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The Role of Green Capital Women (GCW) in Green Business Digitalization (GBD) Through New Product Creation (NPC) in Ecoprint Business

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Abstract
Women entrepreneurs in Yogyakarta and Solo in the ecoprint sector demonstrate a commitment to sustainability and play a significant role in the creative industry. They have great potential as agents of change for sustainable MSEs. The use of Green Knowledge (WGK) and Green Skills (WGS) is expected to accelerate Green Business Digitalization (GBD) through New Product Creation (NPC). This study aims to analyze the role of WGK and WGS on GBD through NPC. With a quantitative approach, this study involved women owners of ecoprint MSEs in Yogyakarta and Surakarta Residency, using a purposive sampling technique. The analysis used Structural Equation Modeling (SEM) and the Partial Least Square (PLS) approach. The results showed that WGK and WGS were significant to NPC but did not affect GBD through NPC; they directly affected GBD.

Abstrak
Pengusaha perempuan di Yogyakarta dan Solo dalam bidang ecoprint menunjukkan komitmen terhadap keberlanjutan dan berperan signifikan dalam industri kreatif. Mereka berpotensi besar sebagai agen perubahan untuk UMK yang berkelanjutan. Pemanfaatan Pengetahuan Hijau (PHP) dan Keterampilan Hijau (KHP) diharapkan mempercepat Digitalisasi Bisnis Hijau (DBH) melalui Penciptaan Produk Baru (PPB). Penelitian ini bertujuan menganalisis peran PHP dan KHP terhadap DBH melalui PPB. Dengan pendekatan kuantitatif, penelitian ini melibatkan perempuan pemilik UMK ecoprint di Yogyakarta dan Karesidenan Surakarta, menggunakan teknik purposive sampling. Analisis dilakukan dengan Structural Equation Modelling (SEM) dan pendekatan Partial Least Square (PLS). Hasil penelitian menunjukkan PHP dan KHP signifikan terhadap PPB, namun tidak berpengaruh melalui PPB terhadap DBH, tetapi memiliki pengaruh langsung terhadap DBH.

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Kata kunci
Peran Perempuan;
Perempuan Kapital Hijau;
Digitalisasi Bisnis Hijau;
Penciptaan Produk Baru;
Ecoprint.

1. Introduction

In the era of globalization and increasing awareness of the importance of sustainability, the role of the micro and small business (MSE) sector is increasingly in the spotlight (Regif et al., 2023). This phenomenon is no exception in Indonesia, where MSEs have a significant role in economic growth and job creation (Novitasari, 2022). The contribution of MSEs to the Indonesian economy can be seen from the contribution of MSEs to the National GDP of 60.5%. In contrast, the contribution of MSEs to job creation can be seen from the number of MSE units in 2019, reaching 65.4 million, which can absorb up to 123.3 thousand workers (Tambunan, 2023). However, along with this development, environmental challenges are increasingly real, and the obligation to pay attention to environmental sustainability is becoming increasingly urgent (Ahdad & Agit, 2023).

Climate change, environmental damage, and increased waste are critical issues that require serious attention from all sectors of society, including the business world. Green MSEs are becoming an increasingly important alternative as an answer to this challenge. In global business dynamics, green MSEs function as a motor of economic growth and as agents of change to achieve environmental sustainability (Nuringsih et al., 2022) because consumers prioritize lifestyle (Kartini & Zed, 2023) and environmentally friendly products.

The importance of integrating the sustainability dimension in business is also reflected in the phenomenon of women entrepreneurs in the ecoprint sector in the Yogyakarta and Surakarta Residency areas (Kartini & Setiawan, 2024). Women often have a central role in the creative industry and care about sustainability. Women entrepreneurs in the ecoprint sector have great potential to become agents of change in creating sustainable SMEs. By utilizing GCW, namely WGK, and WGS, which focus on sustainable business practices, it is hoped that the GBD process can be accelerated through NPC.

