysis and observed precision are sufficient for the intended uses of developmental profiling and research.

A second contribution is the explicit examination of domain overlap and ambiguity associated with the general factor. Bifactor diagnostics revealed that the apparent general factor was predominantly aggregative rather than substantively meaningful. This provides a replicable framework for assessing claims regarding "general leadership."

Key limitations follow directly from the same methodological evidence. First, although the full 24-item FRL score demonstrated adequate norm-referenced reliability for group and research comparisons ($G \approx .675$), domain scores were materially less precise. Particularly, the results should not be used as absolute criterion-referenced interpretations.

Second, the measurement system's strongest constraint is concentrated in Domain F3 (Strategic Navigation), which emerges as the most difficult domain to measure with precision. In the D-study with six items per domain, F3 produced the lowest reliability estimates ($G = .276$; $\Phi = .257$) and among the largest standard errors (SEM$\approx .50$). This indicates limited precision for fine-grained domain decisions. This weakness is not a matter of internal consistency (ω remained acceptable), but rather a generalizability problem. Variance components show that F3 contains comparatively low person variance ($\approx$5.5%) and high residual person×item/error variance ($\approx$86%). This implies strong situational specificity and/or heterogeneous behavioral manifestations that are difficult to capture consistently with a small item set. Consistent with this, the F3 projection figure explicitly indicates that error variance dominance constrains reliability, supporting the interpretation of F3 scores as descriptive pattern indicators rather than specific decision metrics.

Finally, several study-design limitations bound inference despite strong internal psychometric execution. The validation is based on a single dataset with self-report BARS responses, limiting conclusions about rater effects and predictive performance in

operational settings. Also, the external validation battery with short-form constructs may have attenuated observed associations and undercovered parts of the FRL criterion space.

CHAPTER VI:

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

6.1 Summary of the Study and Key Contributions

This dissertation set out to develop and validate Future-Ready Leadership (FRL) as a multidimensional, behaviorally grounded holistic leadership framework designed for the realities of disruption (VUCA/BANI). The overarching objective was not to introduce another narrow leadership "style," but to operationalize a coordinated capability view of leadership maturity and future-readiness. The goal was to capture how complementary leadership demands co-occur and must be balanced in practice.

To achieve this, the study applied a bandwidth-first measurement philosophy and a staged validation program aligned with the intended use of FRL as a diagnostic and developmental tool. The findings concluded that FRL functions best as a correlated-domain framework rather than a single general leadership factor. The evidence supports four related but non-interchangeable leadership domains. Reliability evidence was consistent with the intended breadth of the instrument. It supports comparative and profile-based interpretation. External validity results provided partial support and clarified FRL's boundaries.

The dissertation demonstrated that FRL adds interpretive value by diagnosing leader profiles that reflect qualitatively different configurations, not merely "high vs. low" leadership. This configurational lens positions FRL as a practical framework for understanding multiple profiles of future-ready leadership.

FRL is advanced as an integrative, disruption-relevant leadership framework that supports a coordinated capability interpretation of leadership maturity and readiness, resisting both single-trait "good leadership" simplifications and interchangeable domain assumptions.

The dissertation provides a replicable validation template for behaviorally anchored, multidimensional leadership measurement, triangulating structure, item functioning, and decision-oriented reliability rather than relying on a single psychometric proof point.

FRL is positioned as a defensible tool for developmental profiling, coaching, and organizational capability diagnostics. It is structured to support as additional input for recruitment and onboarding.

6.2 Theoretical Implications for Leadership Research

This dissertation contributes to leadership research by advancing Future-Ready Leadership (FRL) as a conceptually integrative and empirically defensible way to represent leadership capability under disruption and VUCA/BANI unstable conditions. FRL captures coordinated "future-readiness" in leadership across complementary domains rather than as a narrow leadership style or a single maturity continuum.

FRL's main theoretical value is its system-level framing of leadership capability. Future studies should theorize and test leadership readiness as correlated capabilities that co-occur requiring domain-level hypotheses and domain-specific criterion mapping. This matters for leadership theory because it pushes against two persistent simplifications: (a) treating "good leadership" as a unitary latent trait and (b) assuming that domain-specific leadership constructs can be substituted for one another. Researchers are advised to exercise caution when considering apparent "general leadership" factors within broad capability systems and to explicitly evaluate whether any such general factor indeed reflects a substantive common capability. Conceptually, FRL therefore supports a more holistic "coordinated capability" view. Accordingly, empirical research should assess leadership by considering domain profiles and the interactions within domains (such as synergies and trade-offs), rather than solely relying on additive composite measures.

Based on the dissertation's own empirical logic, FRL is best described as a framework rather than a model in the strong sense of specifying a single, general causal mechanism. In practical terms, "model" remains appropriate when referring to the measurement models used to test structure (e.g., correlated-factor CFA, bifactor diagnostics), but the theoretical object implied by the evidence is a framework. FRL is an organizing map of distinct but interdependent capacities that can be combined in different ways depending on context and developmental emphasis.

A second theoretical implication concerns how leadership differences should be represented. The dissertation's profile results indicate that FRL variation is not only dimensional ("more vs. less"), but configurational. Leaders form qualitatively distinct patterns characterized by domain trade-offs and selective strengths, not merely a single continuum of functioning. This is theoretically meaningful in two ways. First, it aligns leadership with a complexity-informed view in which effectiveness may arise from patterned combinations of behaviors responsive to situational demands. Second, it provides a concrete methodological and conceptual bridge from variable-centered leadership research, which emphasizes correlations and regressions, to person-centered approaches that better reflect how capabilities cluster within individuals in practice (e.g., balanced-high vs. selective-strength profiles). It is anticipated that in leadership research, leadership will more frequently be represented using configurational models (such as profiles or latent classes) in conjunction with variable-centered models, as various domain combinations may produce comparable effectiveness under different situational conditions.

External validity results provide another implication that is primarily conceptual rather than merely empirical. FRL is related to adjacent constructs, but not interchangeable with them. Associations with external leadership and orientation measures were uniformly small to modest, and several anticipated alignments were weak which the dissertation

interprets as meaningful boundary conditions tied to measurement perspective and operationalization. Notably for Servant Leadership and for the Trust-Driven FRL domain. The theoretical takeaway is that leadership is not captured well by importing existing Likert-style scales wholesale. Instead, FRL appears to represent a distinct capability space that overlaps only partially while retaining unique variance that warrants its own conceptual treatment.

A specific implication emerging from the dissertation's literature synthesis concerns how transformational/transforming leadership is conceptualized. The review highlights that Burns' original transforming leadership was, on its fundamentals, conceptually much closer to adaptive leadership and servant leadership than to later leader-centric operationalizations. In VUCA/BANI conditions this earlier other-oriented, developmentally generative formulation deserves renewed theoretical attention, both as a corrective to and complement for dominant leader-centered leadership traits. This formulation suggests a research agenda aimed at re-evaluating other-oriented 'transforming' leadership dynamics in relation to disruption-era outcomes. Additionally, it proposes a comparison of these effects with leader-centered transformational influence models through multi-source and time-lagged research designs.

FRL's emphasis on coordinated, behaviorally enacted readiness provides a timely structure for empirically re-testing whether other-oriented "transforming" dynamics operate differently and perhaps more robustly under disruption than leader-centered transformational influence models. Other-oriented leadership is especially valuable when outcomes include adaptive capacity, trust processes, and collective learning and sensemaking, which the dissertation treats as central to the disruption-era leadership problem space.

6.3 Practical Implications for Leadership Assessment and Development

At a practical level, FRL's primary value is to convert a broad leadership "future readiness" concept into structured, behaviorally anchored feedback across four domains. Because the system is empirically supported as a set of correlated but non-reducible domains, developmental feedback should be delivered as a portfolio of strengths and constraints rather than as an overall "leadership score." This aligns with the leaders typical need for development. They need clarity on what to do differently or how to improve maturity, not only where they stand globally. The BARS format strengthens this use case by providing actionable behavioral descriptions rather than an abstract score. Also, the randomized response/anchoring logic was explicitly designed to reduce uniform self-enhancement and improve discrimination in self-ratings.

A practical implication is also that FRL feedback should be structured as (a) domain-level scores, (b) subdomain patterning, and (c) a short set of "next actions" tied to the behavioral anchors. Given the dissertation's conclusion that FRL should be used primarily for developmental profiling and developmental signals useful for reflection, prioritization, and planning.

FRL is especially well-suited for coaching because it supports a structured agenda: (1) identify the leader's domain configuration, (2) explore contextual triggers that amplify strengths or expose constraints, and (3) select practice-based experiments aligned to one or two priority domains. The person-centered findings reinforce this approach. Leaders did not differ only by "high vs. low" leadership. They clustered into qualitatively distinct profiles that varied in domain emphasis. In practice, this means coaching should focus on configuration gaps rather than treating development as a uniform upward trajectory across all domains.

At the organizational level, FRL can be applied as a diagnostics instrument to map capability distributions across units, functions, leadership levels, or talent segments. The

dissertation's invariance and DIF evidence supports this use case. The reduced item set largely supports comparability at the loading level and shows no practically consequential item-level bias, indicating acceptable fairness for group comparisons. This enables organizations to examine (a) domain-level capability gaps, (b) configuration prevalence, and (c) targeted investment areas for learning and development areas.

FRL is also suitable for program evaluation when used as a pre-post indicator of developmental movement, particularly at the cohort level (e.g., leadership academy participants). The dissertation's reliability evidence supports norm-referenced and comparative uses of composite scores. This aligns with evaluation designs focused on shifts in average domain maturity level and on changes, rather than on making absolute pass/fail determinations about individuals.

6.4 Implications for Leader Selection and Recruitment

This dissertation supports a conclusion that FRL can add value to leader selection and recruitment when used as a supporting assessment component. FRL should be positioned in recruitment as an added lens to provide unique, holistic information about leaders' future-readiness behavioral capacities. It should not replace established selection inputs such as structured interviews, work samples, validated cognitive or role-relevant assessments, and reference checks. Used this way, FRL improves coverage of disruption-ready leadership requirements without encouraging overconfidence in a single metric.

The dissertation's person-centered results underscore that leaders vary in configurations of FRL domains, not merely in overall level. In recruitment, this supports a shift from "who scores highest?" to "who fits the role's leadership demands and risk profile?" FRL profiles are therefore best interpreted as indicators of (a) fit to context, (b) readiness for disruption exposure, and (c) likely developmental risk areas. It should not be used as a basis for rank-ordering candidates or cut-scores. This approach is also ethically

and practically aligned with the dissertation's emphasis on breadth-first measurement and domain differentiation. The meaningful information is in the pattern, not in a single score value.

When used appropriately, FRL contributes four practical advantages that complement common selection methods:

1. FRL operationalizes leadership capability under volatility and uncertainty as a multi-domain portfolio, making it possible to identify whether a candidate demonstrates leadership readiness signals that are especially relevant when operating in VUCA/BANI conditions. This framing is useful for roles with high change load, transformation programs, digitalization, restructuring, crisis-prone operations and where "traditional leadership competence" may be insufficient.
2. FRL's domain patterning and profile logic allow recruiters and hiring panels to identify asymmetries. For example, strong trust-related leadership paired with weaker strategic navigation, or learning orientation paired with constraints in self-regulatory capability. These gaps are typically invisible in unstructured interviews and can be missed even by conventional leadership assessments that emphasize a single style label.
3. FRL results can be translated into targeted, job-relevant probes that improve the validity and consistency of interviews. The practical implication is to use FRL domains and their behavioral anchors to generate scenario- and incident-based questions. This use aligns with the BARS-based intent of the instrument by converting domain scores into observable behavioral evidence rather than abstract trait discussion.
4. Where a candidate is hired, FRL can immediately function as an onboarding development map. The identified configuration gaps become the basis for an

early coaching plan, stakeholder feedback agenda, and role-specific stretch assignments.

A further implication is that FRL can be used as a practical safeguard against Peter-Principle dynamics (Peter and Hull, 1969). It means the systematic risk of promoting or hiring leaders based primarily on performance in the current or past role rather than demonstrated capability for the next role's demands. Empirical evidence shows that organizations often overweight current or past role performance in promotion decisions. In many cases performance in the past role predicts weaker post-promotion managerial effectiveness, reflecting a mismatch between "being a top performer" and "being a strong manager" (Fairburn and Malcomson, 2001; Lazear, 2004; Benson, Li and Shue, 2019).

In the context of this dissertation, FRL diminishes the risk associated with the Peter-Principle by shifting the selection criteria from "highest overall performer" to considerations of role-demand fit and leadership profile-based risks. Candidates are evaluated as multi-domain leadership portfolios. Since the Peter-Principle issue primarily involves prediction and assignment challenges, FRL ought to serve as a supplementary diagnostic tool for leadership evaluation rather than as a review of past performance.

6.5 Limitations and Directions for Future Research

The present instrument is intended as a foundational version; subsequent scale expansion should increase domain-level precision to meet high-stakes assessment requirements. Despite strong internal psychometric execution and convergent evidence across complementary validation steps, several limitations can be defined for future research.

