Intervention Strategies for Women Entrepreneurs towards Enhanced Leadership and Digital Competence in the 21st Century

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Abstract
Can different frameworks of intervention be successful in increasing the number of women leaders in the Klang Valley, Malaysia? This study aims to identify whether there is a significant relation between education and work experience, or rather, which specific qualities make individuals likely to aspire to the position of a leader, or which digital qualities would be important for effective and responsible leadership. A structured questionnaire was employed to collect data from 30 women entrepreneurs and then the data collected were subjected to descriptive analysis, correlation analysis, and multiple linear regression analysis. The study suggests that both education (B = 0.047, p < 0.01) and business experience (B = 0.034, p < 0.05) significantly enhance leadership development. Such findings reinforce calls to policymakers to consider increasing training and mentorship, particularly on the side of digital literacy for female entrepreneurs and preparing them to face future problems.
Keywords: Strategies, Women Entrepreneurs, Leadership, Digital Competency

Introduction
When dealing with Malaysian women entrepreneurs, several variables that have a significant influence on their capability and the potential of their contribution to the economy can be identified. In today's digital economy leadership needs to include not only human abilities but also technological skills; it is necessary to acknowledge that leadership is not limited to traditional qualities but rather to how we can operate in a digital environment.

As can be observed from the literature review, women entrepreneurs believe that learning and skills can improve their effectiveness as leaders (Brush et al., 2020). However, today in the modern economic environment a leader not only means traditional leadership but also digital leadership (McKinsey & Company, 2021). There are more problems that women

entrepreneurs face that are even more challenging because they lack the technology and skills that are essential to be successful in the workplace. This research focuses on a leadership intervention analysis of women entrepreneurs in Klang Valley in search of leadership as well as to find ways to enhance digital leadership competencies.

Related Work
Women Entrepreneurs and Leadership
The business function of women entrepreneurs plays a vital role in improving international economic performance by boosting innovation, economic growth, and capacity-building (Foss et al., 2021). Various studies have revealed the substantial influence of women's entrepreneurship in terms of employment, community building, and securing a sustainable livelihood (Brush et al., 2020). However, entrepreneurship is increasingly gaining popularity, especially among women but is met with some challenges like lack of funding, social expectations, and limited female leadership.

Leadership specifically, where female leaders hold high positions in businesses and economies has developed a lot of developments over the years. Eagly and Carli (2018) stated that women in leadership positions face multiple challenges compared to the women's glass ceiling. This metaphorically depicts the many challenges that women encounter when it comes to wanting to promote entrepreneurship. It's worth mentioning that these findings are most significant when taking into account the cultural and educational context of Malaysia.

Digital Leadership and Entrepreneurship
Technology is indeed a big factor, hence making leadership and entrepreneurship quite relevant nowadays. According to the work of Gupta and Gupta (2019), it is suggested that digital leadership will play a key role in supporting women entrepreneurs in the context of the digital economy. This field involves being able to manage organizations within a digital environment to improve efficiency, customer satisfaction, and innovation (Gupta & Gupta, 2019). In the Malaysian case, women's entrepreneurial capabilities in technology and technology adoption and assimilation can be understood positively or negatively. However, this was in some cases with the assistance of the internet by which one can buy or engage in business. On the other hand, most women entrepreneurs encounter low levels of technology use and technology use that is not optimized in their operations since digital tools and technologies are underutilised in their enterprises (Hamzah et al., 2022). From Gordon and Rozario (2018) we know that e-commerce provides women entrepreneurs with the potential to thrive and that this especially becomes possible due to the enlarged market and increased income potential as they are presented with new and digital opportunities.

Impact of Training and Intervention Programs
However, the following programs are indicated to harm the effectiveness of the training and interventions intended for women entrepreneurs. Despite several programs focused on leadership development, this specific course of action falls short in incorporating cutting-edge ideas on digital leadership and, hence, is not fully relevant to contemporary business realities (Hamid et al., 2021). Research also highlights the impact of being a leader and the implementation of digital literacy training on the business performance of women in entrepreneurship, especially when it comes to entrepreneurial skills (Nor et al., 2022). Ariffin and Nkosi (2019) also point towards the requirement of a leadership training program that

addresses the needs of rural women entrepreneurs in Malaysia and others which can include the following statement "A need exists for programs which help build leadership and digital abilities of women entrepreneurs which were highlighted by Ariffin and Nkosi (2019)." By pointing to these areas it is possible to state that programs that develop leadership and digital skills will help rural women entrepreneurs to successfully navigate a competitive business landscape.

