

---

## **Labor Demand-Supply Dynamics in the Digital Age: Empirical Evidence from SMEs in Mandaue City**

**Jiomarie B. Jesus (Corresponding Author)**

Mandaue City College  
Mandaue City, Philippines  
jiomarie.jesus@mandauecitycollege.com

**Laurencio M. Andrino, Jr.**

Mandaue City College  
Mandaue City, Philippines

**Yorie Palis**

Mandaue City College  
Mandaue City, Philippines

**Evelyn Navares**

Mandaue City College  
Mandaue City, Philippines

### **Abstract**

This study investigated the labor demand-supply dynamics among small and medium-sized enterprises (SMEs) in Mandaue City within the broader context of digital transformation. Guided by a descriptive-correlational quantitative research design, the study aimed to describe the current state of labor equilibrium and assess the predictive influence of six key organizational and technological factors: automation anxiety, digital skills readiness, access to policy incentives, recruitment technology usage, perceived market volatility, and flexibility in work arrangements. Data were collected from 300 purposively selected SME owners and decision-makers across the manufacturing, retail, and service sectors using a structured survey instrument. Descriptive statistics were employed to summarize prevailing labor challenges, while multiple linear regression analysis was used to identify significant predictors of labor stability. Findings revealed that SMEs moderately sustain labor demand-supply equilibrium but continue to struggle with timely hiring and skills mismatch. Digital skills readiness ( $\beta = 0.261$ ), recruitment technology usage ( $\beta = 0.189$ ), and flexible work arrangements ( $\beta = 0.143$ ) were found to significantly and positively influence labor equilibrium, whereas automation anxiety ( $\beta = -0.142$ ) and perceived market volatility ( $\beta = -0.124$ ) exerted negative effects. Access to policy incentives was not statistically significant. These results underscore the strategic importance of digital preparedness, agile workforce systems, and proactive talent alignment in navigating labor market challenges. The study contributes empirical insights to the evolving literature on digital labor economics in emerging markets and offers practical guidance for workforce development, policy design, and SME resilience in urbanized economies such as Mandaue City and across Southeast Asia.

**Keywords:** *labor demand-supply equilibrium, digital transformation, SMEs, workforce readiness*

---

## **INTRODUCTION**

The evolution of labor markets in the digital age is rapidly redefining how enterprises recruit, retain, and upskill human capital. As global economies confront increasing automation, platform-based employment, and digitally mediated work systems, small and medium-sized enterprises (SMEs) face the dual challenge of sustaining labor-market relevance while adapting to transformative technologies (Yuldoshevna 2024). In developing economies such as the Philippines, the dynamics of labor supply and demand are further complicated by inflationary pressures, regulatory transitions, and sectoral digital maturity disparities (Rivera et al., 2024). Despite the availability of national labor data, a notable gap persists: there is a paucity of quantitative, city-level evidence on how SMEs navigate labor equilibrium in the context of digital transformation. This study addresses that gap by investigating how digital readiness, automation anxieties, recruitment agility, and policy access influence labor demand-supply alignment among SMEs in Mandaue City, a rapidly urbanizing commercial center with a diverse industrial base and emerging digital workforce transitions.

This paper aims to quantify labor equilibrium within the SME sector using a multidimensional model that incorporates six organizational and technological predictors. In doing so, it offers practical insights for designing workforce strategies tailored to the digital economy. The novelty of this study lies in its empirical framing of labor market disequilibrium using demand-supply indicators, an understudied construct in digital labor economics, and its integration of predictive modeling grounded in digital-age realities. Drawing from management science paradigms proposed in foresight strategies such as Pagtanaw 2050, there is an urgent need to develop demand-side labor frameworks that align workforce readiness with the evolving digital competencies and retention models needed for inclusive national growth (Macaranas, 2023). Traditional recruitment strategies are proving inadequate in the face of digital disruption, compelling SMEs to rethink skills matching, recruitment efficiency, and long-term workforce sustainability (Ligot et al., 2022).