The formulation of the problems to be studied, namely (1) What is the role of WGK on NPC? (2) What is the role of WGS on NPC? (3) How does NPC affect GBD? (4) What is the role of WGK on GBD? (5) What is the role of WGS on GBD? (6) What is the role of WGK on GBD through NPC, and (7) What is the role of WGS on GBD through NPC?

2. Method

This research will be conducted using a quantitative approach. The population in this study were women who have ecoprint SMEs in Jogjakarta and Surakarta Residency. The sample in this study will be taken using a purposive sampling technique. The sample will be selected based on the following criteria: women who have ecoprint businesses in Jogjakarta and Surakarta Residency are willing to be interviewed. The research location is in Jogjakarta and Surakarta Residency. The research location was chosen based on the number of female ecoprint entrepreneurs in both regions. The number of female ecoprint entrepreneurs who are respondents is targeted at a maximum of 30 people for each city (Jogjakarta and Surakarta Residency), so the total number of respondents is a maximum of 60 people. Data was obtained using a closed questionnaire, guiding researchers in conducting interviews with several respondents. The questionnaire was designed using a Likert scale.

The analysis method used is the Structural Equation Modeling (SEM) method with the Partial Least Square (PLS) approach. The SEM data analysis method is used to see the effect between PHP and KHP on DBH with PPB as a mediating variable.

The research model can be seen in Figure 3. This model is to see (1) the influence of WGK on NPC, (2) the influence of WGS on NPC, (3) the influence of NPC on GBD, (4) the influence of WGK on GBD, (5) the influence of WGS on GBD, (6) the influence of WGK on GBD through NPC, and (7) the influence of WGS on GBD through NPC.

3. Results and Discussion

The latent variables in this study are WGK, WGS, NPC, and GBD. WGK and WGS are X variables, GBD is a Y variable, and NPC is a Z variable or mediation. Each latent variable has three indicators. Figure 1 is a picture of the initial research model.

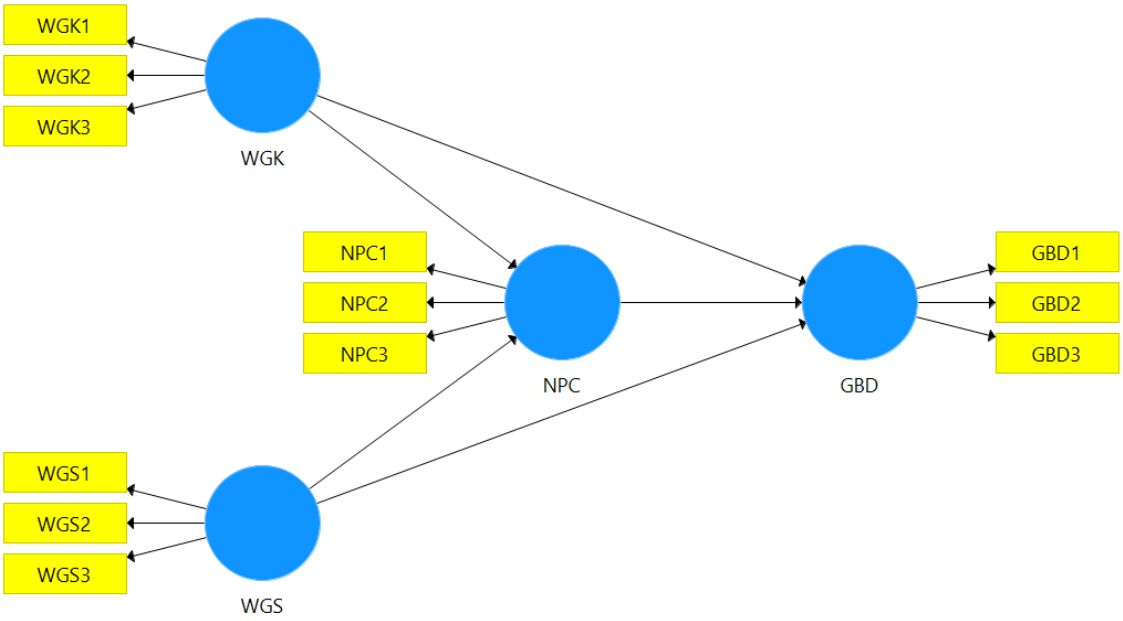

Figure 1. Initial Research Model

3.1. Outer Model Analysis

The first step is to analyze the outer model. Table 1 is a summary of the results of the outer model analysis. Based on the analysis results, the loading factor values on all indicators are more than 0.7. The composite reliability values on all constructs are more than 0.7. The AVE value of each construct is more than 0.5. Based on the study's results, the outer model met good standard values for reliability and validity parameters (Table 1).