Challenges in Digital Leadership for Women Entrepreneurs
Some challenges include the availability of proper training on how to apply digital technologies to their business (Halim et al.,2018). This trend is especially visible in rural areas, which, by and large, lack the necessary technology for efficient communication and operations. It has been noted that organizations have specific gender roles which are often inconsistent with the gender that is being asked to manage, for example, women in workforce supervision, finances or customer care (Hamid & Musa, 2020). According to (Hamzah, et al., 2022), the perceived quality of service has been identified as a significant factor that influences customer satisfaction. In Malaysia many rural women entrepreneurs are limited in the availability of technological and knowledge training, making it difficult for them to fully participate in the opportunities in the digital economy. Another topic concerns cultural prejudices such as gender inequalities in access to practices in business or employment as well as positions for women (Embong & Rusdi, 2021).

Methodology
Research Design and Sampling
The procedure employed in this research is quantitative the various data gathered and the conclusion drawn have been thorough and the research's validity is assessed through multiple tests. However, the paper has two parts, where the first is the study of the intervention strategies implemented for women entrepreneurs and the second is the use of structured questionnaires to evaluate the impact of the strategies. The non-probability Purposive Sampling approach was used in selecting respondents as women entrepreneurs who had undergone leadership development programs to get respondents to the study. Purposive sampling entails participants have to exhibit certain behaviours to help ensure the research objectives are met in the end. For the quantitative part of the study, the selected 30 women entrepreneurs from various sectors within Klang Valley that employed in SMEs were considered.

Data Collection
Questionnaires are given during various levels of leadership education and training including during the leadership training programmes and the after programmes are done. It encompassed the education, employment, and technology deployment of the respondents. Additionally, the survey had some questions measuring participants' self-evaluations of their leadership skills during and after the courses. The quantitative research tool consisted of 25 items and was divided into four sections as shown in Figure 1.

Figure 1: The quantitative data collection instrument

Data Analysis
The quantitative data was analyzed using the Statistical Package for the Social Sciences (SPSS). The following analyses were conducted, as shown in Figure 2:
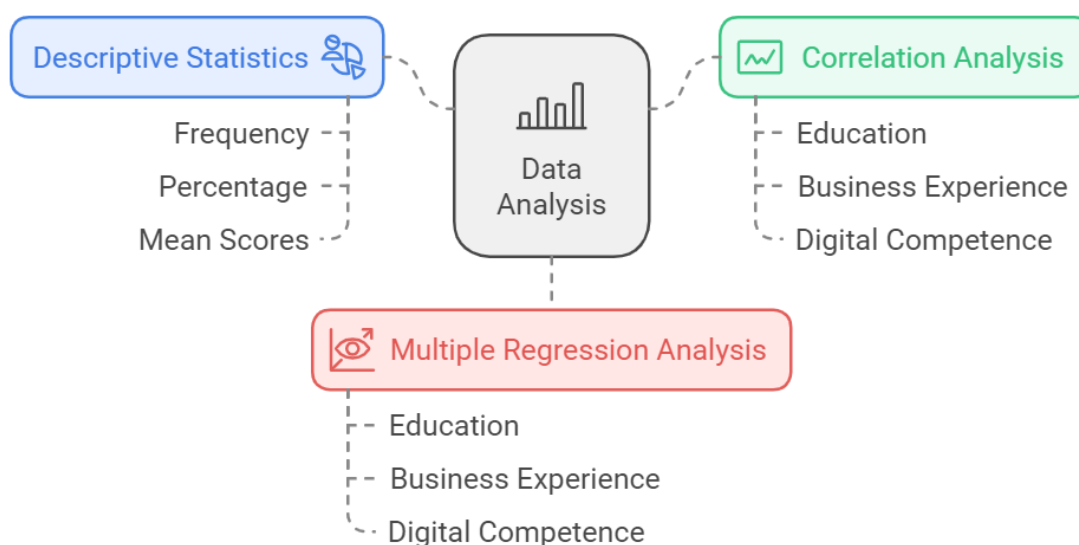

Figure 2: The data analysis

a) Descriptive Statistics: Used to summarize the demographic profile of the respondents, including educational attainment, business experience, and program participation. This included measures of frequency, percentage, and mean scores.
b) Correlation Analysis: Conducted to examine the relationships between leadership development and key variables such as education, business experience, and digital competence. A Pearson correlation was used to assess the strength and direction of these relationships.
c) Multiple Regression Analysis: Used to determine the predictive power of variables such as education, business experience, and digital competence on leadership development outcomes. This approach helped in identifying the key factors that contributed most to leadership improvement.