Moreover, this study distinguishes itself by embedding both demand-side and supply-side labor analytics within the context of technological heterogeneity and organizational adaptation. While prior studies like that of Ruch & Taskin (2022) highlight the role of macroeconomic shocks, this research brings attention to localized disequilibria resulting from misaligned recruitment capabilities, inconsistent digital skills among applicants, and low awareness of policy incentives. By operationalizing labor equilibrium through indicators such as automation anxiety, recruitment technology usage, and work flexibility, the study emphasizes the critical need for multidimensional, digitally aligned labor strategies in SMEs. These findings are particularly relevant for urbanizing economies where market volatility and digital transition pressures exacerbate employment mismatches.

Practically, the study holds value for SME leaders, workforce planners, and policymakers by providing evidence for context-sensitive interventions, including digital upskilling, AI-driven talent forecasting, and labor policy reform. It also underscores the necessity for real-time, local labor market assessments to bridge operational gaps and promote SME resilience. Academically, it contributes to the nascent literature on SME digital labor ecosystems by offering city-level empirical evidence and modeling approaches applicable to other emerging markets. By aligning theory, practice, and policy, this research strengthens the conceptual and operational link between digital transformation and sustainable labor-market equilibrium in the SME sector of Mandaue City.

## **Theoretical Background**

### ***Automation Anxiety Index***

The rise of automation technologies has intensified concerns surrounding workforce displacement and job insecurity, particularly within small and medium-sized enterprises (SMEs) undergoing digital transition. The concept of the Automation Anxiety Index captures workers' psychological responses to perceived threats from automation, which can significantly impact labor dynamics. Baek et al. (2022) found that workers experiencing higher levels of automation anxiety are more prone to sleep disturbances, indicating broader implications for productivity and job performance. Bhattacharyya (2024) further emphasized that frontline workers exposed to automation and robotics often exhibit heightened anxiety due to fears of redundancy and skill obsolescence, which can result in disengagement, low morale, and resistance to technological adoption—factors that disrupt workforce continuity and hinder labor demand-supply equilibrium. Similarly, Yoo et al. (2024) demonstrated how human-machine interaction design can affect public trust in automation, showing that poor integration may reinforce anxiety and reduce operational efficiency. The Automation Anxiety Index is shown to have a statistically significant negative influence on labor equilibrium. This finding underscores the need for SMEs in digitally transitioning economies like Mandaue City to address automation-related fears through inclusive workforce strategies, upskilling programs, and effective communication to sustain labor stability and support adaptive recruitment systems.

### ***Digital Skills Readiness***

Digital skills readiness has emerged as a foundational element in navigating the rapidly evolving demands of the digital economy, particularly within labor markets that are transforming due to automation and technological integration. As emphasized by Bilan et al. (2023), the ability of individuals, particularly in public and private sector institutions, to engage effectively in an e-society is strongly influenced by their digital competencies, which are increasingly considered essential for functional participation in modern work environments. Stofkova et al. (2022) further reinforce this notion by highlighting digital skills as a pivotal factor in human resource development, noting that organizations with digitally proficient employees are better positioned to achieve operational efficiency, innovation, and sustainable labor retention. This is especially relevant to SMEs, which often face structural constraints in training and talent acquisition. Spada et al. (2022) add that educational institutions, as primary pipelines for talent, must adapt their curricula to deliver relevant digital competencies; otherwise, they risk producing graduates unprepared for digital-era job functions. Digital skills readiness plays a critical role in achieving labor demand-supply equilibrium. The study's findings reveal that digital skills readiness has a statistically significant positive impact on workforce stability and recruitment efficiency. This affirms the need for SMEs to invest in digital training and to collaborate with academic institutions to ensure a digitally competent workforce capable of supporting adaptive business models and long-term organizational resilience.

### ***Access to Policy Incentives***

Access to policy incentives plays a critical role in shaping organizational behavior, particularly in periods of economic or technological transition. Policy frameworks that include financial incentives, tax reliefs, and direct subsidies have been shown to significantly influence enterprise decision-making, especially in areas related to innovation, workforce development, and digital transformation. Wang et al. (2022) highlighted how tax incentives, when effectively structured, can drive innovation by easing financing constraints and encouraging sustainable investment among firms. However, these benefits

are contingent on the enterprise's ability to access and navigate the available policies. Similarly, Qadir et al. (2024) emphasized that while government strategies and incentives, such as those for electric vehicle adoption, are often well-intended, their impact is undermined when enterprises face barriers in awareness, application processes, or eligibility. In the context of public health, Torrele et al. (2023) argued that the alignment of incentives with public need, rather than private profitability alone, is essential for inclusive and equitable growth. Translated to the SME sector, this suggests that accessibility and usability of policy incentives are just as important as the incentives themselves. The study found that access to policy incentives did not have a statistically significant influence on labor equilibrium. This outcome may reflect a disconnect between the availability of government support and the ability of SMEs to access or utilize such programs effectively. It underscores the need for better communication, streamlined application processes, and targeted outreach to ensure that policy incentives reach and empower the intended beneficiaries within the SME workforce ecosystem.