Table 1. Outer Model Analysis

	Parameter	Outer Model Analysis	
1	Loading Factor ≥ 0,7	WGK1 = 0,845	NPC1 = 0,883
		WGK2 = 0,861	NPC2 = 0,914
		WGK3 = 0,717	NPC3 = 0,910
		WGS1 = 0,799	GBD1 = 0,808
		WGS2 = 0,803	GBD2 = 0,893
		WGS3 = 0,741	GBD3 = 0,884
2	Composite Reliability	WGK = 0,851	NPC = 0,930
		WGS = 0,824	GBD = 0,897
3	AVE	WGK = 0,657	NPC = 0,815
		WGS = 0,611	GBD = 0,744
4	AVE Square	All AVE square root values of the latent variables are higher compared to the correlation of other latent variables.	
5	Cross Loading	Each indicator has a higher correlation with the latent variable it represents compared to its correlation with other latent variables.	

Figure 2 shows the results of the outer model analysis on the latent variables WGK, WGS, NPC, and GBD. In the latent variable WGK, all indicators produce loading factor values above 0.7, indicating that each indicator strongly contributes to the latent variable. The study results illustrate that education and training are important in improving environmental understanding among female entrepreneurs. In addition, the results of the study also confirm that female entrepreneurs who are more environmentally aware tend to make more ecologically responsible decisions in a business context. The results of this study indicate the importance of active participation in improving knowledge and skills related to sustainable business. Overall, these indicators are very relevant and influential in explaining the concept of Women's Green Knowledge, indicating that

efforts to improve environmental knowledge and awareness among female entrepreneurs can positively encourage green business practices in companies.