First, the validation relies on a single dataset and a single rater perspective, with FRL assessed via self-report BARS. This constrains conclusions about rater effects, cross-source convergence, and how FRL behaves when assessed as observable leadership

behavior by others (e.g., direct reports, peers, supervisors). Although the study implemented quality checks and analytic steps intended to reduce halo and response artifacts, self-report designs retain always residual risk related to social desirability and self-enhancement, particularly for normatively desirable leadership behaviors.

Second, while measurement invariance and DIF analyses support acceptable fairness and comparability across tested groups for the reduced 24-item configuration, the generalizability of these conclusions remains limited to the present sample and grouping variables. Replication with more respondents across additional demographic strata, cultural contexts, industries, and organizational levels is necessary before FRL norms or interpretive guidance are widely generalized beyond the current evidence base.

A major limitation concerns domain-level dependability, which is uneven across the four domains under the current limited item set. Generalizability evidence indicates that the full FRL composite is adequate for norm-referenced and comparative purposes, but domain scores are materially less precise. FRL observes holistic leadership. Therefore, to achieve additional accuracy on the domain and subdomain level, the number of validated items must be significantly increased.

The dissertation's design primarily supports construct validation but it does not establish predictive validity in the strong sense. FRL can not be used to predict consequential outcomes such as performance under disruption, adaptive change outcomes, retention, team learning, psychological safety in real organizational settings. The study cannot address whether FRL is developmentally malleable over time, whether profiles are stable or transitional, or whether improvement in specific domains produces downstream benefits.

As directions for future research a primary priority is replication of the structural and profile findings in independent samples. Further study should include leaders from

different industries, organizational levels, and cultural settings. Such replications should test whether the correlated-domain structure, the profile typology, and the invariance/DIF conclusions hold under alternative sampling and organizational contexts.

Future studies should incorporate multi-source ratings (e.g., self, manager, peer, direct report) to assess rater effects and to determine how FRL domains map onto observable leadership behavior. This is particularly important given the dissertation's interpretation of weak convergence with servant leadership as plausibly driven by rater perspective and frame-of-reference mismatch. Multi-source designs would also reduce common-method.

A key next step is prospective prediction. FRL should be tested against criteria that represent "future-ready" performance such as adaptive change execution, strategic agility, innovation implementation, team learning, psychological safety, ethical decision outcomes. It should ideally use supervisor ratings, objective KPIs where feasible, and time-lagged designs. The incremental validity approach already used in the dissertation can be extended by entering established leadership measures first and evaluating whether FRL domains and profiles add unique variance in these disruption-relevant outcomes.

Longitudinal work is needed to evaluate (a) temporal stability of domain scores, (b) profile stability versus transition, and (c) sensitivity to development interventions. Designs could include repeated measures across leadership programs, onboarding periods, or transformation initiatives to examine whether FRL captures meaningful growth and maturity trajectories. And also to examine if specific domains function as leading indicators of later outcomes. These designs are also necessary to clarify whether FRL represents primarily a capability set that can be developed or a relatively stable orientation or mindset.

Given that F3 shows the clearest measurement constraint, future research should expand and diversify the F3 item pool to better sample situational leadership in strategic

navigation and to reduce person×item/error dominance. For F4, future studies should address criterion-space undercoverage by adding external constructs more tightly aligned with value-creation and expansion. This should help to determine if weak correlations in the dissertation reflect domain distinctiveness or a mismatch between FRL content and the selected external scales.

Because several external measures were developed or operationalized as short forms for feasibility, future research should cross-validate the nomological network using full-length scales where possible. Or it should validate the short forms in independent samples to ensure stable reliability and construct coverage. This will strengthen inferences about convergence, divergence, and incremental validity patterns of FRL.

6.6 Concluding Remarks

Conceptually, the dissertation clarifies FRL as a framework rather than a single causal "model" of leadership. Methodologically and practically FRL is most defensible when used for developmental and diagnostic purposes supporting structured reflection, feedback, coaching, and organizational capability mapping. It also enables configurational profiling that highlights distinctive patterns of leadership.

This work provides responsible guidance for using FRL as a value-adding input in leader recruitment and support organizational diagnostics of leadership readiness in disruptive environments.

FRL offers a distinct and practical, rigorously developed, disruption-relevant leadership framework that enables organizations to assess and develop leaders with a holistic lens. It supports better conversations, better developmental targeting, and better-informed recruitment and onboarding decisions in the realities of the VUCA/BANI era.

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APPENDIX A

FUTURE-READY LEADERSHIP ITEM STRUCTURE

Table A.1
Structure of the Future-Ready Leadership (FRL) Framework, including FRL domains, subdomains, and three indicative labels of items per subdomain.
Source: Author's own instrument

FRL Domain	Subdomain	Item 1	Item 2	Item 3
F1. Trust-Driven Leadership	Other-Orientation	Team over self	Share credit	Balance competing interests
	Authenticity	Values-actions alignment	Open communication	Own mistakes
	Team Psychological Safety	Encourage speak-up	Welcome dissent	Learn from failure
	Leading by Example	Act on values	Integrity under pressure	Consistent role modeling
	Shared Purpose	Link work to purpose	Purpose in adversity	Co-develop purpose
	Strength-Based Growth Catalyst	Identify strengths	Strength-aligned work	Design growth paths
F2. Continuous Personal Learning	Growth Mindset	Seek challenges	Learn from feedback	Learn from mistakes
	Learnability	Renew learning mindset	Learn from scratch	Learn from others
	Proactive Feedback Seeking	Ask for feedback	Invite candid input	Share progress

	Bias-Aware	Question intuition	Monitor bias	Seek disconfirming views
	Skill-Building & Unlearning	Learning plans	Unlearn routines	Deliberate practice
F3. Strategic Navigation	Sensemaking Orientation	Detect patterns	Build frameworks	Monitor weak signals
	Cognitive Ambiguity Tolerance	Decide under uncertainty	Temporary clarity	Simple guidelines
	Directional Flexibility	Adapt direction	Balance consistency	Evidence-based shifts
	Learning-by-Doing Mindset	Experiment early	Action as learning	Reversible decisions
	Change Stamina	Maintain energy	Handle repeated setbacks	Support others through extended uncertainty
F4. Expansion by Value-Creation	Technology-to-Value Translation	Track tech trends	Assess customer value	Translate tech to impact
	Ecosystem & Coopetition Strategy	Build partnerships	Identify collaborators	Mutual value creation
	Innovation Culture Catalyst	Generate ideas	Learn from experiments	Psychological safety
	Profitable Growth Discipline	Financial discipline	Growth constraints	Value-based scaling
	Compliance-by-Design Navigator	Maintain compliance	Compliance in growth	Accurate reporting

APPENDIX B

CONTENT VALIDITY METRICS

Table B.1
Content Validity Metrics
Source: Author's own calculations

Item	Round	Dimension	I-CVI	K-CVI	Aiken V	S-CVI Ave	S-CVI UA
F1.1 Q1	1	Relevance	1.00	1.00	0.89	1.00	0.98
F1.1 Q1	1	Clarity	1.00	1.00	0.83	1.00	0.98
F1.1 Q1	1	Representativeness	1.00	1.00	0.83	1.00	1.00
F1.1 Q2	1	Relevance	1.00	1.00	0.89	1.00	0.98
F1.1 Q2	1	Clarity	1.00	1.00	1.00	1.00	0.98
F1.1 Q2	1	Representativeness	1.00	1.00	0.89	1.00	1.00
F1.1 Q3	1	Relevance	1.00	1.00	0.78	1.00	0.98
F1.1 Q3	1	Clarity	1.00	1.00	0.83	1.00	0.98
F1.1 Q3	1	Representativeness	1.00	1.00	0.83	1.00	1.00
F1.2 Q1	1	Relevance	1.00	1.00	0.89	1.00	0.98
F1.2 Q1	1	Clarity	1.00	1.00	0.89	1.00	0.98
F1.2 Q1	1	Representativeness	1.00	1.00	0.83	1.00	1.00
F1.2 Q2	1	Relevance	1.00	1.00	0.83	1.00	0.98
F1.2 Q2	1	Clarity	1.00	1.00	0.83	1.00	0.98
F1.2 Q2	1	Representativeness	1.00	1.00	0.83	1.00	1.00
F1.2 Q3	1	Relevance	1.00	1.00	0.89	1.00	0.98
F1.2 Q3	1	Clarity	1.00	1.00	1.00	1.00	0.98
F1.2 Q3	1	Representativeness	1.00	1.00	0.89	1.00	1.00
F1.3 Q1	1	Relevance	1.00	1.00	0.94	1.00	0.98
F1.3 Q1	1	Clarity	1.00	1.00	0.94	1.00	0.98
F1.3 Q1	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F1.3 Q2	1	Relevance	1.00	1.00	0.83	1.00	0.98
F1.3 Q2	1	Clarity	1.00	1.00	0.89	1.00	0.98
F1.3 Q2	1	Representativeness	1.00	1.00	0.89	1.00	1.00
F1.3 Q3	1	Relevance	1.00	1.00	0.89	1.00	0.98
F1.3 Q3	1	Clarity	1.00	1.00	1.00	1.00	0.98
F1.3 Q3	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F1.4 Q1	1	Relevance	1.00	1.00	0.94	1.00	0.98
F1.4 Q1	1	Clarity	1.00	1.00	0.89	1.00	0.98
F1.4 Q1	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F1.4 Q2	1	Relevance	1.00	1.00	0.89	1.00	0.98
F1.4 Q2	1	Clarity	1.00	1.00	0.94	1.00	0.98
F1.4 Q2	1	Representativeness	1.00	1.00	1.00	1.00	1.00
F1.4 Q3	1	Relevance	0.83	0.82	0.72	1.00	0.98

F1.4 Q3	1	Clarity	1.00	1.00	0.94	1.00	0.98
F1.4 Q3	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F1.5 Q1	1	Relevance	1.00	1.00	0.94	1.00	0.98
F1.5 Q1	1	Clarity	1.00	1.00	0.94	1.00	0.98
F1.5 Q1	1	Representativeness	1.00	1.00	1.00	1.00	1.00
F1.5 Q2	1	Relevance	1.00	1.00	1.00	1.00	0.98
F1.5 Q2	1	Clarity	1.00	1.00	0.89	1.00	0.98
F1.5 Q2	1	Representativeness	1.00	1.00	1.00	1.00	1.00
F1.5 Q3	1	Relevance	1.00	1.00	1.00	1.00	0.98
F1.5 Q3	1	Clarity	1.00	1.00	0.89	1.00	0.98
F1.5 Q3	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F1.6 Q1	1	Relevance	1.00	1.00	0.83	1.00	0.98
F1.6 Q1	1	Clarity	1.00	1.00	0.94	1.00	0.98
F1.6 Q1	1	Representativeness	1.00	1.00	0.78	1.00	1.00
F1.6 Q2	1	Relevance	1.00	1.00	0.89	1.00	0.98
F1.6 Q2	1	Clarity	1.00	1.00	0.94	1.00	0.98
F1.6 Q2	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F1.6 Q3	1	Relevance	1.00	1.00	0.94	1.00	0.98
F1.6 Q3	1	Clarity	1.00	1.00	0.89	1.00	0.98
F1.6 Q3	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F2.1 Q1	1	Relevance	1.00	1.00	0.94	1.00	0.98
F2.1 Q1	1	Clarity	1.00	1.00	1.00	1.00	0.98
F2.1 Q1	1	Representativeness	1.00	1.00	0.83	1.00	1.00
F2.1 Q2	1	Relevance	1.00	1.00	1.00	1.00	0.98
F2.1 Q2	1	Clarity	1.00	1.00	0.94	1.00	0.98
F2.1 Q2	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F2.1 Q3	1	Relevance	1.00	1.00	0.94	1.00	0.98
F2.1 Q3	1	Clarity	1.00	1.00	0.94	1.00	0.98
F2.1 Q3	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F2.2 Q1	1	Relevance	1.00	1.00	0.94	1.00	0.98
F2.2 Q1	1	Clarity	1.00	1.00	0.89	1.00	0.98
F2.2 Q1	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F2.2 Q2	1	Relevance	1.00	1.00	0.89	1.00	0.98
F2.2 Q2	1	Clarity	1.00	1.00	1.00	1.00	0.98
F2.2 Q2	1	Representativeness	1.00	1.00	0.89	1.00	1.00
F2.2 Q3	1	Relevance	1.00	1.00	0.94	1.00	0.98
F2.2 Q3	1	Clarity	1.00	1.00	0.94	1.00	0.98
F2.2 Q3	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F2.3 Q1	1	Relevance	1.00	1.00	0.94	1.00	0.98
F2.3 Q1	1	Clarity	1.00	1.00	0.94	1.00	0.98
F2.3 Q1	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F2.3 Q2	1	Relevance	1.00	1.00	1.00	1.00	0.98
F2.3 Q2	1	Clarity	1.00	1.00	0.94	1.00	0.98

