



Training of Women in the Air Force in the Disruption Era: A Literature Review on Adaptive and Future-Ready Strategies

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Abstrak. The rapid development of technology and the challenges posed by the era of disruption necessitate military institutions, particularly the Air Force, to develop innovative strategies for human resource development, with a focus on women in military service. This study aims to systematically review literature related to adaptive and future-ready strategies that can be employed to enhance women's competencies and leadership within the air force environment. The methodology employed is a literature review conducted through searches of databases such as Google Scholar, Scopus, and Web of Science, covering publications from 2018 to 2023, which are then selected based on quality and relevance. The findings indicate that technological innovations, particularly Virtual Reality (VR) and Augmented Reality (AR), significantly improve motivation and technical competency among female air force personnel. Leadership strategies based on Transformational and Adaptive Leadership theory are also effective in building confidence and capacity. The discussion emphasizes the importance of fostering an inclusive organizational culture and ensuring sustainability in evaluation processes as critical success factors. In conclusion, the success in developing a future-ready female workforce in the military depends on the synergy between technological innovation, transformational leadership, and a sustainable, inclusive organizational culture. Therefore, the military must develop holistic and innovative programs to respond effectively to global dynamics.

Keywords: technological innovation, women in the military, adaptive leadership, future-ready

1. INTRODUCTION

In the current era of disruption, rapid technological advancements and global social changes have led to significant transformations across various sectors, including the military. The emergence of technologies such as Artificial Intelligence (AI), Big Data, virtual simulation, and the Internet of Things (IoT) has drastically altered operational paradigms and military training processes (Miller & Hogue, 2019). The Air Force, as a key component of national defense, must adapt swiftly and innovatively to remain effective and resilient amidst increasingly complex global challenges (Katz & Levin, 2020).

However, these changes demand more than just technological upgrades—they require balanced efforts in human resource development to effectively manage, utilize, and foster innovation. A critical aspect of this is the development of women in the military, who continue to face cultural barriers, gender stereotypes, and limited access to modern, technology-based training programs (Hwang & Park, 2021). Currently, women are increasingly occupying strategic and leadership positions; yet, maintaining their competencies and readiness amid ongoing disruptions remains a primary concern.

Recent research and literature emphasize that innovative, adaptive training strategies are crucial to ensure women in the military are not left behind and can compete effectively in rapidly changing environments. The integration of new technologies such as VR and AR in training programs has shown promising results in improving technical capabilities and boosting confidence among female personnel (Hart et al., 2021). Nonetheless, the long-term effectiveness of these strategies requires further evaluation and development to create sustainable training models suitable for Indonesia and other countries.

Furthermore, concepts like Transformational Leadership and Adaptive Leadership provide a robust theoretical framework to support the development of innovative and inclusive strategies within organizations undergoing significant

change. International studies demonstrate that cultivating an inclusive and innovative organizational culture greatly influences the preparedness of women to become future leaders in the disruption era (Krogstad et al., 2020). However, recent literature remains limited in addressing specific models of innovative, future-ready strategies for women in the air force environment.

This study aims to conduct a comprehensive literature review on adaptive and future-ready strategies for women's development in the air force amid the disruptions of the digital era. The goal is to provide an innovative overview that can guide military organizations in designing effective human resource development programs. Additionally, this research seeks to enrich academic discourse on women's military development by integrating insights into technological progress and organizational culture that are currently evolving and will continue to do so.

2. Literature Review

Recent advancements in technology and the increasing dynamics of global social change have driven various institutions, including the air force, to adopt innovative approaches in human resource development (HRD). International literature affirms that technologies such as virtual reality (VR), augmented reality (AR), and artificial intelligence (AI) are instrumental in enhancing training effectiveness and operational readiness (Miller & Hogue, 2019). Besides technological aspects, awareness of gender inclusion has also risen, prompting military institutions to strengthen female participation in strategic positions and leadership roles (Hwang & Park, 2021). The relevance of this topic has increased as the successful integration of these innovative strategies will determine the competitiveness and effectiveness of the military in confronting global disruptions in the future.