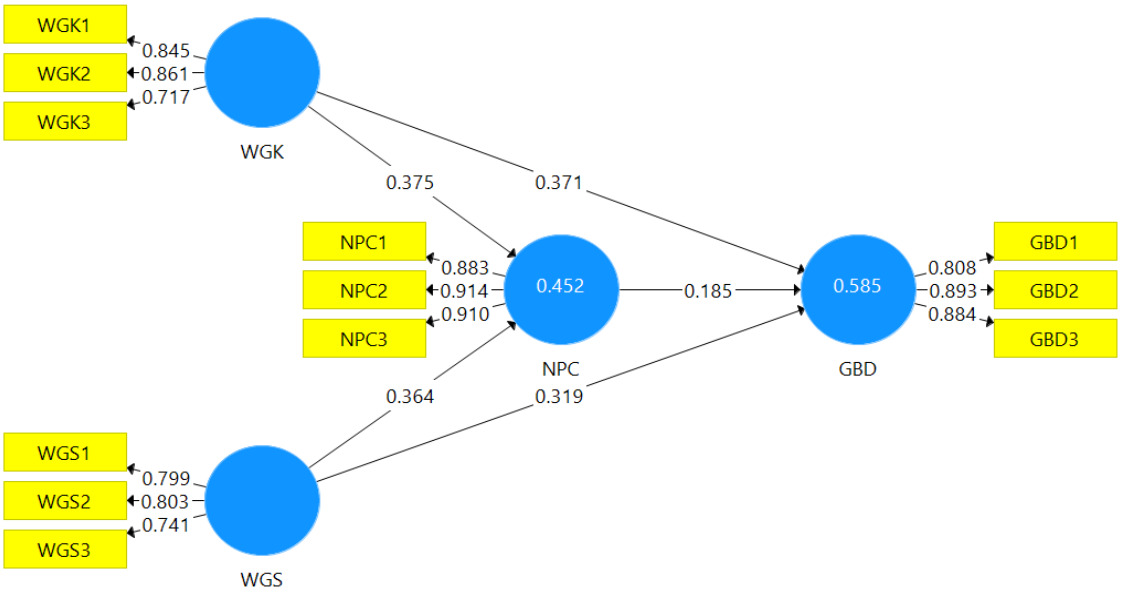

Figure 2. Outer Model

The results of this study indicate that the WGS1, WGS2, and WGS3 indicators have a loading factor value of more than 0.7, indicating that the three indicators strongly contribute to measuring the latent variables related to women's green skills (WGS). This study produces three things. First, it emphasizes the importance of technical skills as a foundation for running a sustainable business. Second, it emphasizes the important role of innovation in developing greener and more efficient business strategies. Third, it shows that interpersonal and leadership skills are essential to drive positive change in the context of sustainability. Overall, these results indicate that women's technical skills, innovation, communication, and leadership have a significant role in encouraging green business practices in companies, so improving these skills can contribute to the successful implementation of a more sustainable business.

The results of this study indicate that all indicators in the NPC (New Product Creation) variable have a loading factor value higher than 0.7, indicating that each indicator contributes significantly to measuring the latent variable. Three things are emphasized in the results of this study. First, the results show that product innovation capability is crucial in supporting the company's sustainability efforts. Second, the results emphasize the importance of a systematic process to encourage the creation of innovative products. Third, the results show that fast launch time is key to winning the competition and meeting market demand. Overall, the results of this study imply that new product innovation, effective innovation processes, and product launch speed are important elements that support each other in creating new products for women entrepreneurs. Improvements in these three aspects can help women entrepreneurs more successfully present innovative and sustainable products to the market.

The results of this study indicate that all indicators in the GBD (Green Business Digitalization) variable have a loading factor value higher than 0.7, indicating that each indicator plays a significant role in explaining the latent variable. There are three results in this study. The results of this study highlight the importance of adopting green technology as part of a company's sustainability strategy. The results of this study show the important role of digitalization in improving operational efficiency and effectiveness, which supports sustainability. The results of this study emphasize that digital presence can be key to reaching wider consumers and supporting sustainable business growth. Overall, the results of this study state that the use of environmentally friendly technology, digital system integration, and digital platforms synergistically contribute to the achievement of

greener and more sustainable business practices. Improving these three aspects can help women entrepreneurs optimize business operations while supporting sustainability goals.

3.2. Inner Model Analysis

The second step is to conduct an inner model analysis. When analyzing the inner model, the research results must meet two parameters, namely R2 and path coefficient estimates. Table 2 is a summary of the results of the inner model analysis.

Table 2. Inner Model Analysis

	Parameter	*Inner Model Analysis*	
1	R^2	R^2 for NPC = 0,452	
	0,67 = good	R^2 for GBD = 0,585	
	0,33 = moderate		
	0,19 = weak		
2	Path Coefficient	T-statistic for:	
	Estimation	WGK -> NPC = 3,176	WGK -> GBD = 1,602
	Alpha = 5%	WGS -> NPC = 2,870	WGS -> GBD = 1,214
	T-table = 1,671	NPC -> GBD = 1,661	
		WGK -> GBD = 3,211	
		WGS -> GBD = 2,436	
		Nilai Koefisien:	
		WGK -> NPC = 0,375	
		WGS -> NPC = 0,364	WGK -> GBD = 0,070
		NPC -> GBD = 0,185	WGS -> GBD = 0,067
		WGK -> GBD = 0,371	
		WGS -> GBD = 0,319	

WGK (Women's Green Knowledge) and WGS (Women's Green Skills) on NPC (New Product Creation) provide an R^2 value of 0.452. WGK and WGS explain 45.2% of the variation in the NPC variable. Women's green knowledge and skills have a significant contribution to influencing new product creation. However, about 54.8% of the variation in NPC is explained by other factors not included in this model. In other words, although WGK and WGS play an important role, other factors influence new product creation that this model does not capture.