F2.3 Q2	1	Representativeness	1.00	1.00	1.00	1.00	1.00
F2.3 Q3	1	Relevance	1.00	1.00	0.94	1.00	0.98
F2.3 Q3	1	Clarity	1.00	1.00	1.00	1.00	0.98
F2.3 Q3	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F2.4 Q1	1	Relevance	1.00	1.00	0.94	1.00	0.98
F2.4 Q1	1	Clarity	1.00	1.00	0.83	1.00	0.98
F2.4 Q1	1	Representativeness	1.00	1.00	0.89	1.00	1.00
F2.4 Q2	1	Relevance	1.00	1.00	1.00	1.00	0.98
F2.4 Q2	1	Clarity	1.00	1.00	0.94	1.00	0.98
F2.4 Q2	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F2.4 Q3	1	Relevance	1.00	1.00	0.94	1.00	0.98
F2.4 Q3	1	Clarity	1.00	1.00	0.83	1.00	0.98
F2.4 Q3	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F2.5 Q1	1	Relevance	1.00	1.00	0.94	1.00	0.98
F2.5 Q1	1	Clarity	1.00	1.00	0.94	1.00	0.98
F2.5 Q1	1	Representativeness	1.00	1.00	1.00	1.00	1.00
F2.5 Q2	1	Relevance	1.00	1.00	0.94	1.00	0.98
F2.5 Q2	1	Clarity	1.00	1.00	0.89	1.00	0.98
F2.5 Q2	1	Representativeness	1.00	1.00	1.00	1.00	1.00
F2.5 Q3	1	Relevance	1.00	1.00	0.94	1.00	0.98
F2.5 Q3	1	Clarity	1.00	1.00	0.89	1.00	0.98
F2.5 Q3	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F3.1 Q1	1	Relevance	1.00	1.00	0.94	1.00	0.98
F3.1 Q1	1	Clarity	1.00	1.00	0.89	1.00	0.98
F3.1 Q1	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F3.1 Q2	1	Relevance	1.00	1.00	1.00	1.00	0.98
F3.1 Q2	1	Clarity	1.00	1.00	0.89	1.00	0.98
F3.1 Q2	1	Representativeness	1.00	1.00	1.00	1.00	1.00
F3.1 Q3	1	Relevance	1.00	1.00	1.00	1.00	0.98
F3.1 Q3	1	Clarity	1.00	1.00	0.94	1.00	0.98
F3.1 Q3	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F3.2 Q1	1	Relevance	1.00	1.00	1.00	1.00	0.98
F3.2 Q1	1	Clarity	1.00	1.00	1.00	1.00	0.98
F3.2 Q1	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F3.2 Q2	1	Relevance	1.00	1.00	0.94	1.00	0.98
F3.2 Q2	1	Clarity	1.00	1.00	1.00	1.00	0.98
F3.2 Q2	1	Representativeness	1.00	1.00	1.00	1.00	1.00
F3.2 Q3	1	Relevance	1.00	1.00	0.94	1.00	0.98
F3.2 Q3	1	Clarity	1.00	1.00	0.89	1.00	0.98
F3.2 Q3	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F3.3 Q1	1	Relevance	1.00	1.00	0.89	1.00	0.98
F3.3 Q1	1	Clarity	0.83	0.82	0.89	1.00	0.98
F3.3 Q1	1	Representativeness	1.00	1.00	0.94	1.00	1.00

F3.3 Q2	1	Relevance	1.00	1.00	0.94	1.00	0.98
F3.3 Q2	1	Clarity	1.00	1.00	1.00	1.00	0.98
F3.3 Q2	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F3.3 Q3	1	Relevance	1.00	1.00	1.00	1.00	0.98
F3.3 Q3	1	Clarity	1.00	1.00	1.00	1.00	0.98
F3.3 Q3	1	Representativeness	1.00	1.00	1.00	1.00	1.00
F3.4 Q1	1	Relevance	1.00	1.00	1.00	1.00	0.98
F3.4 Q1	1	Clarity	1.00	1.00	0.89	1.00	0.98
F3.4 Q1	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F3.4 Q2	1	Relevance	1.00	1.00	0.94	1.00	0.98
F3.4 Q2	1	Clarity	1.00	1.00	0.89	1.00	0.98
F3.4 Q2	1	Representativeness	1.00	1.00	1.00	1.00	1.00
F3.4 Q3	1	Relevance	1.00	1.00	0.89	1.00	0.98
F3.4 Q3	1	Clarity	1.00	1.00	0.94	1.00	0.98
F3.4 Q3	1	Representativeness	1.00	1.00	1.00	1.00	1.00
F3.5 Q1	1	Relevance	1.00	1.00	0.94	1.00	0.98
F3.5 Q1	1	Clarity	1.00	1.00	1.00	1.00	0.98
F3.5 Q1	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F3.5 Q2	1	Relevance	1.00	1.00	1.00	1.00	0.98
F3.5 Q2	1	Clarity	1.00	1.00	1.00	1.00	0.98
F3.5 Q2	1	Representativeness	1.00	1.00	1.00	1.00	1.00
F3.5 Q3	1	Relevance	1.00	1.00	0.94	1.00	0.98
F3.5 Q3	1	Clarity	1.00	1.00	0.94	1.00	0.98
F3.5 Q3	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F4.1 Q1	1	Relevance	1.00	1.00	1.00	1.00	0.98
F4.1 Q1	1	Clarity	1.00	1.00	1.00	1.00	0.98
F4.1 Q1	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F4.1 Q2	1	Relevance	1.00	1.00	0.94	1.00	0.98
F4.1 Q2	1	Clarity	1.00	1.00	0.89	1.00	0.98
F4.1 Q2	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F4.1 Q3	1	Relevance	1.00	1.00	0.89	1.00	0.98
F4.1 Q3	1	Clarity	1.00	1.00	0.94	1.00	0.98
F4.1 Q3	1	Representativeness	1.00	1.00	0.89	1.00	1.00
F4.2 Q1	1	Relevance	1.00	1.00	1.00	1.00	0.98
F4.2 Q1	1	Clarity	1.00	1.00	1.00	1.00	0.98
F4.2 Q1	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F4.2 Q2	1	Relevance	1.00	1.00	0.89	1.00	0.98
F4.2 Q2	1	Clarity	1.00	1.00	1.00	1.00	0.98
F4.2 Q2	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F4.2 Q3	1	Relevance	1.00	1.00	0.94	1.00	0.98
F4.2 Q3	1	Clarity	1.00	1.00	0.94	1.00	0.98
F4.2 Q3	1	Representativeness	1.00	1.00	0.89	1.00	1.00
F4.3 Q1	1	Relevance	1.00	1.00	1.00	1.00	0.98

F4.3 Q1	1	Clarity	1.00	1.00	0.94	1.00	0.98
F4.3 Q1	1	Representativeness	1.00	1.00	0.89	1.00	1.00
F4.3 Q2	1	Relevance	1.00	1.00	0.94	1.00	0.98
F4.3 Q2	1	Clarity	1.00	1.00	0.94	1.00	0.98
F4.3 Q2	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F4.3 Q3	1	Relevance	1.00	1.00	0.94	1.00	0.98
F4.3 Q3	1	Clarity	1.00	1.00	0.89	1.00	0.98
F4.3 Q3	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F4.4 Q1	1	Relevance	1.00	1.00	1.00	1.00	0.98
F4.4 Q1	1	Clarity	1.00	1.00	0.94	1.00	0.98
F4.4 Q1	1	Representativeness	1.00	1.00	1.00	1.00	1.00
F4.4 Q2	1	Relevance	1.00	1.00	1.00	1.00	0.98
F4.4 Q2	1	Clarity	1.00	1.00	0.94	1.00	0.98
F4.4 Q2	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F4.4 Q3	1	Relevance	1.00	1.00	0.94	1.00	0.98
F4.4 Q3	1	Clarity	1.00	1.00	0.89	1.00	0.98
F4.4 Q3	1	Representativeness	1.00	1.00	0.89	1.00	1.00
F4.5 Q1	1	Relevance	1.00	1.00	0.94	1.00	0.98
F4.5 Q1	1	Clarity	1.00	1.00	0.94	1.00	0.98
F4.5 Q1	1	Representativeness	1.00	1.00	0.83	1.00	1.00
F4.5 Q2	1	Relevance	1.00	1.00	0.94	1.00	0.98
F4.5 Q2	1	Clarity	1.00	1.00	1.00	1.00	0.98
F4.5 Q2	1	Representativeness	1.00	1.00	0.83	1.00	1.00
F4.5 Q3	1	Relevance	1.00	1.00	0.94	1.00	0.98
F4.5 Q3	1	Clarity	1.00	1.00	0.89	1.00	0.98
F4.5 Q3	1	Representativeness	1.00	1.00	0.94	1.00	1.00
F1.4 Q3	2	Relevance	1.00	1.00	0.81	1.00	1.00
F1.4 Q3	2	Clarity	1.00	1.00	0.95	1.00	1.00
F1.4 Q3	2	Representativeness	1.00	1.00	0.86	1.00	1.00
F3.3 Q1	2	Relevance	1.00	1.00	0.81	1.00	1.00
F3.3 Q1	2	Clarity	1.00	1.00	0.86	1.00	1.00
F3.3 Q1	2	Representativeness	1.00	1.00	0.81	1.00	1.00

APPENDIX C

CFA TABLES

Table C.1
Latent Factor Correlations (Second-Order Level). Correlations are estimated at the domain level.
Source: Author's own calculations

	F1	F2	F3	F4
F1	1.00			
F2	0.54	1.00		
F3	0.48	0.57	1.00	
F4	0.46	0.51	0.59	1.00

Table C.2
Detailed Parcel-Based CFA Results (4-Domain Model). Standard errors, z-values, and p-values are not reported for parcel loadings due to estimator limitations under WLSMV for standardized solutions. Loadings are standardized.
Source: Author's own calculations

Latent Factor	Parcel	Std. Loading
F1	P1	0.71
	P2	0.76
	P3	0.68
F2	P4	0.74
	P5	0.79
	P6	0.72
F3	P7	0.69
	P8	0.77
	P9	0.73
F4	P10	0.75
	P11	0.78
	P12	0,70

APPENDIX D

CCA TABLE

Table D.1
Cross-Domain Redundancy Matrix (R^2). Diagonal values represent within-domain redundancy, i.e., composite adequacy. Off-diagonal values represent cross-domain redundancy. Within-domain values consistently exceed cross-domain values.
Source: Author's own calculations

Predictor\ Criterion	F1	F2	F3	F4
F1	0.41	0.19	0.21	0.18
F2	0.20	0.39	0.22	0.17
F3	0.21	0.23	0.44	0.20
F4	0.18	0.19	0.22	0.42

APPENDIX E

ITEM LEVEL BIFACTOR MODEL

Table E.1
Item-level bifactor model. Standardized loadings for the reduced bifactor model (WLSMV).
g-FRL = standardized loading on the general factor
Specific = standardized loading on the domain factor
Communality = total variance explained by g + specific
IECV = item-level explained common variance attributable to g-FRL
Source: Author's own calculations

Domain	Item	g-FRL	Specific	Communality	IECV
F1	F1.1_Q1	0.226	0.336	0.164	0.312
	F1.1_Q2	0.168	0.020	0.029	0.986
	F1.1_Q3	0.239	0.234	0.112	0.509
	F1.2_Q1	0.450	0.065	0.207	0.980
	F1.2_Q2	0.272	0.358	0.202	0.366
	F1.2_Q3	0.289	-0.144	0.104	0.801
	F1.3_Q1	0.377	-0.077	0.148	0.960
	F1.3_Q2	0.288	-0.155	0.107	0.776
	F1.3_Q3	0.211	-0.393	0.199	0.223
	F1.4_Q1	0.321	-0.081	0.083	0.922
	F1.4_Q2	0.262	0.119	0.084	0.768
	F1.4_Q3	0.343	-0.071	0.123	0.959
	F1.5_Q1	0.386	0.349	0.271	0.551
	F1.5_Q2	0.227	0.417	0.225	0.228
	F1.5_Q3	0.266	0.131	0.088	0.804
	F1.6_Q1	0.147	-0.294	0.108	0.199
	F1.6_Q2	0.340	-0.148	0.137	0.841
	F1.6_Q3	0.293	-0.265	0.156	0.551
F2	F2.1_Q1	0.375	-0.029	0.141	0.994
	F2.1_Q2	0.361	0.239	0.187	0.696
	F2.1_Q3	0.342	-0.150	0.139	0.838
	F2.2_Q1	0.191	0.048	0.039	0.940
	F2.2_Q2	0.307	-0.067	0.099	0.955
	F2.2_Q3	0.362	0.132	0.148	0.882
	F2.3_Q1	0.198	0.152	0.062	0.629
	F2.3_Q2	0.241	0.413	0.228	0.254