Based on studies from the past five years, research indicates that the implementation of technological innovations in military training effectively boosts

technical competence and confidence among participants, including women in the armed forces (Smith & Brown, 2018). For instance, quantitative studies by Smith and Brown (2018), utilizing surveys and practical competency assessments across various countries, revealed that VR and AR usage significantly improved training outcomes and motivation by 25–35%. Furthermore, Rodriguez et al. (2020) employed case studies and qualitative interviews to evaluate the effectiveness of leadership development programs based on Transformational Leadership theory, which demonstrated the potential to elevate women's involvement in strategic military roles. These findings underscore that technological development and leadership are critical components of an integrated training strategy, which must be approached holistically and sustainably to ensure long-term impacts and continued effectiveness.

However, despite the focus on the importance of technological innovation and leadership development, the bulk of existing research remains confined to specific aspects without fully integrating these strategies within a comprehensive, holistic framework tailored for women in the air force. Moreover, longitudinal studies examining the sustainability and long-term impact of such strategies are limited, especially considering the conservative organizational culture and resistance to change present in military settings (Fitzgerald & White, 2020; Thompson & Webb, 2021). Variables such as organizational culture and gender bias continue to influence the success of training and development programs, highlighting the necessity for models that effectively integrate technological, leadership, and cultural strategies to cultivate resilient, future-ready women capable of excelling in dynamic environments.

The theoretical foundation of this research is based on Burns' (1978) Transformational Leadership, emphasizing the importance of inspiring change and innovation through visionary leadership. Complementing this is Heifetz's (1994) Adaptive Leadership, which focuses on the organization's and individuals' capacity to adapt swiftly in uncertain conditions. The Future-Ready concept plays a pivotal role in developing the capacities of individuals and organizations to respond rapidly

to sudden changes and to adopt ongoing innovations (Krogstad et al., 2020). The framework is further strengthened by the Inclusion and Diversity theory, which demonstrates that diversity accelerates innovation and enhances organizational performance (Fitzgerald & White, 2020). The integration of these theoretical perspectives provides a solid basis for designing innovative, inclusive, and adaptive models of training to prepare women effectively for future leadership roles in military settings.

Overall, the literature suggests that addressing the specific needs of women in military environments requires comprehensive, innovative, and adaptive strategies supported by advanced technology, transformational and adaptive leadership models, and an inclusive organizational culture. This integrated approach is essential not only to improve individual competencies but also to foster organizational excellence capable of thriving amid global disruptions. As such, these insights form an important foundation for policy-making and program development that are sustainable, inclusive, and forward-looking—crucial pillars for preparing a future-ready women's workforce capable of facing evolving defense challenges (Khan et al., 2019; Heifetz, 1994; Kotter, 1997).

3. Research Methodology

This study employs a literature review approach with the aim of collecting, evaluating, and synthesizing previous research related to strategies for developing women in the air force amid the disruptions of the modern era. Data collection was conducted through searches of electronic databases such as Google Scholar, Scopus, and Web of Science, using key keywords including “women in military aviation,” “disruption era strategy,” “female military leadership,” and “future-ready military training.” The initial step involved screening relevant scholarly articles published

within the last five years (2018–2023). Subsequently, a selection process was carried out based on inclusion and exclusion criteria focusing on methodological quality, topical relevance, and source reliability (Khan et al., 2019).

The selected data were then analyzed thematically using a qualitative approach, following principles of systematic content analysis. This process involved identifying core concepts, patterns, trends, and proposed strategies within each selected study. The findings were then synthesized into a narrative review to highlight points of convergence and divergence, as well as research gaps that warrant further investigation. This analysis was conducted in accordance with the framework recommended by Popay et al. (2006), emphasizing the importance of internal and external validity to ensure the credibility and utility of the literature review in guiding the development of modern strategic frameworks. Through this approach, comprehensive and trustworthy insights into relevant innovations and strategic models are expected to be derived, which can be practically implemented to foster the development of future-ready women in the air force.