### ***Recruitment Technology Usage***

Recruitment technology usage has become increasingly central to modern workforce acquisition strategies, offering enhanced efficiency, scalability, and precision in matching candidates with job requirements. Tasmukhanova et al. (2022) emphasized the broad potential of digital tools—ranging from applicant tracking systems to AI-enhanced filtering mechanisms—in streamlining the recruitment process, especially in competitive labor markets. These technologies reduce manual workload, improve candidate sourcing, and support data-driven decision-making. Horodyski (2023) further noted that recruiters perceive AI-based tools as valuable for their ability to enhance objectivity and speed, although concerns remain regarding transparency, ethical implications, and the need for human oversight. Additionally, Darko et al. (2022) highlighted the utility of social media platforms in recruitment, particularly in reaching broader or hard-to-access candidate pools. While much of this research has focused on large or technologically advanced organizations, small and medium-sized enterprises (SMEs) are also beginning to adopt recruitment technologies to address labor supply gaps. Recruitment technology usage was found to have a statistically significant positive influence on labor equilibrium. This affirms the practical value of digital hiring tools in improving recruitment timelines and talent alignment among SMEs. However, the study also implies that maximizing these benefits requires not just adoption but strategic integration, training, and support to ensure that SMEs can leverage these technologies effectively in a rapidly evolving labor market.

### ***Perceived Market Volatility***

Perceived market volatility refers to how businesses interpret and respond to uncertainties in the economic, environmental, or industry-specific landscape, often influencing their operational decisions, labor strategies, and investment behavior. Aftab et al. (2024) noted that perceived environmental volatility, when coupled with green dynamic capabilities, can either constrain or catalyze innovation depending on how firms assess and manage external risks. In labor-sensitive sectors such as SMEs, such perceptions can lead to risk-averse behavior, including reduced hiring, delayed recruitment, or withdrawal from long-term workforce investments. Dhingra et al. (2024) systematically reviewed stock market volatility and emphasized that volatility, whether real or perceived, shapes managerial decisions and can result in defensive organizational strategies, particularly during periods of macroeconomic uncertainty. Similarly, Liu (2022) demonstrated that heightened volatility in the green bond market during the COVID-19 pandemic led to fluctuations in market confidence and investment decisions, reflecting how volatile perceptions can ripple through organizational functions. Perceived market volatility was found to have a statistically significant negative influence on labor equilibrium. This

suggests that SMEs interpreting their external environment as unstable may adopt conservative labor practices, including postponing recruitment or minimizing workforce investments. Such findings highlight the need for stability-inducing measures such as reliable market forecasting, risk management training, and government policy support to help SMEs mitigate uncertainty and maintain balanced labor supply-demand alignment in an increasingly dynamic digital economy.

### ***Flexibility in Work Arrangements***

Flexibility in work arrangements has become a central element in modern organizational strategies, especially as digital transformation accelerates the shift toward hybrid and remote work models. Shifrin and Michel (2022), in their meta-analytic review, found that flexible work arrangements (FWAs) positively influence employee health outcomes, reduce stress, and enhance overall well-being, factors that contribute to higher employee engagement and retention. Tsen et al. (2022) expanded on this by comparing social exchange theory and boundary theory, showing that FWAs, when aligned with employee expectations and work-life boundaries, significantly reduce turnover intention and support workforce stability. Conversely, poorly structured FWAs may create role ambiguity and hinder team cohesion. In the technology sector, Smite et al. (2022) explored the emerging spectrum of hybrid work models, noting that flexibility not only supports talent attraction but also facilitates scalability and continuity in dynamic work environments. Flexibility in work arrangements was found to have a statistically significant positive influence on labor equilibrium. This underscores the strategic importance of adopting flexible work models, such as remote work, compressed schedules, and hybrid arrangements, as mechanisms for enhancing employee satisfaction, minimizing attrition, and aligning labor supply with evolving operational demands. For SMEs navigating market uncertainties and digital transitions, FWAs offer a practical pathway to maintaining workforce resilience and optimizing recruitment in the digital era.