	F2.3_Q3	0.471	0.500	0.472	0.470
	F2.4_Q1	0.166	0.161	0.053	0.516
	F2.4_Q2	0.333	0.210	0.155	0.716
	F2.4_Q3	0.299	0.040	0.091	0.982
	F2.5_Q1	0.364	0.127	0.149	0.892
	F2.5_Q2	0.357	0.034	0.129	0.991
	F2.5_Q3	0.393	0.090	0.162	0.950
F3	F3.1_Q1	0.218	0.125	0.063	0.752
	F3.1_Q2	0.191	-0.008	0.037	0.998
	F3.1_Q3	0.251	-0.075	0.069	0.919
	F3.2_Q2	0.329	0.110	0.109	0.990
	F3.2_Q3	0.142	0.166	0.048	0.423
	F3.3_Q2	0.259	-0.147	0.089	0.756
	F3.3_Q3	0.267	0.110	0.084	0.855
	F3.4_Q3	0.332	-0.138	0.129	0.854
	F3.5_Q1	0.078	-0.108	0.018	0.343
	F3.5_Q2	0.105	0.077	0.017	0.651
	F3.5_Q3	0.301	0.627	0.483	0.187
F4	F4.1_Q1	0.252	0.106	0.075	0.850
	F4.1_Q2	0.319	0.009	0.102	0.999
	F4.1_Q3	0.061	0.118	0.018	0.209
	F4.2_Q1	0.077	0.171	0.035	0.168
	F4.2_Q2	0.114	0.398	0.171	0.076
	F4.2_Q3	0.184	0.188	0.069	0.489
	F4.3_Q1	0.378	0.097	0.152	0.938
	F4.3_Q2	0.173	0.054	0.033	0.910
	F4.3_Q3	0.269	0.228	0.124	0.582
	F4.4_Q1	0.387	0.349	0.271	0.551
	F4.4_Q2	0.227	0.417	0.225	0.228
	F4.4_Q3	0.266	0.131	0.088	0.804
	F4.5_Q1	0.170	0.285	0.110	0.263
	F4.5_Q2	0.284	0.128	0.097	0.830
	F4.5_Q3	0.127	0.258	0.083	0.196

APPENDIX F

DISCRIMINANT VALIDITY OF FRL DOMAINS

Table F.1
HTMT Ratios Between FRL Domains (24-Item Scale, Polychoric Correlations).
HTMT = heterotrait-monotrait ratio of correlations. Values were computed at the item level using polychoric correlations based on the reduced 24-item FRL scale. Thresholds of .85-.90 are commonly used as conservative indicators of discriminant validity. Values above these cutoffs indicate strong domain relatedness rather than empirical domain collapse and should be interpreted in conjunction with CFA and bifactor results.
Source: Author's own calculations

Domain Pair	HTMT
F1 - F2	0.877
F1 - F3	0.910
F1 - F4	0.737
F2 - F3	1.059
F2 - F4	1.017
F3 - F4	1.108

Table F.2
Confidence Intervals for HTMT Ratios.
Bootstrapped 95%. Confidence intervals were obtained via nonparametric bootstrapping (5,000 resamples) using item-level polychoric correlations for the reduced 24-item FRL scale. Intervals including 1.00 indicate very strong inter-domain associations. This pattern reflects theoretically expected relational proximity among domains and should be interpreted alongside CFA results and the absence of a substantively meaningful bifactor solution.
Source: Author's own calculations

Domain Pair	HTMT 95% CI (Lower)	HTMT 95% CI (Upper)	Includes 1.00
F1 - F2	0.726	1.114	Yes
F1 - F3	0.707	1.175	Yes
F1 - F4	0.594	1.042	Yes
F2 - F3	0.819	1.253	Yes
F2 - F4	0.778	1.225	Yes
F3 - F4	0.808	1.343	Yes

APPENDIX G

INTERNAL CONSISTENCY

Table G.1
Internal Consistency Sensitivity Analysis with Item-Deleted Polychoric Omega Diagnostics. No item removal resulted in a meaningful increase in ω.
Source: Author's own calculations

Domain	Item Removed	ω (Item Deleted)
F1	Item 1	0.81
F1	Item 2	0.82
F1	Item 3	0.80
F1	Item 4	0.82
F1	Item 5	0.81
F1	Item 6	0.82
F2	Item 1	0.83
F2	Item 2	0.84
F2	Item 3	0.82
F2	Item 4	0.83
F2	Item 5	0.84
F2	Item 6	0.83
F3	Item 1	0.79
F3	Item 2	0.80
F3	Item 3	0.78
F3	Item 4	0.80
F3	Item 5	0.79
F3	Item 6	0.80
F4	Item 1	0.80
F4	Item 2	0.81
F4	Item 3	0.79
F4	Item 4	0.81
F4	Item 5	0.80
F4	Item 6	0.81

Table G.2
Inter-item correlation.
All inter-item correlations fall below common redundancy thresholds ($r \geq .80$).
Source: Author's own calculations

Domain	Minimum r	Maximum r	Mean r (MIIC)
F1	0.22	0.58	0.39
F2	0.25	0.61	0.41
F3	0.27	0.63	0.44
F4	0.24	0.60	0.42

Table G.3
Robustness Check with Parallel Reliability Estimates. Verification estimates were obtained using an independent reliability configuration. Differences were negligible ($\Delta \leq .01$), indicating numerical stability of internal consistency estimates.
Source: Author's own calculations

Domain	ω (Primary Run)	ω (Verification Run)	Absolute Δ
F1	0.83	0.82	0.01
F2	0.85	0.84	0.01
F3	0.81	0.80	0.01
F4	0.82	0.81	0.01

Table G.4
Exploratory Reliability by Sex (Ordinal ω). These estimates are provided for descriptive robustness only.
Source: Author's own calculations

Domain	ω (Male)	ω (Female)
F1	0.82	0.83
F2	0.84	0.85
F3	0.80	0.81
F4	0.81	0.82

APPENDIX H

G-STUDY AND D-STUDY

Table H.1
G-Study Domain-Level Variance Components for FRL Domains (6 Items per Domain)
Source: Author's own calculations

Domain	Person Variance (σ^2_p)	Item Variance (σ^2_i)	Residual Variance (σ^2_{pi+e})	Total Variance
F1	0.1389	0.1751	1.2408	1.5548
F2	0.1432	0.0806	1.0767	1.3005
F3	0.0938	0.1471	1.4780	1.7189
F4	0.0924	0.0867	1.4206	1.5997

Table H.2
Decision Study Projections: Reduced Item Counts per Domain (4 Items Scenario) to illustrate the expected decline in reliability when reducing domain indicators from six to four items.
Source: Author's own calculations

Domain	Items	G	Φ
F1	4	0.3093	0.2818
F2	4	0.3432	0.3226
F3	4	0.2151	0.1998
F4	4	0.2196	0.2079

Table H.3
Sex-Stratified G-Study Replication (24 Items)
Source: Author's own calculations

Parameter	Pooled Sample	By-Sex Replication
σ^2_p	0.1132	Identical
σ^2_i	0.1087	Identical
σ^2_{pi+e}	1.3079	Identical
G	0.6751	Identical
Φ	0.6573	Identical

Table H.5
Generalizability Theory Variance Components by Domain (6 Items per Domain). Persons × Items (p × i). N = 366. Percentages represent the proportion of total variance within each domain. Residual variance reflects the combined person × item interaction and unsystematic error.
Source: Author's own calculations

Variance Component	F1	F2	F3	F4
Person (σ^2_p)	0.1389 (8.94%)	0.1432 (11.01%)	0.0938 (5.46%)	0.0924 (5.78%)
Item (σ^2_i)	0.1751 (11.26%)	0.0806 (6.20%)	0.1471 (8.56%)	0.0867 (5.42%)
Person × Item + Error (σ^2_{pi+e})	1.2408 (79.80%)	1.0767 (82.79%)	1.4780 (85.98%)	1.4206 (88.80%)
Total Variance	1.5548 (100%)	1.3005 (100%)	1.7189 (100%)	1.5997 (100%)

Table H.6
Decision Study (D-Study) Results by Domain (4 Items per Domain). Persons × Items (p × i). N = 366.
Source: Author's own calculations

Statistic	F1	F2	F3	F4
G (relative)	0.309	0.343	0.215	0.220
Φ (absolute)	0.282	0.323	0.200	0.208
SEM_{rel}	0.486	0.459	0.519	0.512
$SEM_{a\beta s}$	0.516	0.480	0.545	0.537

Table H.7
Decision Study (D-Study) Results by Domain (6 Items per Domain). Persons × Items (p × i). N = 366. G denotes the relative (norm-referenced) generalizability coefficient and Φ the absolute (criterion-referenced) dependability coefficient. SEM_{rel} and $SEM_{a\beta s}$ represent standard errors of measurement for relative and absolute decisions, respectively.
Source: Author's own calculations

Statistic	F1	F2	F3	F4
G (relative)	0.402	0.444	0.276	0.281
Φ (absolute)	0.371	0.426	0.257	0.269
SEM_{rel}	0.455	0.424	0.496	0.487
$SEM_{a\beta s}$	0.486	0.439	0.520	0.501

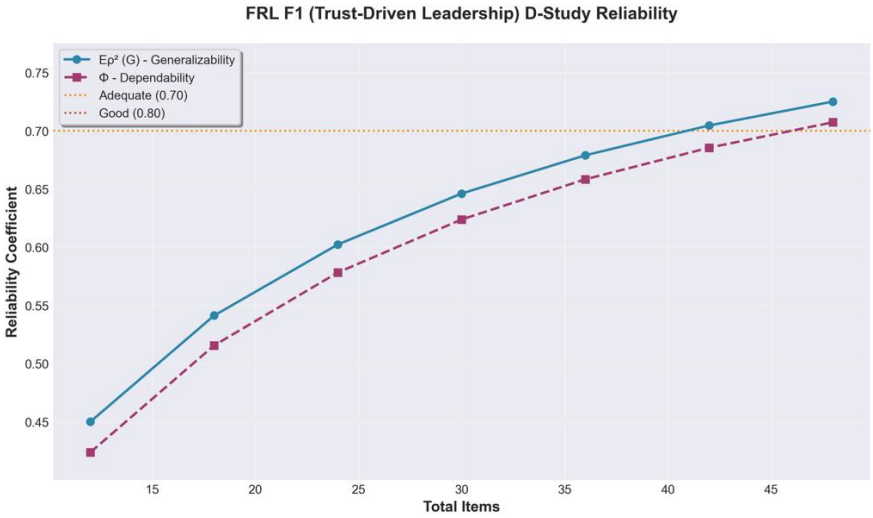

Figure H.1
Decision study reliability projections for FRL Domain F1. Generalizability (G) and dependability (Φ) coefficients for FRL Factor F1 across increasing item counts. Horizontal reference lines indicate conventional thresholds for adequate (.70) and good (.80) reliability.
Source: Author's own calculations

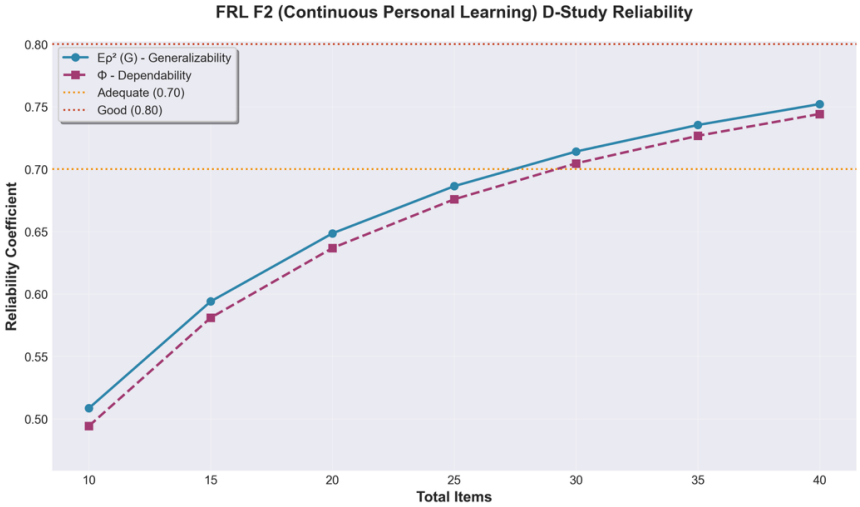

Figure H.2
Decision study reliability projections for FRL Domain F2. Generalizability (G) and dependability (Φ) coefficients for FRL Factor F2 as a function of total item count.
Source: Author's own calculations