4. Results and Discussion

The data collection and analysis reveal that numerous relevant studies consistently identify technological innovation as a core component of strategies for developing women in the air force. The majority of research conducted between 2018 and 2023 highlights successful adoption of simulation technologies such as Virtual Reality (VR) and Augmented Reality (AR) in technical and tactical training, which have demonstrated an ability to enhance operational competencies among participants by approximately 25–35%, according to findings by Smith et al. (2019) and Lee & Kim (2021). Furthermore, these studies indicate that the integration of digital technologies not only increases training efficiency but also accelerates adaptation processes and boosts motivation among female participants—particularly

in leadership development and decision-making aspects (Wang & Zhao, 2022). These findings support the hypothesis that technological innovation is a pivotal factor in building future-ready women in the military air environment, especially amidst the challenges of the disruption era.

Moreover, the analysis underscores that leadership strategies based on Transformational Leadership and Adaptive Leadership are also emphasized within the existing literature. Several studies, such as those by Rodriguez et al. (2020) and Patel & Singh (2022), demonstrate that leadership development programs grounded in these theories significantly enhance women's self-confidence, courage, and capacity to assume strategic roles. These improvements translate into an increase of approximately 20–30% in leadership competence and decision-making indicators (Johnson & Creswell, 2021). The combination of these leadership approaches is therefore regarded as an innovative and adaptive solution to develop women in the air force who can flexibly and effectively face future challenges.

However, the review also identifies significant gaps within the literature concerning long-term sustainability and effectiveness of these strategies. Many studies, although methodologically comprehensive and exhibiting positive short-term results, lack sufficient insight into the organizational ecosystem's overall impact and the influence of organizational culture and gender bias in the process (Fitzgerald & White, 2020; Thompson & Webb, 2021). Additionally, there is limited research examining the adaptation of conservative military organizational culture, reducing the capacity to measure the long-term effectiveness of strategies aimed at cultivating an inclusive culture capable of supporting technological and leadership changes (Khan et al., 2019).

Theoretically, the findings suggest that Transformational Leadership, Adaptive Leadership, and Future-Ready concepts serve as foundational pillars for developing innovative, inclusive, and adaptive training models. These frameworks clarify how

leaders can initiate innovation, overcome cultural resistance, and facilitate women’s competency development, enabling rapid adaptation to significant changes and uncertainties (Heifetz, 1994; Burns, 1978). Additionally, the literature indicates that principles of inclusion and diversity accelerate innovation and enhance overall organizational performance (Krogstad et al., 2020). By adopting this combined theoretical framework, the proposed strategies are positioned to offer comprehensive and sustainable solutions to prepare women in the air force to face disruptive challenges adaptively and innovatively.

Tabel Summary of Key Studies on Technological And Leadership Strategies For Developing Women In The Air Force

No	Source	Focus of Research	Methodology	Main Findings	Key Implications
1	Smith et al. (2019)	Use of VR and AR in training female air force personnel	Quantitative surveys and experiments	VR/AR technology improves technical competencies by up to 30% in training	Innovative technology accelerates adaptation and enhances motivation
2	Lee & Kim (2021)	Technological innovation in training and development of women	Case studies and interviews	Digital technology use accelerates mastery of operational skills	Technology strategies support efficient and adaptive training
3	Rodriguez et al. (2020)	Leadership development programs based on Transformational Leadership theory	Quantitative and literature review	Increases in leadership competence and confidence of up to 25–30%	Transformational leadership development as a foundation for adaptation

4	Patel & Singh (2022)	The role of adaptive leadership in building future-ready women	Qualitative, interviews, and content analysis	Adaptive capabilities increase courage and decision-making	Adaptive leadership supports long-term success
5	Fitzgerald & White (2020)	Cultural barriers and resistance in long-term strategic development	Literature review and interviews	Conservative culture and gender bias affect sustainability of programs	Importance of developing an inclusive organizational culture and sustainability policies
6	Thompson & Webb (2021)	Gaps in long-term effectiveness of strategies	Longitudinal study	Lack of data on sustainability and organizational culture influence	Importance of long-term evaluation and organizational culture development

The results of this literature review demonstrate that the implementation of technological innovations such as Virtual Reality (VR) and Augmented Reality (AR) in training women in the air force significantly enhances their technical competencies and motivation. This aligns with the Technology Acceptance Model (Davis, 1989), which asserts that ease of use and perceived benefits of technology influence the rate of adoption and success of such innovations.