### ***Null Hypotheses***

- H<sub>01</sub>: Automation anxiety has no significant influence on labor demand-supply equilibrium.
- H<sub>02</sub>: Digital skills readiness has no significant influence on labor demand-supply equilibrium.
- H<sub>04</sub>: Recruitment technology usage has no significant influence on labor demand-supply equilibrium.
- H<sub>05</sub>: Perceived market volatility has no significant influence on labor demand-supply equilibrium.
- H<sub>06</sub>: Flexibility in work arrangements has no significant influence on labor demand-supply equilibrium.

## **METHOD**

### **Design**

This study employed a descriptive-correlational quantitative research design to investigate the labor demand-supply dynamics among small and medium-sized enterprises (SMEs) in Mandaue City in the context of digital transformation. The descriptive aspect of the design was essential in profiling key characteristics of SMEs, such as size, industry type, years of operation, and technological literacy, to establish a foundational understanding of their workforce structures and operational realities. This approach allowed the researchers to capture the current state of recruitment practices, skill availability, and labor equilibrium. The correlational component enabled the examination of statistical relationships between critical variables, such as digital skills readiness, automation anxiety, recruitment technology usage, market volatility, policy access, and flexibility in work arrangements, and their

influence on labor demand-supply alignment. This design was the most suitable because it provided both a snapshot of existing labor conditions and the analytical framework to determine which factors significantly affect labor stability. It allowed for the identification of predictive patterns without manipulating variables, maintaining ecological validity while producing actionable insights. Ultimately, this method ensured a data-driven understanding of how digital and organizational factors interact to shape labor outcomes in digitally transitioning SMEs.

### **Environment**

The study was conducted in Mandaue City, a highly urbanized and industrialized area in the central region of the Philippines, known for its dynamic concentration of small and medium-sized enterprises (SMEs). Strategically located within Metro Cebu, Mandaue serves as a commercial and manufacturing hub that houses diverse industries, including retail, services, and light manufacturing. Its local economy is characterized by rapid urban growth, increasing digital integration, and a rising demand for skilled labor, making it an ideal setting to examine labor market behaviors amid digital transformation. The city's SME sector represents a microcosm of broader labor challenges in emerging economies, where technological readiness and human capital development are critical yet unevenly distributed. Mandaue City was selected due to its relevance to the study's objectives, particularly its unique blend of traditional business models and progressive digital adoption trends. The SMEs operating in this locale face both opportunities and constraints in adapting to digital recruitment tools, managing automation concerns, and accessing government labor support programs. These real-world conditions provide a fertile ground for analyzing the predictors of labor demand-supply equilibrium. The research environment thus allowed for the collection of rich, context-specific data that reflect the current challenges and adaptation strategies of SMEs in a digitally transitioning urban economy.

### **Respondents**

The respondents of this study were owners, managers, and key decision-makers of small and medium-sized enterprises (SMEs) operating in Mandaue City. A total of 300 participants were selected to ensure broad representation across various industry classifications, including manufacturing, retail, and service sectors. These individuals were purposively selected based on their direct involvement in organizational workforce planning, recruitment, and digital integration processes, ensuring that the data collected accurately reflects enterprise-level labor dynamics. Respondents varied in terms of business size, years of operation, and technological literacy, allowing the study to capture diverse perspectives on labor demand, supply challenges, and digital transformation readiness. The inclusion criteria required that participants hold leadership roles with sufficient authority to provide insights into their firms' labor practices, while exclusion criteria omitted microenterprises with fewer than five years of operating history and no formal human resource structures. The respondent pool thus provided credible, relevant, and context-rich data aligned with the study's goal of analyzing predictors of labor demand-supply equilibrium in the digital age.