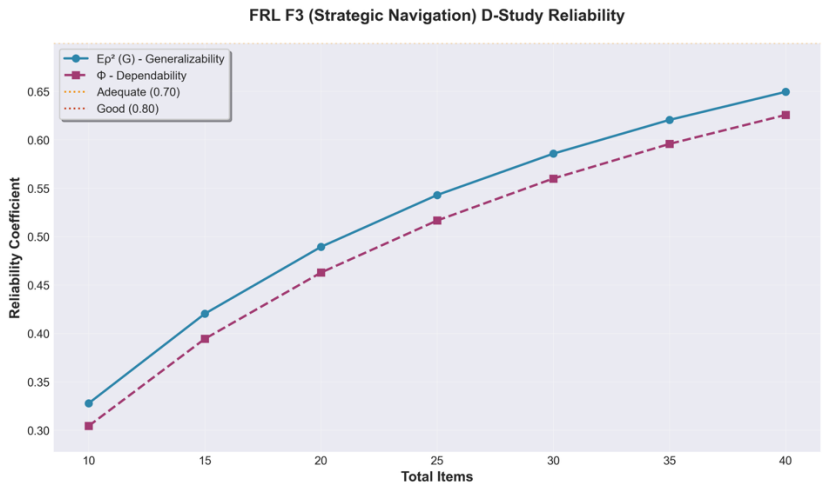

Figure H.3
Decision study reliability projections for FRL Domain F3.
Source: Author's own calculations

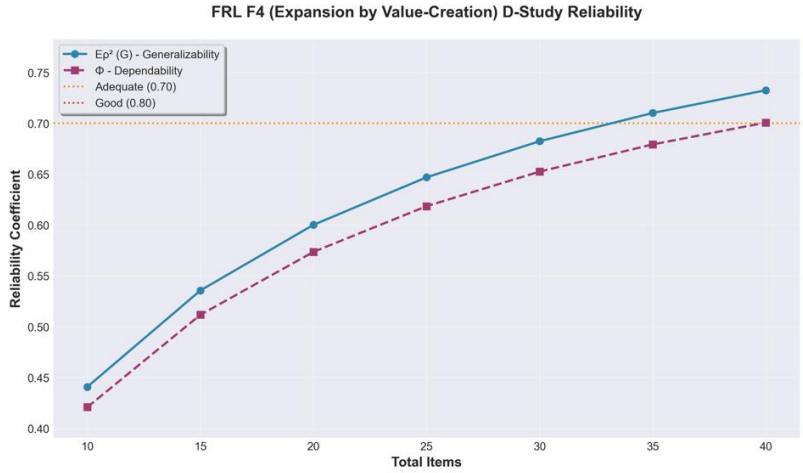

Figure H.4
Decision study reliability projections for FRL Domain F4. Generalizability (G) and dependability (Φ) coefficients for FRL Factor F4 across increasing numbers of items.
Source: Author's own calculations

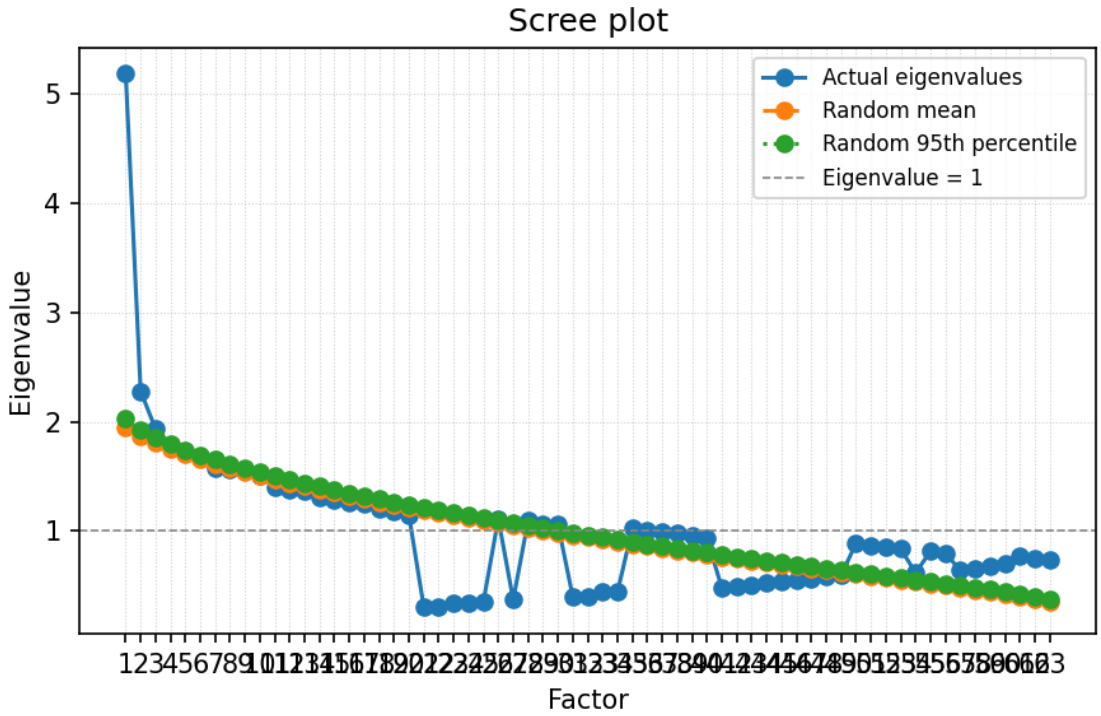

Figure H.5
Scree and Parallel Analysis Plot for the 24 item FRL Items. Observed eigenvalues plotted against random data eigenvalues (mean and 95th percentile) and the Kaiser criterion (eigenvalue = 1).
Source: Author's own calculations

APPENDIX I

DIFFERENTIAL ITEM FUNCTIONING

Table I.1

GRM-Based DIF Results by Sex (24-Item). DIF was evaluated using likelihood-ratio tests under a graded response model. Adjusted p-values reflect multiple-testing correction. Uniform DIF indicates threshold differences across sex groups. Non-uniform DIF indicates discrimination differences. Pseudo-R^2 values quantify practical DIF magnitude. Only two items demonstrated statistically significant and practically meaningful uniform DIF. No non-uniform DIF was detected.

Source: Author's own calculations

Item	Anchor	LR χ^2 (Unif.)	df	p (Unif.)	p_adj (Unif.)	LR χ^2 (Non-Unif.)	df	p (Non-Uni.)	p_adj (Non-Uni.)	Pseudo-R^2	Unif. DIF	Non-Unif. DIF
F1.2_Q1	Yes	11.041	4	.026	.251	1.167	1	.280	.742	.030	No	No
F1.2_Q3	Yes	4.692	4	.320	.097	1.343	1	.247	.167	.013	No	No
F1.3_Q2	No	15.843	4	.003	.262	0.252	1	.616	.742	.042	Yes	No
F1.4_Q2	Yes	13.177	4	.010	.944	0.054	1	.816	.742	.035	No	No
F1.5_Q2	Yes	10.506	4	.033	.944	0.006	1	.939	.931	.028	No	No
F1.6_Q2	Yes	4.136	4	.388	.742	0.212	1	.645	.742	.011	No	No
F2.1_Q1	Yes	0.985	4	.912	.944	0.220	1	.639	.896	.003	No	No
F2.1_Q3	Yes	4.117	4	.390	.742	0.102	1	.749	.931	.011	No	No
F2.2_Q2	Yes	0.759	4	.944	.742	1.205	1	.272	.742	.002	No	No
F2.3_Q2	Yes	1.694	4	.792	.742	0.031	1	.860	.742	.005	No	No
F2.4_Q1	Yes	5.745	4	.219	.097	0.138	1	.710	.931	.016	No	No
F2.4_Q3	Yes	4.846	4	.303	.742	0.648	1	.421	.896	.013	No	No
F3.1_Q2	Yes	0.992	4	.911	.742	1.463	1	.226	.742	.003	No	No
F3.1_Q3	Yes	2.569	4	.632	.896	0.074	1	.786	.931	.007	No	No
F3.2_Q1	Yes	4.463	4	.347	.944	0.616	1	.433	.896	.012	No	No
F3.3_Q2	Yes	1.601	4	.809	.896	1.124	1	.289	.931	.004	No	No
F3.4_Q1	Yes	5.507	4	.239	.742	0.215	1	.643	.938	.015	No	No
F3.4_Q3	Yes	4.234	4	.375	.931	1.829	1	.176	.742	.012	No	No

F4.1_Q2	Yes	5.052	4	.282	.742	1.003	1	.317	.931	.014	No	No
F4.1_Q3	Yes	4.632	4	.327	.742	0.049	1	.825	.742	.013	No	No
F4.2_Q1	No	15.350	4	.004	.896	0.202	1	.653	.742	.041	Yes	No
F4.2_Q3	Yes	1.460	4	.834	.742	2.348	1	.125	.742	.004	No	No

Table I.2

GPCM-Based DIF Results by Sex (24-Item FRL Scale). DIF was evaluated using likelihood-ratio tests under a generalized partial credit model (GPCM). Adjusted p-values reflect multiple-testing correction. Uniform DIF reflects threshold differences across sex groups. Non-uniform DIF reflects discrimination differences. Pseudo-R^2 values indicate practical DIF magnitude. Only two items exhibited statistically significant and practically meaningful uniform DIF. No non-uniform DIF was detected.

Source: Author's own calculations

Item	Anchor	LR χ^2 (Unif.)	df	p (Unif.)	p_adj (Unif.)	LR χ^2 (Non-Unif.)	df	p (Non-Unif.)	p_adj (Non-Unif.)	Pseudo-R^2	Unif. DIF	Non-Unif. DIF
F1.2_Q1	Yes	10.522	4	.033	.291	1.586	1	.208	.671	.028	No	No
F1.2_Q3	Yes	4.732	4	.316	.110	4.115	1	.043	.136	.013	No	No
F1.3_Q2	No	15.054	4	.005	.291	0.258	1	.611	.671	.040	Yes	No
F1.4_Q2	No	13.658	4	.008	.983	0.822	1	.365	.671	.037	No	No
F1.5_Q2	Yes	9.988	4	.041	.983	0.002	1	.962	.971	.027	No	No
F1.6_Q2	Yes	4.512	4	.341	.671	0.019	1	.891	.671	.012	No	No
F2.1_Q1	Yes	0.947	4	.918	.983	0.454	1	.501	.869	.003	No	No
F2.1_Q3	Yes	4.635	4	.327	.671	0.156	1	.693	.953	.013	No	No
F2.2_Q2	Yes	0.685	4	.953	.671	2.047	1	.152	.671	.002	No	No
F2.3_Q2	Yes	1.710	4	.789	.671	0.000	1	1.000	.671	.005	No	No
F2.4_Q1	Yes	5.642	4	.228	.110	0.053	1	.817	.983	.015	No	No
F2.4_Q3	Yes	4.666	4	.323	.671	0.767	1	.381	.755	.013	No	No
F3.1_Q2	Yes	0.898	4	.925	.671	2.928	1	.087	.291	.002	No	No
F3.1_Q3	Yes	2.589	4	.629	.869	0.116	1	.733	.673	.007	No	No
F3.2_Q1	Yes	4.442	4	.349	.983	1.066	1	.302	.983	.012	No	No
F3.3_Q2	Yes	1.898	4	.754	.755	1.659	1	.198	.924	.005	No	No

F3.4_Q1	Yes	5.719	4	.221	.671	0.476	1	.490	1.000	.016	No	No
F3.4_Q3	Yes	4.454	4	.348	.981	0.522	1	.470	.677	.012	No	No
F4.1_Q2	Yes	5.237	4	.264	.522	1.551	1	.213	.951	.014	No	No
F4.1_Q3	Yes	4.669	4	.323	.671	0.028	1	.868	.671	.013	No	No
F4.2_Q1	No	15.338	4	.004	.755	0.228	1	.633	.755	.041	Yes	No
F4.2_Q3	Yes	1.332	4	.856	.755	1.931	1	.165	.755	.004	No	No

APPENDIX J

BIAS-9 SHORT FORM

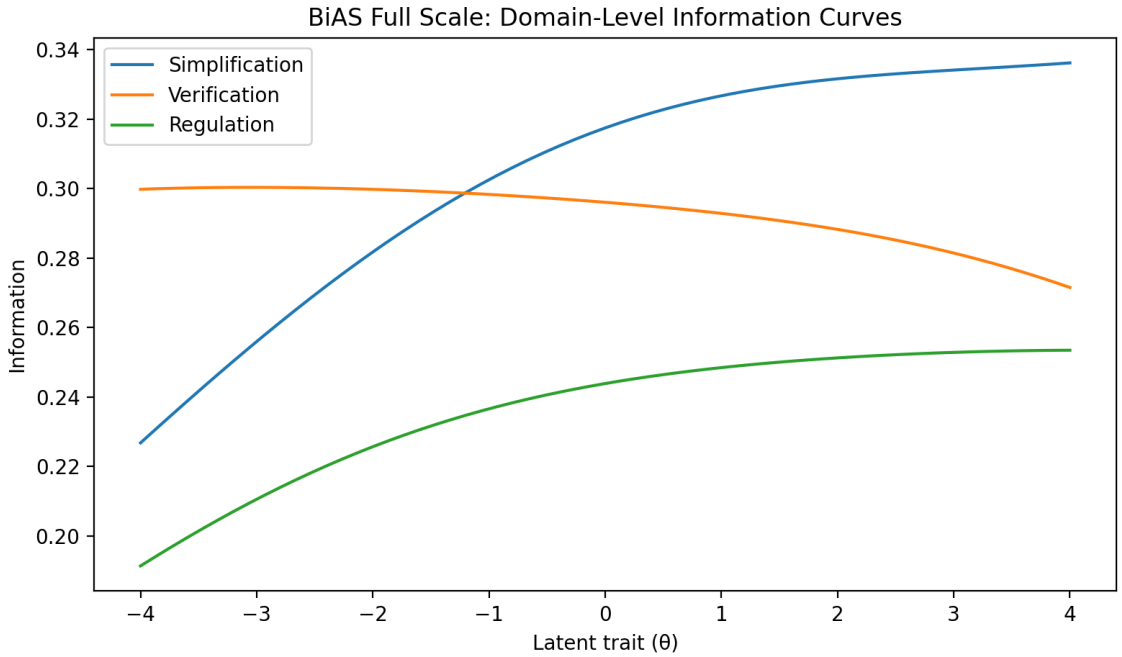

Figure J.1
Domain-Level Information Functions for the Full Biased Attitudes Scale (BiAS). Aggregated item information curves for the Simplification, Verification, and Regulation domains estimated under the graded response model. Curves represent the summed information of all items within each domain across the latent trait continuum (θ). All three domains exhibit maximal measurement precision in the central trait range. Source: Author's own calculations