NPC (New Product Creation) on GBD (Green Business Digitalization) provides an R^2 value of 0.585. The finding indicates that NPC explains 58.5% of the variation in the GBD variable. The results demonstrate that creating new products, especially those focusing on sustainability, significantly influences the success of green business digitalization. Around 41.5% of the variation in GBD is explained by other factors not included in this model. Therefore, creating innovative and environmentally friendly new products improves the performance and advances the digitalization of green businesses.

The bootstrapping technique is a method that can be used to test research hypotheses. Figure 3 shows the analysis results carried out using the bootstrapping method.

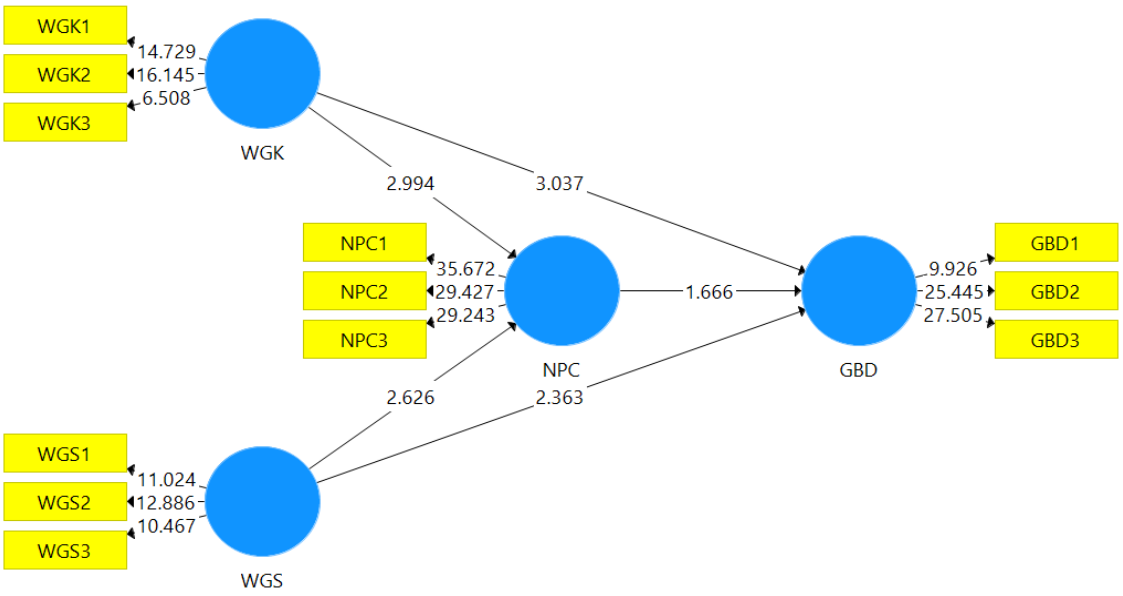

Figure 3. Bootstrapping

3.3. Hypothesis Testing

The study's results indicate that WGK (Women's Green Knowledge) positively and significantly affects NPC (New Product Creation). The evidence for this is the T-statistic value of 3.176, greater than the T-table value, along with a path coefficient value of 0.375. The T-statistic value of 3.176, greater than the T-table value, indicates that the effect of WGK on NPC is statistically significant. This finding indicates that women's green knowledge genuinely impacts the creation of new products and that this effect is not due to chance. The positive path coefficient of 0.375 indicates that increasing women's green knowledge will increase the ability of women entrepreneurs to create new environmentally friendly products. These results confirm that the green knowledge possessed by women plays an important role in supporting innovation and the creation of new environmentally friendly products. This knowledge helps improve the process and results of new product innovation, indicating that increasing women's green knowledge can positively contribute to creating more sustainable new products.