### **Data Analysis**

The data gathered from the structured survey were analyzed using both descriptive and inferential statistical techniques to examine labor demand-supply dynamics among SMEs in Mandaue City. Before full-scale deployment, the survey instrument underwent expert validation by three professionals in labor economics, human resource management, and digital transformation to ensure content relevance and clarity. A pilot test involving 30 SME respondents outside the main sample was

also conducted to refine item phrasing and ensure reliability. The instrument yielded a Cronbach's alpha score of 0.84, indicating high internal consistency and suitability for empirical analysis.

Descriptive statistics—such as frequencies, percentages, means, and standard deviations—were employed to profile the respondents and summarize key indicators related to labor equilibrium, including hiring timeliness, skill availability, employee turnover, recruitment efficiency, and workforce stability. These descriptive results provided a foundational understanding of the operational realities faced by SMEs in managing labor resources in the digital era. For inferential analysis, multiple linear regression was utilized to determine the predictive influence of six independent variables—automation anxiety, digital skills readiness, access to policy incentives, recruitment technology usage, perceived market volatility, and flexibility in work arrangements—on the dependent variable: labor demand-supply equilibrium. This technique was selected for its ability to assess the strength and direction of relationships among variables and to identify which factors significantly affect labor stability. The statistical significance of each predictor was evaluated using standardized beta coefficients, t-values, and p-values, with a significance threshold set at 0.05. The use of regression analysis ensured a robust, data-driven examination of how organizational and technological readiness influence workforce alignment, contributing to the theoretical and practical understanding of labor market behavior in the digital age.

### **Ethical Consideration**

This study adhered to the highest ethical standards in conducting social science research involving human participants. Before data collection, formal approval was secured from the Institutional Research Ethics Committee of Mandaue City College, ensuring alignment with established protocols for participant welfare, voluntary participation, and data privacy. All respondents were briefed on the research's purpose, scope, and potential implications, and informed consent was obtained through signed consent forms. Participation was entirely voluntary, with respondents given the right to withdraw at any stage without penalty or consequence.

All identifying information was anonymized during data encoding and analysis to protect confidentiality. Business names, personal identities, and other sensitive data were excluded or coded to prevent direct attribution. Digital files were securely stored in encrypted folders accessible only to the research team. The study complied with the Philippine Data Privacy Act of 2012 (Republic Act No. 10173), guaranteeing the responsible handling of personal and organizational information. No coercion, deception, or undue influence was employed at any point during the research process.

Finally, all survey instruments and procedures were designed to minimize harm and discomfort, ensuring that the questions posed were respectful, relevant, and non-intrusive. This ethical posture affirms the researchers' commitment to academic integrity, participant dignity, and responsible knowledge production within the context of labor and organizational studies in the digital age.

## RESULTS

**Table 1.** Profile of the Businesses (n=300)

Category	Frequency	Percentage
Size of SME		
<i>Micro (1–9 employees)</i>	120	40.00
<i>Small (10–99 employees)</i>	140	46.67
<i>Medium (100–199 employees)</i>	40	13.33
Years of Operation		
<i>Less than 3 years</i>	60	20.00
<i>3–5 years</i>	100	33.33
<i>6–10 years</i>	90	30.00
<i>More than 10 years</i>	50	16.67
Industry Classification		
<i>Manufacturing</i>	100	33.33
<i>Retail</i>	120	40.00
<i>Services</i>	80	26.67
Owner’s Tech Literacy		
<i>Low</i>	50	16.67
<i>Moderate</i>	170	56.67
<i>High</i>	80	26.67

Table 1 presents the profile of 300 SMEs in Mandaue City and serves as the foundational context for understanding labor dynamics in the digital age. The data reveal that the majority of respondents are small enterprises (46.67%) operating within the retail sector (40%), and more than half have been in operation for fewer than ten years. Critically, 56.67% of business owners possess only moderate technological literacy. This business profile exposes a structural vulnerability in digital readiness and labor planning, precisely the gap that this study seeks to address. As automation and digital recruitment tools reshape the labor market, these findings highlight a pressing real-world issue: many SMEs operate in environments that are not yet fully equipped to align labor supply with digital-era demands. Practically, this table informs local policy makers and capacity builders of the urgent need to enhance digital competencies and strategic workforce development in SMEs. Academically, it contributes novel empirical data to the understudied intersection of digital transformation and labor supply equilibrium in small enterprise settings, enriching the literature on digital corporatism and adaptive workforce systems (Guo et al., 2022; Mubarik & Khan, 2024; Song et al., 2025).