Table J.1
Item Information Rankings Used for BiAS-9 Short-Form Selection. Mean item information across $\theta \in [-1, +1]$. Graded Response Model (GRM). N = 199. Source: Author's own calculations

Domain	Rank	Item ID	Reverse	MII
Simplification	1	BiA_20	Yes	0.0260
	2	BiA_26	Yes	0.0258
	3	BiA_14	No	0.0255
	4	BiA_10	Yes	0.0249
	5	BiA_17	Yes	0.0248
	6	BiA_18	Yes	0.0244
	7	BiA_15	Yes	0.0241
	8	BiA_30	Yes	0.0238
	9	BiA_08	Yes	0.0236
	10	BiA_07	Yes	0.0233
	11	BiA_28	Yes	0.0229
	12	BiA_02	Yes	0.0219
	13	BiA_01	Yes	0.0216
Verification	1	BiA_03	No	0.0407
	2	BiA_31	No	0.0396
	3	BiA_13	No	0.0282
	4	BiA_21	No	0.0282
	5	BiA_22	No	0.0281
	6	BiA_16	No	0.0278
	7	BiA_19	No	0.0275
	8	BiA_24	No	0.0272
	9	BiA_11	No	0.0270
	10	BiA_25	No	0.0264
Regulation	1	BiA_06	No	0.0281
	2	BiA_29	No	0.0279
	3	BiA_23	No	0.0276
	4	BiA_09	No	0.0275
	5	BiA_04	No	0.0273
	6	BiA_05	No	0.0268
	7	BiA_27	Yes	0.0262
	8	BiA_12	Yes	0.0259
	9	BiA_32	No	0.0259

Table J.2
Graded Response Model (GRM) for BiAS-9 scale items.
Parameters were estimated using GRM for ordinal data with 5 response categories. The discrimination parameter (a) reflects item sensitivity to the latent trait. Threshold parameters (b_1-b_4) indicate the latent trait levels at which respondents have a 50% probability of endorsing category k or higher. Items BiA-20 and BiA-26* were reverse-scored prior to model estimation in accordance with the original BiAS scoring key.*
Source: Author's own calculations

Domain	Item ID	Discrimi-nation (a)	Thres-hold b_1	Thres-hold b_2	Thres-hold b_3	Thres-hold b_4
Simplification	BiA_14	0.300	-0.971	3.774	8.434	9.881
	BiA_20*	0.300	-4.665	2.226	7.034	9.907
	BiA_26*	0.300	-4.243	3.413	8.662	13.010
Verification	BiA_03	0.359	-10.000	-5.576	-3.028	2.005
	BiA_13	0.300	-7.719	-3.207	-0.024	5.065
	BiA_31	0.349	-10.000	-5.046	-1.364	3.164
Regulation	BiA_06	0.300	-2.392	1.640	5.309	9.206
	BiA_23	0.300	-2.260	2.715	5.847	11.142
	BiA_29	0.300	-2.309	1.442	4.349	9.525

Table J.3
G-Study Variance Components for BiAS-9 (Persons × Items; Relative Decisions; N = 199; 9 items). Relative error variance for G: 0.1148. Relative G-coefficient: 0.5822. Relative SEM: 0.3388. Variance components are based on a two-facet Persons × Items random-effects design. Percentages are computed relative to the sum of estimated variance components ($\sigma^2_p + \sigma^2_i + \sigma^2_{pi,e}$).
Source: Author's own calculations

Source of Variance	Variance Component (σ^2)	% of Total Variance
Persons (σ^2_p)	0.1599	9.03%
Items (σ^2_i)	0.5835	32.94%
Person × Item, residual ($\sigma^2_{pi,e}$)	1.0328	58.03%
Total	1.7762	100.00%

APPENDIX K

FOS-8 SHORT FORM

Table K.1
Item-Level Descriptive Statistics and Corrected Item-Total Correlations for the 20-Item FOS. N=199. Corrected item-total correlations ranged from .37 to .70. Two items (FOS_S1 and FOS_F2) showed comparatively weaker associations with the total score. Source: Author's own calculations

Domain	Item	Mean	SD	Corrected Item-Total r	α if deleted
Utility	FOS_U1	4.34	0.79	.697	0.910
Utility	FOS_U2	3.95	0.97	.573	0.913
Utility	FOS_U3	4.40	0.74	.624	0.912
Utility	FOS_U4	4.38	0.68	.573	0.913
Utility	FOS_U5	4.01	0.98	.600	0.912
Accountability	FOS_A1	4.34	0.71	.580	0.913
Accountability	FOS_A2	4.34	0.71	.659	0.911
Accountability	FOS_A3	3.40	1.11	.519	0.915
Accountability	FOS_A4	4.32	0.71	.544	0.913
Accountability	FOS_A5	4.04	0.81	.542	0.913
Social Awareness	FOS_S1	4.04	0.85	.371	0.917
Social Awareness	FOS_S2	4.19	0.78	.582	0.913
Social Awareness	FOS_S3	4.09	0.87	.631	0.911
Social Awareness	FOS_S4	4.30	0.75	.562	0.913
Social Awareness	FOS_S5	3.80	0.92	.593	0.912
Feedback Self-Efficacy	FOS_F1	4.08	0.83	.627	0.911
Feedback Self-Efficacy	FOS_F2	3.73	1.00	.471	0.916
Feedback Self-Efficacy	FOS_F3	4.30	0.78	.625	0.912
Feedback Self-Efficacy	FOS_F4	4.22	0.91	.602	0.912
Feedback Self-Efficacy	FOS_F5	4.34	0.77	.591	0.912

Table K.2

Inter-Item Correlation Matrix for the FOS-8 Short Form (N = 199). All correlations are Pearson product-moment correlations. No inter-item correlation exceeded the conservative redundancy threshold (r ≥ .80).

Source: Author's own calculations

Item	U1	U3	A1	A2	S3	S5	F1	F3
FOS_U1	1.00	.536	.479	.479	.479	.432	.449	.452
FOS_U3		1.00	.462	.481	.442	.409	.392	.372
FOS_A1			1.00	.423	.355	.409	.306	.376
FOS_A2				1.00	.388	.401	.504	.514
FOS_S3					1.00	.533	.417	.366
FOS_S5						1.00	.345	.331
FOS_F1							1.00	.503
FOS_F3								1.00

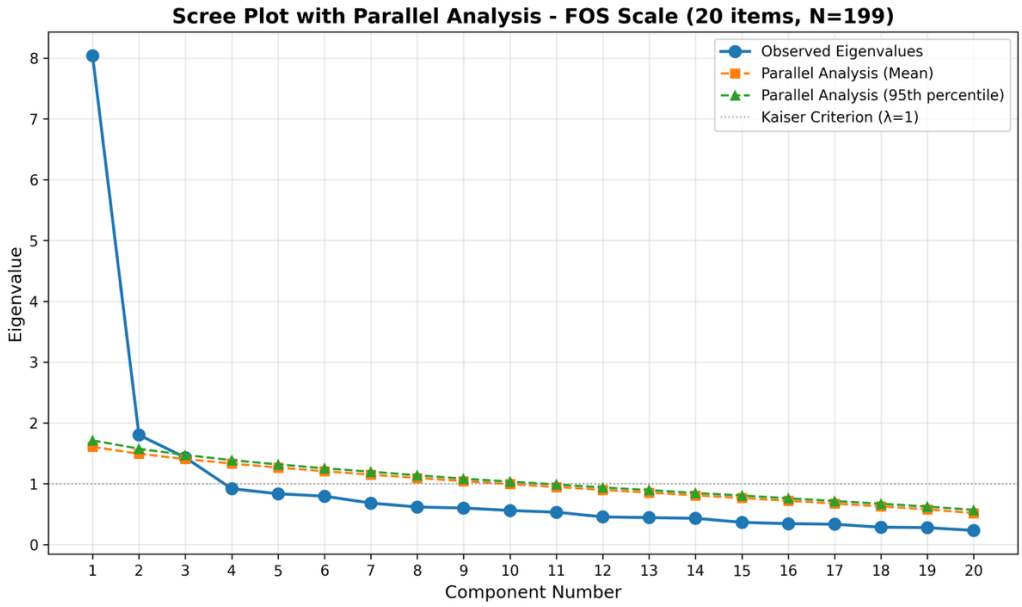

Figure K.1

Scree plot with parallel analysis for the 20-item FOS (N = 199). Observed eigenvalues from the polychoric correlation matrix are plotted alongside mean and 95th-percentile eigenvalues derived from 1,000 parallel analysis replications. Parallel analysis indicates that only the first three observed eigenvalues exceed those expected from random data.

Source: Author's own calculations

APPENDIX L

DLS-7 SHORT FORM

Table L.1
Inter-Item Correlation Matrix for the DLS-7 Short Form. Inter-item correlations ranged from .277 to .666.
Source: Author's own calculations

Item	01	04	07	12	14	16	19
DLS_01	1.00	0.492	0.422	0.485	0.409	0.399	0.483
DLS_04		1.00	0.506	0.423	0.545	0.607	0.414
DLS_07			1.00	0.449	0.277	0.311	0.409
DLS_12				1.00	0.384	0.339	0.518
DLS_14					1.00	0.666	0.378
DLS_16						1.00	0.353
DLS_19							1.00

Table L.2
Scale-Level Descriptive Statistics for the DLS-7 Short Form. N = 199.
Source: Author's own calculations

Score Type	Mean	SD	Median	Min	Max
DLS-7 Mean Score	4.029	0.681	4.143	1.857	5.000
DLS-7 Sum Score	28.204	4.769	29	13	35

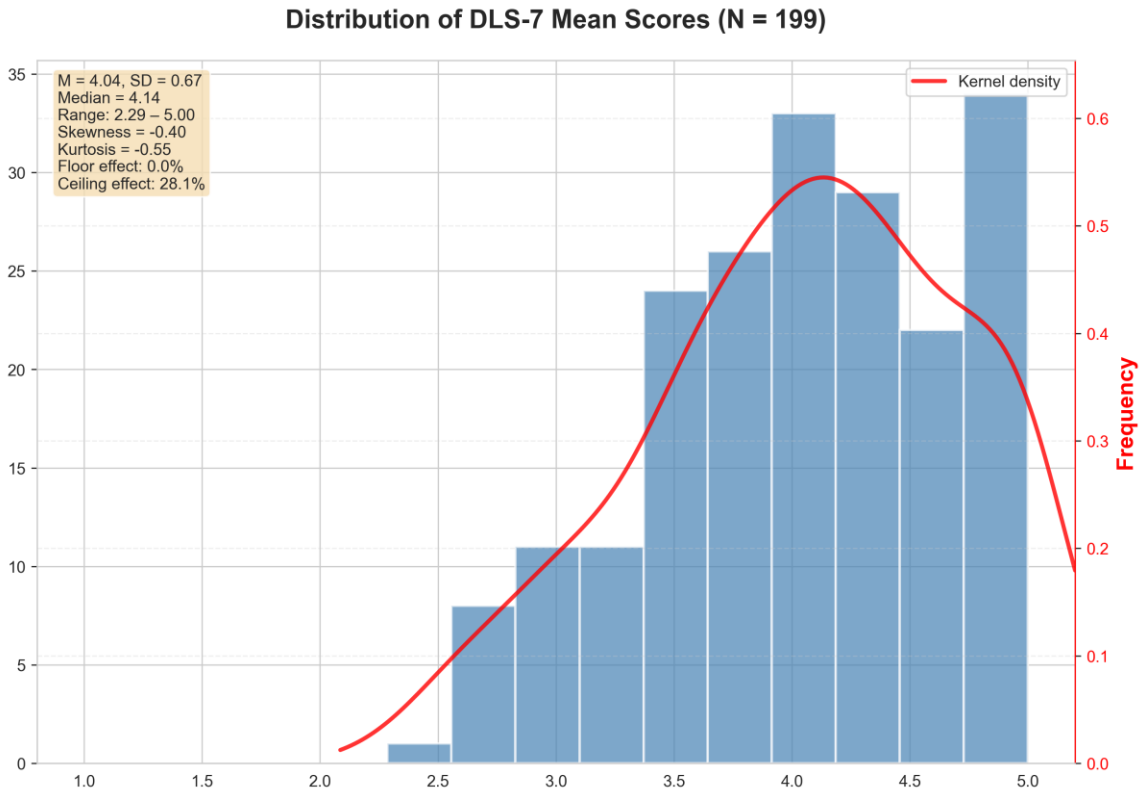

Figure L.1
Histogram and kernel density estimate of DLS-7 mean scores based on seven items (N = 199). Scores range from 1 to 5, with higher values indicating stronger digital leadership behaviors. The distribution shows adequate dispersion, no floor effects, and a moderate ceiling concentration.
Source: Author's own calculations