The study results indicate that WGS (Women's Green Skills) positively and significantly affects NPC (New Product Creation). The evidence for this can be seen in the T-statistic value of 2.870, greater than the T-table value, along with a path coefficient value of 0.364. The T-statistic value greater than the T-table indicates that the effect of WGS on NPC is statistically significant, meaning that there is a real relationship between women's green skills and new product creation. The positive path coefficient of 0.364 indicates that increasing women's green skills will increase the ability of women entrepreneurs to create new environmentally friendly products. Thus, hypothesis 2 (H2) states that WGS positively affects NPC and can be accepted. These results indicate that green skills possessed by women, such as technical skills, innovation, and leadership in the context of sustainability, play an important role in encouraging new product creation. These skills help create innovative and effective solutions that support green business practices, thereby strengthening the efforts of women entrepreneurs to bring sustainable products to the market.

The results of the study indicate that Hypothesis 3 (H3), which states that NPC (New Product Creation) has a positive and significant effect on GBD (Green Business Digitalization), cannot be accepted or rejected. The path coefficient value of 0.185 and the T-statistic value of 1.661, which is smaller than the T-table value, support this conclusion. The T-statistic value of 1.661, which is smaller than the T-table value, indicates that the effect of NPC on GBD is not statistically significant. Although there is an indication of a positive relationship between new product creation and green business digitalization, the relationship is not strong enough to be considered significant. In other words, the effect of NPC on GBD is not strong enough to support the hypothesis that new product creation significantly affects green business digitalization. The path coefficient value of 0.185

indicates a positive relationship between NPC and GBD, but the magnitude of the effect is not significant enough. Although the direction of the effect is positive, meaning that new product creation can contribute to green business digitalization, the effect is not strong enough to be considered to have a real impact in the context of this study. These results imply that new product creation does not significantly affect green business digitalization. Other factors may be more dominant in influencing green business digitalization, or the effect of new product creation on green business digitalization may require additional conditions or contexts to be significant.

The results of the study indicate that Hypothesis 4 (H4), which states that WGK (Women's Green Knowledge) has a positive and significant effect on GBD (Green Business Digitalization), can be accepted. The evidence for this conclusion is provided by the path coefficient value of 0.371 and the T-statistic value of 3.211, both exceeding the T-table value. The T-statistic value of 3.211, which is greater than the T-table value, indicates that the effect of WGK on GBD is statistically significant. The path coefficient value of 0.371 and the T-statistic value of 3.211 indicate that women's green knowledge significantly influences green business digitalization, and this relationship is not due to chance. The path coefficient value of 0.371 indicates a positive relationship between women's green knowledge and green business digitalization. Increasing women's green knowledge will lead to a 0.371 unit increase in green business digitalization. In other words, the higher the women's green knowledge in the organization, the greater their contribution to strengthening green business digitalization. These results underline the importance of women's green knowledge in supporting environmentally friendly business digitalization efforts. Good green knowledge enables women to be more effective in adopting sustainability-supporting digital technologies, managing their businesses more efficiently, and strengthening their business positions in markets oriented towards sustainability and green innovation.

The results of the study indicate that WGS (Women's Green Skills) has a positive and significant effect on GBD (Green Business Digitalization), with a T-statistic value of 2.436, which is greater than the T-table value and a path coefficient value of 0.319. Therefore, hypothesis 5 (H5) is accepted. The T-statistic value of 2.436, which is greater than the T-table value, indicates that the effect of WGS on GBD is statistically significant. The green skills possessed by women in the organization play a significant role in encouraging green business digitalization, and this influence is not due to chance. The path coefficient value of 0.319 indicates a positive relationship between women's green skills and green business digitalization. This figure indicates that increasing women's green skills will increase green business digitalization by 0.319 units. The findings illustrate that women's green skills—such as technical expertise, innovation, and leadership in green practices—significantly contribute to integrating digital technologies that support business sustainability. These results confirm that women's green skills positively impact efforts to digitalize environmentally friendly businesses. These skills enable women to play a more active role in adopting and managing digital technologies that support green business practices, thereby strengthening business sustainability and efficiency in the digital era.