Instrument Validity and Reliability
A test of construct validity was conducted to verify that each item contained within the questionnaire assessed the concept of leadership and digital competency. It was then reviewed by three experts on entrepreneurship and leadership training before being applied to a limited group of entrepreneurs for evaluation of its ability to provide a clear and comprehensive assessment of the entrepreneurial and leadership competencies required. For reliability, Cronbach's Alpha test was conducted to check the consistency within each item concerning leadership and digital development. The Cronbach's Alpha rating of 0.75 was observed for the assessment of the instrument, which verified its reliability to the extent.

Ethical Considerations
Ethical approval of all aspects involved in the research was done before the actual collection of the data hence the research adheres to the established guidelines for ethical research. Before submitting their opinions they were instructed to give consent to participate in the research and to acknowledge the possibility of the study being a private activity. The implementation of a mixed methodology to examine the quantitative and the qualitative variables in the research also supported the finding of this study on intervention programs aimed at women entrepreneurs. Both qualitative and quantitative method was used by the research to identify the factors that impact the development of leadership like the relationship between education and experience, or skills in the digital platform to understand and explore.

Results and Discussions
Descriptive Statistics
Out of the 30 respondents, 65% had participated in at least one leadership development program. Table 1 provides a breakdown of the respondents by educational level, work experience, and program participation.

Table 1
Breakdown of the respondents by educational level, work experience, and program participation

Variable	Frequency (%)
Post-Secondary Education	80
Business Experience (>5 years)	75
Program Participation	65

The majority of respondents (80%) had a post-secondary education, and 75% had more than five years of business experience.

Correlation Analysis
A correlation analysis was conducted to determine the relationship between leadership development and factors such as education, business experience, and participation in intervention programs. The analysis showed significant positive correlations between leadership development and both education (r = 0.68, p < 0.01) and business experience (r = 0.62, p < 0.01), as shown in Table 2.

Table 2
Correlation Analysis results

Variable	Leadership Development Correlation (r)
Education	0.68
Business Experience	0.62
Program Participation	0.45

*p < 0.01, p < 0.05

Regression Analysis
Another variable was education, experience with a business and the level of participation in the program which will help to boost the predictive accuracy of the multiple regression model. From the Table 3 analysis, the findings indicate that education ($\beta = 0.48$, $p < 0.01$) and business experience ($\beta = 0.35$, $p < 0.05$) are the most significant predictors for the development of leadership skills, which makes a total of 55% contribution to the variability of the leadership factor ($R^2 = 0.55$).

Table 3
Regression analysis results

Variable	β	p
Education	0.48	<0.01
Business Experience	0.35	<0.05
Program Participation	0.22	>0.05

Leadership Challenges
The literature reviewed some of the major obstacles encountered during the development of leadership for organizations by the respondents: lack of ability of the leader to motivate the employees and increased levels of self-esteem. Hence, though the presented difficulties were prevalent, the repercussions were also in line with the status of the participant in the specified program. The participants who have participated in several programmes showed some improvements in these areas, although the results weren't statistically different from those that have been improved by the programme alone.

Hypothesis, based on quantitative data, states that intervention programs are successful in increasing women's entrepreneurship and related competencies with leadership capabilities as well as experiences in education and business practice. The correlation coefficient of the program participation with the development of the leaders is 0.45, which indicates that these programs are good, however, they need to be explored and improved on a further level. Based on the current research there are the same findings that were reported about education and experience and the other variables including social position and organisational climate as the major predictors of leadership performance in the same way that other research in literature did in past. Despite this, the data does point to some problems that are specific in this aspect, namely dealing with employees, and improving confidence. The findings do not differ from other studies in the same area where training is recommended to be done and coordinated with existing programs, particularly where training should be supplemented to increase effectiveness.

Digital Competency as a Key Enhancer of Leadership for Women Entrepreneurs
Table 4 shows that digital competence significantly contributes to leadership development among women entrepreneurs, which aligns with the broader literature on digital leadership across various sectors.