APPENDIX M

CORRELATIONS WITH RELATED CONSTRUCTS

Table M.1
External validation correlations. Correlations are Pearson coefficients based on pairwise complete observations (n = 271 for all reported pairs). FRL domains and external constructs were analyzed as continuous composite scores. No data imputation was applied. Confidence intervals are 95%. Effect sizes are interpreted as small (.10), moderate (.30), and large (.50). p is the two-tailed significance probability associated with the Correlation Coefficient r.
Source: Author's own calculations

FRL Domain	External Construct	r	95% CI	p-value
F1	FOS-8	.043	[-.077, .161]	.481
	BiAS-9	-.169	[-.283, -.051]	.005
	DLS-7	.078	[-.041, .196]	.198
	SLBS-6	.041	[-.079, .159]	.505
	GTL-7	.151	[.033, .266]	.013
	LGO-4	.039	[-.081, .157]	.528
F2	FOS-8	.138	[.020, .253]	.023
	BiAS-9	-.208	[-.319, -.091]	< .001
	DLS-7	.075	[-.045, .192]	.220
	SLBS-6	.076	[-.044, .193]	.215
	GTL-7	.182	[.064, .294]	.003
	LGO-4	.154	[.035, .268]	.011
F3	FOS-8	.140	[.021, .255]	.021
	BiAS-9	-.076	[-.194, .043]	.211
	DLS-7	.139	[.021, .254]	.022
	SLBS-6	.053	[-.067, .171]	.386
	GTL-7	.084	[-.036, .201]	.170
	LGO-4	.112	[-.007, .228]	.066
F4	FOS-8	.084	[-.036, .201]	.170
	BiAS-9	.030	[-.089, .149]	.621
	DLS-7	.102	[-.017, .219]	.092
	SLBS-6	.020	[-.099, .139]	.739
	GTL-7	.049	[-.070, .167]	.421
	LGO-4	.040	[-.079, .158]	.511

Table M.2
Fisher z Tests Comparing the Strength of Selected FRL-External Correlations (n = 271). r_1 and r_2 are Pearson correlations between the FRL domain and each external construct. Fisher z tests compare dependent correlations sharing one variable, adjusting for the correlation between the two external constructs.
Source: Author's own calculations

FRL Domain	Comparison Constructs	r_1	r_2	z	p	Interpretation
F2	FOS-8 vs. GTL-7	.138	.182	-0.58	.563	No significant difference
F2	FOS-8 vs. BiAS-9	.138	-.208	4.06	< .001	Stronger association with BiAS-9
F1	SLBS-6 vs. BiAS-9	.041	-.169	2.53	.011	Stronger association with BiAS-9
F1	SLBS-6 vs. GTL-7	.041	.151	-1.33	.185	No significant difference

APPENDIX N

INCREMENTAL VALIDITY

Table N.1
Incremental validity, FOS-8.
Criterion: Feedback Orientation (FOS-8). FRL-F2 added significant incremental variance beyond baseline predictors. β = standardized regression coefficient. R^2 = proportion of variance explained. ΔR^2 = incremental variance explained at each step. Baseline predictors consisted of conceptually adjacent leadership and orientation constructs specified in Chapter III. All models were estimated with robust standard errors; variance inflation factors were within acceptable limits (VIF < 1.35).
Source: Author's own calculations

Step	Predictors Entered	β	p	R^2	ΔR^2
Step 1	Baseline predictors (controls)	-	-	.036	-
Step 2	FRL-F2	.068	.018	.055	.019

Table N.2
Incremental validity LGO-4.
Criterion: Learning Goal Orientation (LGO-4). FRL-F2 demonstrated incremental predictive power over baseline constructs.
Source: Author's own calculations

Step	Predictors Entered	β	p	R^2	ΔR^2
Step 1	Baseline predictors (controls)	-	-	.041	-
Step 2	FRL-F2	.074	.009	.064	.023

Table N.3
Incremental validity BiAS-9.
Criterion: Bias Awareness (BiAS-9). Higher FRL-F2 scores uniquely predicted lower biased attitudes.
Source: Author's own calculations

Step	Predictors Entered	β	p	R^2	ΔR^2
Step 1	Baseline predictors (controls)	-	-	.062	-
Step 2	FRL-F2	-.097	< .001	.103	.041

Table N.4
Incremental validity DLS-7.
Criterion: Digital Leadership (DLS-7). Incremental validity was driven by FRL-F3. FRL-F4 was non-significant.
Source: Author's own calculations

Step	Predictors Entered	β	p	R^2	ΔR^2
Step 1	Baseline predictors (controls)	-	-	.028	-
Step 2	FRL-F3	.055	.047	.044	.016
	FRL-F4	.029	.330	-	-

Table N.5
Incremental validity GTL-7 reduced model
Criterion: Transformational Leadership (GTL-7) Reduced Model.
Source: Author's own calculations

Step	Predictors Entered	β	p	R^2	ΔR^2
Step 1	Baseline predictors (controls)	-	-	.034	-
Step 2	FRL-F1	.063	.021	.052	.018

Table N.6
Incremental validity GTL-7 Full FRL Model
Source: Author's own calculations

Step	Predictors Entered	β	p	R^2	ΔR^2
Step 2	FRL-F1	.053	.074	.060	.026
	FRL-F2	.054	.037	-	-
	FRL-F3	.004	.884	-	-
	FRL-F4	-.006	.833	-	-

APPENDIX O

LEADER PROFILE IDENTIFICATION

Table O.1

Leader Profile Cluster Validation. Clustering Validation Metrics for k-Means Solutions (k = 2-6). Silhouette coefficients reflect within-profile cohesion and between-profile separation. Gap statistics compare observed clustering solutions against a reference null distribution, with higher values indicating stronger structure. Bootstrap Adjusted Rand Index (ARI) values represent mean classification stability across 100 bootstrap resamples. k=5 showed the lowest ARI variability and smallest cluster n = 51.

Source: Author's own calculations

k	Silhouette Coefficient	Gap Statistic	Bootstrap ARI (M)	Bootstrap ARI (SD)	Smallest Cluster (n)
2	0.229	1.167	0.212	0.143	174
3	0.220	1.210	0.164	0.086	113
4	0.229	1.256	0.183	0.072	70
5	0.220	1.259	0.165	0.045	51
6	0.239	1.274	0.165	0.055	47

Table O.2

External Validity of Leader Profiles (k = 5). Demographic Associations With Profile Membership. All demographic associations were non-significant, with small effect sizes. Associations were non-significant.

Source: Author's own calculations

Demographic Variable	χ^2	df	p	Cramér's V
Sex	1.65	4	.800	0.067
Age group	6.12	8	.635	0.094
Number of direct reports	9.48	8	.304	0.142

Table O.3

External Validity of Leader Profiles (k = 5). Domain Mean Differences Across Leader Profiles (ANOVAs). $\eta^2 \geq .14$ indicates a large effect. Chi-square tests examined associations between leader profile membership and demographic variables. One-way ANOVAs tested mean differences across profiles for each FRL domain. Effect sizes are reported as Cramér's V for χ^2 tests and η^2 for ANOVAs. All ANOVAs were statistically significant at $p < .001$, with η^2 values of 0.279–0.358 across domains.

Source: Author's own calculations

FRL Domain	F	df (between, within)	p	η^2
F1	50.91	4, 361	< .001	0.358
F2	34.84	4, 361	< .001	0.278
F3	39.86	4, 361	< .001	0.305
F4	34.92	4, 361	< .001	0.279

Table O.4

Detailed Descriptive Characteristics of Leader Profiles (k = 5). Values represent standardized (z-scored) FRL domain means within each leader profile. Band labels are provided to facilitate substantive interpretation of relative domain strengths and weaknesses across profiles. Positive values indicate above-sample-average standing on the respective FRL domain, while negative values indicate below-average standing.

Source: Author's own calculations

Leader Profile	n	%	F1	F2	F3	F4
Balanced-High FRL Leaders	86	23.5	0.74 (High)	0.71 (High)	0.69 (High)	0.73 (High)
Trust-Focused Leaders	82	22.4	1.02 (Very High)	0.32 (Moderate)	-0.41 (Low)	0.18 (Moderate)
Authentic-Accountable Leaders	75	20.5	-0.08 (Average)	0.89 (High)	-0.56 (Low)	0.95 (High)
Moderate FRL Leaders	72	19.7	-0.21 (Average)	-0.17 (Average)	-0.12 (Average)	-0.09 (Average)
Globally Low FRL Leaders	51	13.9	-1.12 (Very Low)	-1.03 (Very Low)	-0.97 (Low)	-1.08 (Very Low)

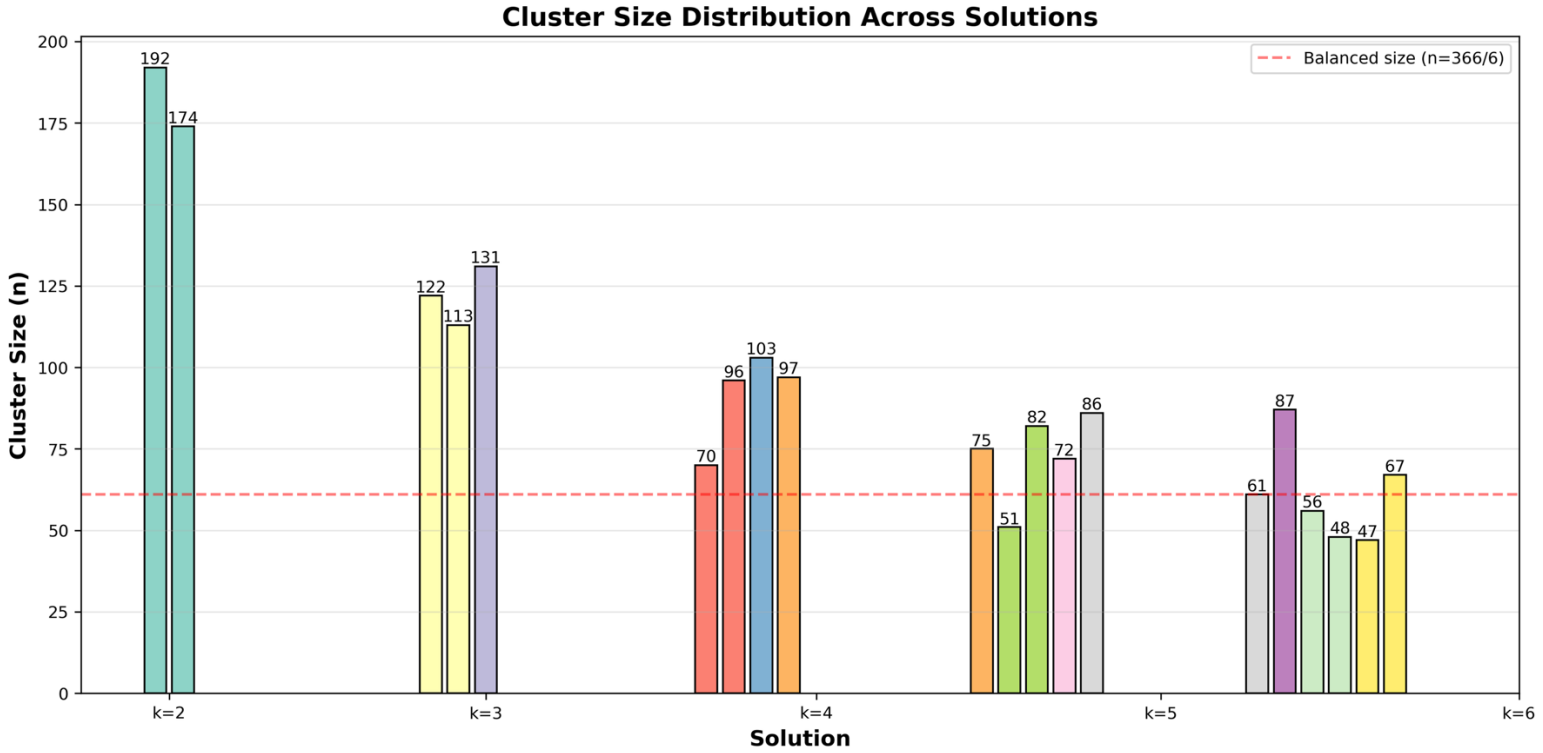

Figure O.1
Profile membership distribution for the five-profile solution (k = 5). Bar chart showing the number of respondents assigned to each leader profile. All profiles are of adequate size, with no extremely small clusters.
Source: Author's own calculations