These technologies effectively reduce physical and psychological barriers during training and accelerate learning processes that are relevant to the needs of modern military operations (Smith et al., 2019). Consequently, integrating these technologies should become a core component of training programs to produce a future-ready and adaptable female workforce capable of confronting contemporary challenges. Additionally, other studies reinforce that leadership strategies based on Transformational and Adaptive Leadership are highly effective in building confidence and capacity among women to assume strategic roles. These approaches,

grounded in the theories of Burns (1978) and Heifetz (1994), emphasize the importance of inspiring and managing change in environments characterized by uncertainty, which forms the basis for developing flexible and agile leadership models.

However, the success of these strategies is also influenced by organizational culture and resistance to change, where conservative cultural norms and gender biases within the military can impede training effectiveness and development programs, as highlighted by Fitzgerald and White (2020). Therefore, ongoing change management strategies and inclusive cultural awareness programs are necessary to embed values of diversity and innovation as integral components of organizational culture, as supported by Organizational Change Theory (Kotter, 1997). This signifies that effective cultural transformation requires active commitment and participation from all organizational levels. Furthermore, the findings indicate a need for systematic development and measurement of the sustainability and long-term impact of these strategies, following the principles of Learning Organization (Senge, 1990), which emphasizes continuous feedback and comprehensive evaluation to ensure strategies remain relevant and dynamically adaptable to ongoing developments.

Moreover, technological competency development must be complemented by reinforcing organizational culture that supports diversity and inclusiveness (Hofstede, 1980), as cultural change requires time and strategic communication, along with targeted awareness training—especially within the conservative context of Indonesia's air force. Practical implications involve establishing continuous education and awareness programs to ensure the ingraining of inclusive values. Theoretically, these approaches are consistent with Cultural Dimensions Theory (Hofstede, 1980), which underscores the importance of cultural adaptation during organizational change. Extending further, this review supports the Triple Helix model (Etzkowitz &

Leydesdorff, 2000), emphasizing the synergistic collaboration between government, industry, and academia to build sustainable innovation ecosystems capable of addressing global challenges and strengthening both competency development and inclusive culture.

In conclusion, this review indicates that a comprehensive and holistic approach—combining technological innovation, transformative and adaptive leadership, and an inclusive, sustainable organizational culture—is essential for training women in the air force in the era of disruption. Theories and scholarly literature affirm that the success of developing a future-ready female workforce heavily depends on the synergy between technological innovations and cultural changes supporting diversity, thereby requiring the military to design programs that not only foster short-term competence but also emphasize long-term sustainability and cultural inclusion. This reinforces the hypothesis that adaptive and innovative strategies are the primary keys to preparing women in the air force to confront future challenges while contributing significantly to the development of human resource practices within a modern military environment.

5. Conclusion

The successful development of a future-ready female workforce in the air force amidst the era of disruption heavily relies on the integration of innovative, technology-based strategies, alongside transformational and adaptive leadership approaches, as well as the reinforcement of an inclusive and sustainable organizational culture. Technological innovations, such as VR and AR, have proven to be effective in enhancing participants' competencies and motivation. Meanwhile, leadership strategies capable of inspiring and adapting to change are central to building women's capacity to confront future uncertainties. Furthermore, long-term success is significantly influenced by cultural change within organizations and the

continuous evaluation of strategy effectiveness, which must be supported by cross-sector collaboration and systematic change management. Consequently, implementing a holistic, innovative, and inclusive strategy is a fundamental prerequisite for cultivating resilient, adaptable women in the air force who can substantially contribute to the success of national defense in the future.

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