Table 4
Digital competency for leadership Key Findings

Focus	Key Findings
Student perceptions of leadership skills for digital transformation Philip & Aguilar (2021)	Digital literacy is a key leadership skill alongside traditional skills; needs to integrate both into educational curricula.
Development of digital leadership competency scale Munsamy et al. (2023)	Identified six core competencies for digital leadership, including adaptability, digital culture, and resilience.
Leadership and digital learning in the health sector Solheim & Skjølsvik (2022)	Digital tools and leadership significantly enhance employee training and knowledge development, especially in response to COVID-19.
Digital competency and self-leadership's influence on teachers Poerwita et al. (2023)	Digital competency significantly improves teachers' innovative behaviour and overall school performance.
Trust-building as a key element of digital leadership Abbu & Mugge (2022)	Trust and collaboration are essential for digital leadership success, promoting organizational adaptability.
Digital Competency Differentiating Digitally Mature Organizations Abbu et al. (2020)	Digital leadership in mature organizations drives successful large-scale transformations through innovation and adaptability.
Digital Leadership and Transformation Abbu, H., et al. (2024)	Successful digital transformation relies on leadership to set a vision and drive change.
Educational Leadership and Teacher Competence Anwar, M. (2024).	Digital competency and self-leadership influence teacher performance, with self-leadership having a greater impact.
Digital Competency-Building Strategies Bhatia, A., & Sharma, R. (2024)	Successful strategies include training programs supported by leadership and a positive organizational culture.
Educational Leadership and Teacher Competence Ismail, Z., & Rahman, A. (2024)	Principal leadership positively influences teachers' pedagogical competence through strategic digital implementation.
E-Leadership in Virtual Contexts Kumar, V., & Singh, R. (2024)	Transactional leadership positively impacts employee motivation and performance in the context of digital competencies.
Digital Culture's Role in Academic Performance Raghavan, S., & Gupta, P. (2024).	Competency-based HR development enhances employee performance and adaptability through effective training programs.
Trends in Teacher Digital Competency Research Sharma, R., & Reddy, K. (2024).	Higher education and experience in leadership roles are key determinants of managerial competencies impacting performance in FPOs.

The development of leaders now focuses on digital competency because technology is the catalyst for the advancement and competitiveness of businesses. This is the argument of how

leadership is currently being identified as requiring a level of digital literacy, as opposed to conventional leadership frameworks. This is particularly pertinent to women entrepreneurs in Malaysia as digital transformation is crucial to the operations of women-owned businesses, customer relationship management, and operational efficiency. Such is the case with this present study that the respondents who were found to have higher levels of digital literacy were the ones that exhibited higher levels of competence in leadership as noted above in (4b).

It could also mean that the interventions for female businesswomen have to be based on the understanding that these women could easily be assisted on how to use digital technology to carry out their business enterprises efficiently. It is a certain context for women entrepreneurs since they have to be flexible to survive challenges that others just do not have to go through. Therefore, the interventions must be centred on empowering women entrepreneurs in their capacity for innovation through digital training to increase their leadership capability among them.

Conclusions

This study underscores the crucial role of digital competence and leadership development in empowering women entrepreneurs to thrive in the 21st-century business environment. The most significant finding reveals a strong correlation between digital literacy, leadership skills, and entrepreneurial success. Women entrepreneurs who possessed higher levels of digital and leadership competencies demonstrated greater adaptability, innovation, and business sustainability especially in the face of rapid technological change and competitive market dynamics.

Additionally, the study highlights that access to training, mentorship, and supportive networks plays a pivotal role in bridging gender gaps and promoting inclusive growth. In rural settings, the lack of digital infrastructure and awareness further amplifies the need for targeted, context-specific interventions.

In response to these findings, the study recommends the implementation of inclusive digital literacy programs, the enhancement of leadership development frameworks, and the establishment of mentorship networks. Furthermore, national policies should integrate digital leadership as a strategic priority within entrepreneurship development initiatives. These well-considered recommendations provide a strong foundation for future interventions aimed at building resilient, digitally competent women entrepreneurs capable of leading in an increasingly digital economy.

Recomendations

Based on the findings, it is recommended that leadership and digital competency programs for women entrepreneurs be enhanced with a stronger focus on digital literacy, practical business technology skills, and strategic leadership development. Programs should be tailored to different contexts, especially for rural women, and include hands-on training in e-commerce, digital marketing, and financial tools. Mentorship and peer networking opportunities should also be expanded to support continuous growth and confidence building.

Policymakers and stakeholders should integrate digital leadership into national entrepreneurship strategies, ensuring equitable access to training and resources. Regular evaluation of program effectiveness is crucial to keep up with evolving technological demands. Public awareness campaigns should also be initiated to challenge societal norms and promote women's leadership in the digital economy.

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Conflicts of Interest
The authors declare no conflicts of interest.

Author Contributions
Mohd Erfanishah Abdullah: Writing and original draft preparation. **Jalaluddin Abdul Malek:** Conceptualization and Supervision **Khadijah Alvi:** Conceptualization and Reviewing
Muhamad Hariz Muhamad Adnan: Writing, Reviewing and Editing.

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Data available on request due to privacy/ethical restrictions.

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