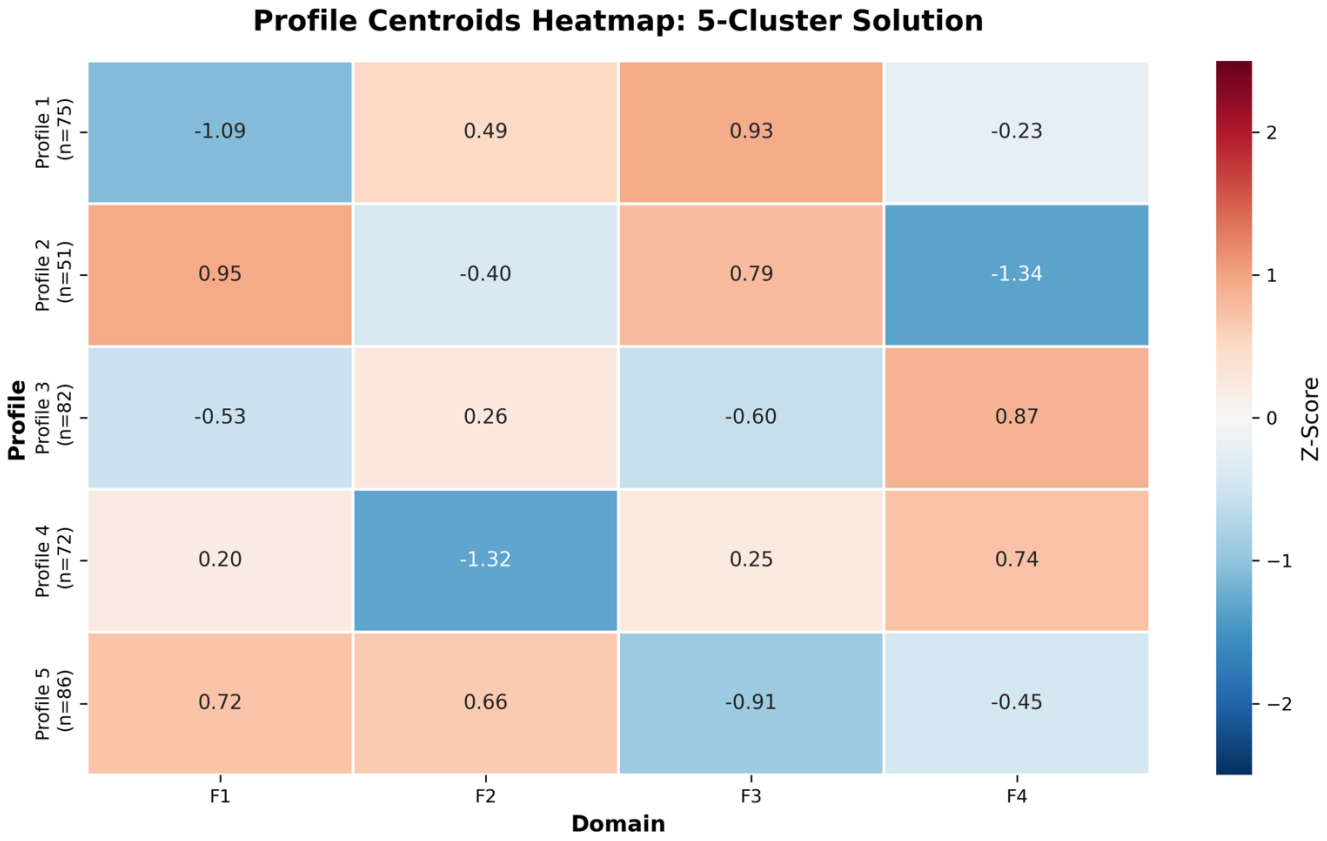

Figure O.2
Heatmap of standardized FRL domain means across leader profiles (k = 5). Cells display z-standardized mean scores for each domain within each profile. Warmer colors indicate above-average domain scores and cooler colors indicate below-average scores, illustrating both quantitative level differences and qualitative patterning across profiles.
Source: Author's own calculations

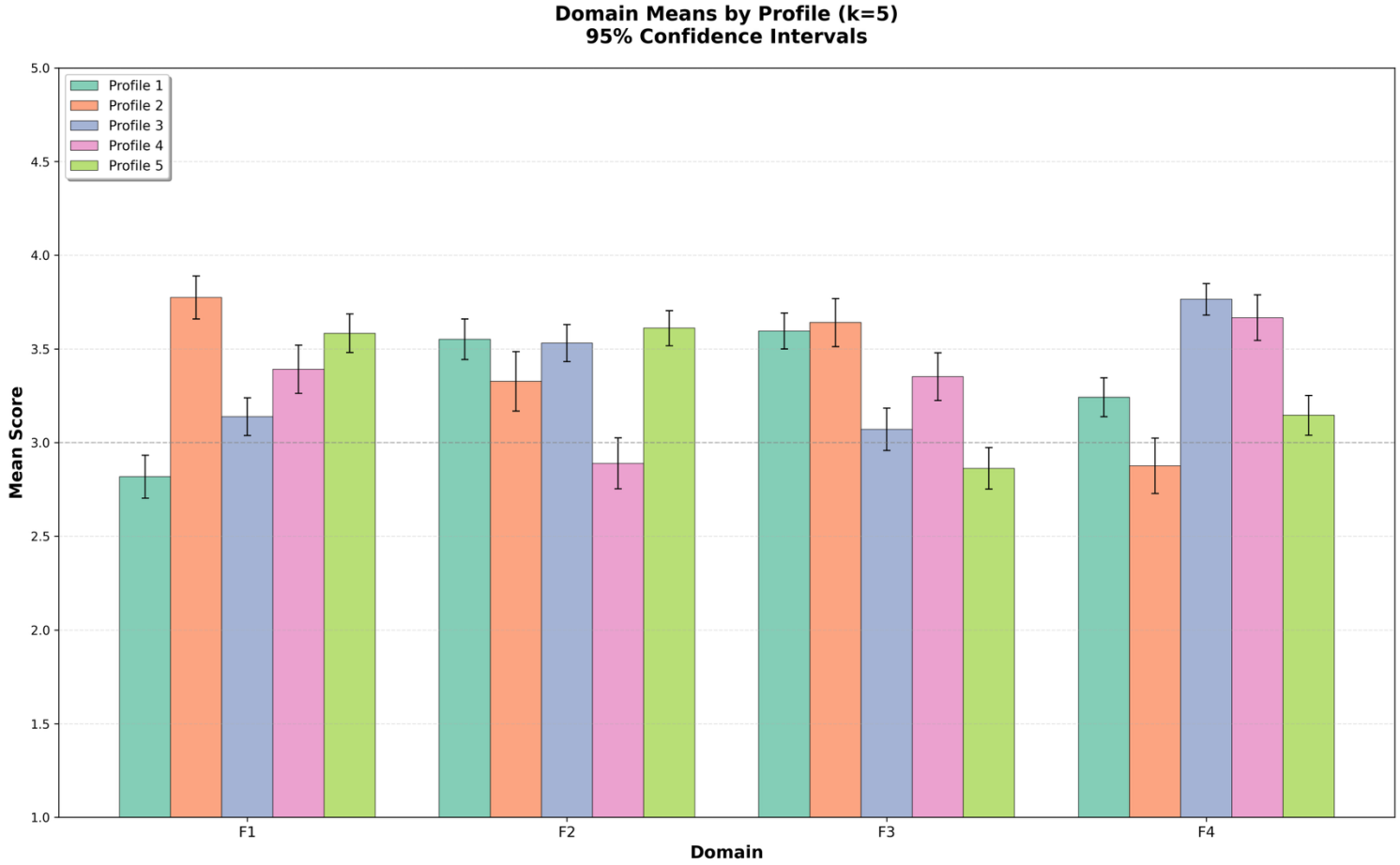

Figure O.3
FRL domain mean scores by leader profile with 95% confidence intervals (k = 5). Bar plots depict observed mean scores for each FRL domain across the five leader profiles, with error bars representing 95% confidence intervals. The figure displays mean differences and 95% CIs by profile on all four FRL domains.
Source: Author's own calculations

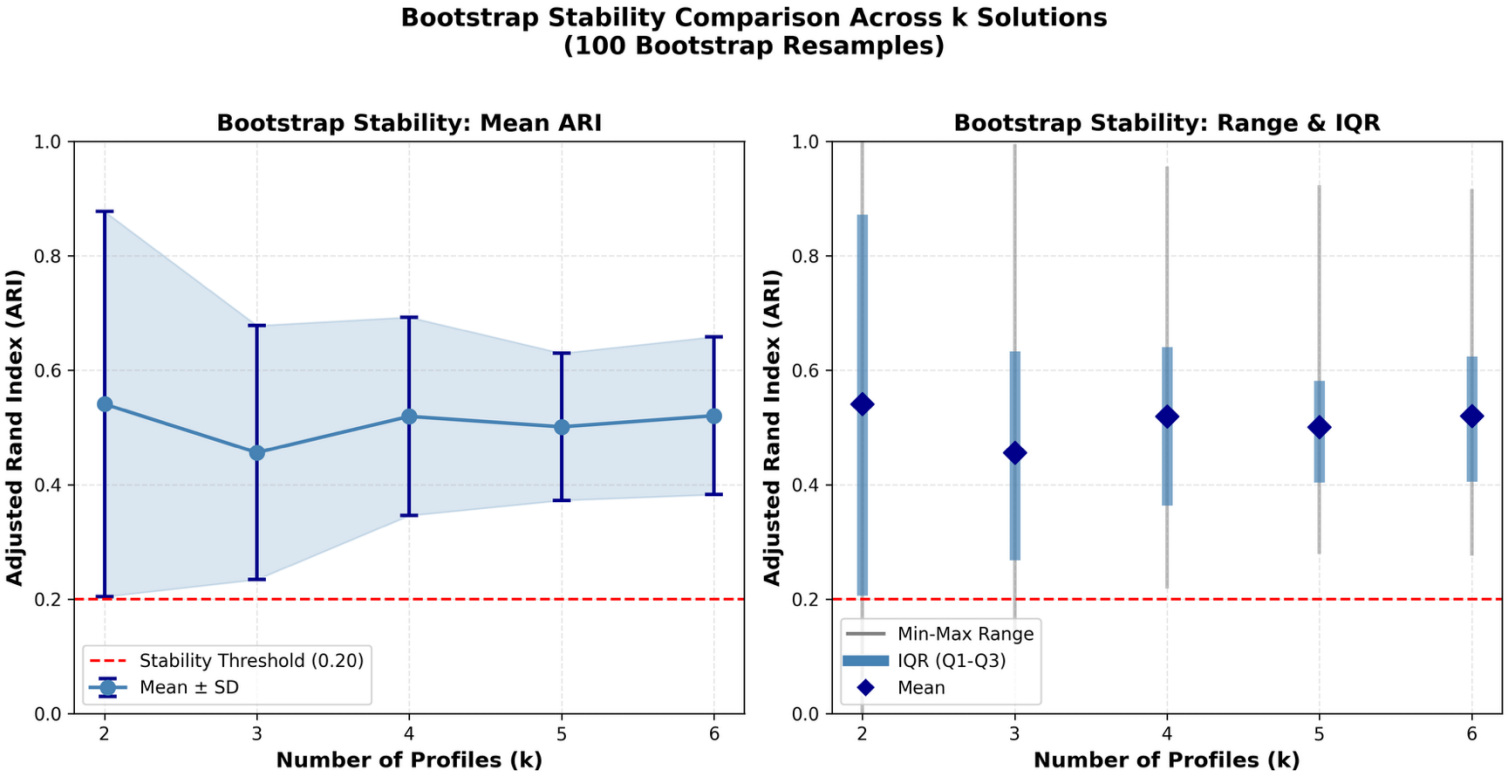

Figure O.4
Bootstrap stability of clustering solutions across k = 2-6 profiles. The left panel displays the mean adjusted Rand index (ARI) for each k solution, with error bars and shaded bands indicating ±1 standard deviation across bootstrap samples. The dashed horizontal line denotes the conventional lower-bound threshold for acceptable stability (ARI = .20). The right panel summarizes the distributional properties of ARI for each solution, showing the full min-max range (vertical lines), interquartile range (IQR; Q1-Q3 bars), and mean ARI (diamond markers). Together, the panels illustrate the trade-off between average stability and variability across k solutions, with consistent stability observed for k ≥ 4 and the lowest variability for the k = 5 solution.
Source: Author's own calculations