The results of the study indicate that Hypothesis 6 (H6), which states that WGK (Women's Green Knowledge) has a positive and significant effect on GBD (Green Business Digitalization) through NPC (New Product Creation), is rejected. The lack of significance is supported by the T-statistic value of 1.602 (smaller than the T-table value), the path coefficient value of 0.070, and the P-value of 0.110. The T-statistic value of 1.602, which is smaller than the T-table value, indicates that the effect of WGK on GBD through NPC is not statistically significant. The results indicate that, although a positive relationship was anticipated, the effect is not strong enough to be considered significant in this research model. The path coefficient value of 0.007 indicates that the impact of WGK on GBD through NPC is almost non-existent. This value is very small, indicating that women's green knowledge weakens green business digitalization if it is through new product creation as an intermediary. The P-value of 0.110 is greater than the general significance level (e.g., 0.05). A P-value greater than 0.05 indicates that the result is not statistically significant, supporting insufficient evidence to conclude that WGK significantly affects GBD through NPC. This result indicates that Hypothesis 6 cannot be accepted because there is no significant effect of women's green knowledge on green business digitalization through new product creation. The findings imply that new product

creation may not effectively transfer the impact of women's green knowledge into green business digitalization, or other factors might play a more significant role in the process.

The results of the study indicate that Hypothesis 7 (H7), which states that WGS (Women's Green Skills) has a positive and significant effect on GBD (Green Business Digitalization) through NPC (New Product Creation), cannot be accepted or rejected. This is based on the T-statistic value of 1.214 (smaller than the T-table value), the path coefficient value of 0.067, and the P-value of 0.225. The T-statistic value of 1.214, which is smaller than the T-table value, indicates that the effect of WGS on GBD through NPC is not statistically significant. The findings indicate that women's green skills do not have a strong or consistent impact on green business digitalization through new product creation in the context of this study. The path coefficient value of 0.067 indicates that the relationship between women's green skills and green business digitalization through new product creation is very small. The analysis indicates that any increase in women's green skills has only a minor impact on green business digitalization when mediated through new product creation. The P-value of 0.225 is greater than the general significance level (e.g., 0.05). A P-value greater than 0.05 indicates that the results are not statistically significant, supporting that there is insufficient evidence to conclude that women's green skills have a significant positive effect on green business digitalization through new product creation. This result indicates that Hypothesis 7 cannot be accepted because the effect of women's green skills on green business digitalization through new product creation is insignificant in this research model. The findings indicate that women's green skills may not significantly support green business digitalization, or the effect might be influenced by other factors not captured in this study.

3.4. Discussion

In this globalized and developing world, micro and small enterprises are starting to be noticed. Indonesia's micro and small enterprises (MSEs) contribute to economic growth and job creation. However, environmental issues are becoming a necessity. Micro and small enterprises (MSEs) are crucial to solving this problem. Green Micro and Small Enterprises (MSEs) drive economic expansion by offering ecological goods that meet customer needs and preserve the environment. In Yogyakarta and the Solo Residency, the involvement of women entrepreneurs in ecoprint demonstrates their commitment to sustainability and underlines their significant contribution to the creative sector. Women ecoprint entrepreneurs have significant potential as catalysts for environmentally sustainable micro and small enterprises (MSEs). By including GCW, namely WGK, and WGS, which prioritize sustainable business practices, it is hoped that the GBD process can be accelerated through NPC.

It has been shown that WGK and WGS have a positive and substantial influence on NPC. This result is consistent with previous research on the influence of WGK on NPC, namely knowledge management that enhances the organization's ability to achieve sustainable innovation (Wang et al., 2022). According to other studies, having knowledge and skills in environmental innovation is very important (Cheng, 2020). In addition, several studies have shown that people's knowledge and confidence in managing their finances can lead to better product innovation and competitive advantage (Mansoor et al., 2021). The findings of this study have important managerial implications for women entrepreneurs in the ecoprint industry, especially regarding the need to improve their green knowledge and capabilities. Women entrepreneurs have the power to create new environmentally friendly goods because of their inventive thinking and extensive knowledge of sustainable business procedures. The results suggest that investing in education and training focused on ecological considerations and effective fiscal management may be beneficial. Women entrepreneurs should strive to improve their ability to develop environmentally friendly products, use what they already have smartly, and advocate for goods that comply with sustainability standards. Focusing on education and training centred on ecological considerations and good fiscal management will give them a competitive edge in a market where consumers are increasingly conscious of environmental issues.

According to the third hypothesis, new product creation (NPC) does not affect green business digitalization (GBD). The findings of this study contradict previous studies that found that SMEs

can benefit the environment and economy when they adopt sustainable practices (Mariska et al., 2023). Green product practices and operational process digitalization are part of the company's transformation from this phenomenon (Cardinali and De Giovanni, 2022). A significant correlation between the level of company process digitalization and NPC has been shown in other studies as well. This correlation is more pronounced in established businesses, indicating that NPC can enhance digitalization efforts along the value chain, which provides confidence in green business activities. There does not seem to be any previous research supporting this study's findings. Current new product innovation does not necessarily drive green company digitalization, according to the managerial implications for women entrepreneurs in the ecoprint industry based on hypothesis 3. Consequently, women ecoprint entrepreneurs should reconsider how they integrate product innovation and digitalization. Integrating digitalization into every step of product innovation is necessary to ensure that new products contribute to digital efficiency and sustainability targets. For example, when creating new products, they think about how digital technology can make manufacturing more environmentally friendly or improve product sustainability. Therefore, by taking a more comprehensive view, they can realize their greener and more sustainable corporate goals through the full potential of product innovation and digitalization.

Hypotheses 4 and 5, namely WGK (Women Green Knowledge) and WGS (Women Green Skills), significantly and positively affect GBD (Green Business Digitalization), are supported by the findings of the study. According to recent research, female business owners are critical to long-term company growth (Putranti and Swastuti, 2023). According to Ashari et al. (2023) and others in corporate digitalization, digital transformation is essential to improve operational efficiency and market accessibility. However, there is little in-depth research investigating the implementation of GBD, particularly in SME settings, and concentrating on the function of GCW. The research findings supporting hypotheses 4 and 5 highlight the need to enhance green knowledge and skills to facilitate corporate digitalization. This finding has important management implications for women entrepreneurs in the ecoprint industry, suggesting that investing in green knowledge and skills can significantly support their digital transformation. There is evidence that green corporate digitalization benefits from female entrepreneurs who enhance their skills in sustainability and green innovation. Their productivity and market access can be improved by learning more about green technologies and how to incorporate them into corporate operations. One way to gain an edge over competitors is to adopt a digital strategy that aligns with sustainability principles. Investing in green knowledge and skills will help women entrepreneurs reach more customers and fulfil their desire for environmentally responsible products and services.

The study on Hypotheses 6 and 7 did not find a statistically significant relationship between WGK (Women's Green Knowledge), WGS (Women's Green Skills), and GBD (Green Business Digitalization) through NPC (New Product Creation). In contrast to previous studies, which have shown that SME digitalization drives green technology innovation through effective information exchange and knowledge integration, the findings of this study do not support the idea that women's green expertise can play a significant role in the digital transformation of environmentally conscious companies' operations (Li et al., 2023). Managerial implications Hypotheses 6 and 7, green female entrepreneurs do not have the power to digitalize green companies by creating new products based on their green expertise and capabilities. Incorporating green knowledge into the digitalization process requires a more mature strategy. Rather than relying on product innovation as an intermediary, female ecoprint entrepreneurs can concentrate more on directly improving their digital and sustainability skills. To drive a more effective and sustainable digital transformation, they can consider measures to increase technology adoption in their operations and specific training in digital technologies relevant to green business practices.

3.5. Conclusion

While WGK (Women's Green Knowledge) and WGS (Women's Green Skills) have significant effects on NPC (New Product Creation), GBD (Green Business Digitalization) is not affected by NPC. The effects of WGK and WGS on GBD through NPC have not been proven substantial, while both have positive and significant impacts on GBD directly. The findings suggest that while women's

green skills are crucial for the digital transformation of green businesses, new product creation is not an effective intermediary for this process. Rather than relying on product creation as the main channel, this study directly emphasizes using green knowledge and skills to promote green business digitalization.

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