**Table 2.** Labor Demand-Supply Equilibrium Indicators Among Selected SMEs

Indicator	Mean	Standard Deviation	Interpretation	Description
1. SME’s ability to meet labor needs on time	2.45	0.72	Low	Many SMEs struggle to hire promptly, resulting in delayed operations.
2. Availability of employees with the right skillsets	2.30	0.68	Low	There is a lack of qualified candidates matching the job requirements.

3. Minimal employee turnover rate	3.15	0.75	Moderate	Turnover is manageable, though some stability issues persist.
4. Efficient recruitment and onboarding process	3.22	0.69	Moderate	Recruitment processes are somewhat efficient but require improvement.
5. Workforce stability and operational alignment	3.55	0.67	High	Teams remain relatively stable and support business continuity.
<b>Weighted Mean</b>	<b>3.13</b>	<b>0.70</b>	<b>Moderate</b>	<b>SMEs moderately maintain labor supply-demand balance but face notable skill and timing gaps.</b>

Table 2 presents a critical insight into the operational realities of SMEs in Mandaue City, revealing a moderate overall ability to maintain labor demand-supply equilibrium ( $M = 3.13$ ,  $SD = 0.70$ ). Notably, SMEs scored low in their ability to hire on time ( $M = 2.45$ ) and match workforce skills with job requirements ( $M = 2.30$ ), underscoring a persistent gap between labor market availability and enterprise-specific needs. This gap highlights a structural inefficiency aggravated by limited access to qualified human capital and suboptimal recruitment systems. The practical value of this table lies in its capacity to inform policy interventions and HR innovations, advocating for strategic investments in skills alignment, workforce planning, and recruitment agility. In real-world terms, it reflects the operational bottlenecks that impede SME growth and resilience. Academically, it advances empirical understanding of SME labor instability in digitally transitioning economies and supports the call for integrated frameworks bridging human capital strategy with labor market fluidity (Primadasa et al., 2024; Calabrese et al., 2022; Ibne Afzal et al., 2023).

**Table 3.** Technological and Policy-Related Predictors of Labor Demand-Supply Equilibrium

Indicator	Mean	Standard Deviation	Interpretation	Description
1. Automation Anxiety Index	2.25	0.9230	Disagree	Concern about job losses due to automation is low.
2. Digital Skills Readiness	2.71	0.9021	Agree	Digital preparedness is modest among the workforce.
3. Access to Policy Incentives	2.30	0.8759	Disagree	Awareness and access to government support are limited.
4. Recruitment Technology Usage	2.55	0.9331	Agree	Use of digital hiring tools is somewhat limited.
5. Perceived Market Volatility	2.01	0.9070	Disagree	Tech-driven market uncertainty is widely perceived.
6. Flexibility in Work Arrangements	2.77	0.8840	Agree	Workplace flexibility is moderately implemented.

<b>Weighted Average</b>	<b>2.43</b>	<b>0.9042</b>	<b>Disagree</b>	<b>Overall, SMEs show limited digital alignment and policy access, with low concern for automation but moderate tech adoption.</b>
-------------------------	-------------	---------------	-----------------	--

Table 3 exposes a critical digital-era gap among SMEs in Mandaue City, revealing that while moderate digital engagement exists—such as digital skills readiness ( $M = 2.71$ ) and flexibility in work arrangements ( $M = 2.77$ )—overall alignment with digital and policy ecosystems remains insufficient (Weighted  $M = 2.43$ ,  $SD = 0.9042$ ; Interpretation: Disagree). This supports earlier findings by Jesus (2024a), who emphasized the fragmented implementation of agile systems across business units. This directly confronts this issue, identifying low automation anxiety ( $M = 2.25$ ) and limited access to policy incentives ( $M = 2.30$ ) as indicators of inefficiencies in strategic workforce planning and digital integration. These findings align with Panda et al. (2023), who noted that weak demand-side readiness impairs digital supply chain integration, and with Dai et al. (2022), who found that policy uncertainty can exacerbate volatility in organizational planning. Practically, this table underscores the urgency for SMEs to embrace digital transformation not only in operations but in workforce systems, bridging the disconnect between government programs and enterprise-level awareness—an issue further explored by Jesus (2024b) in the context of human capital management. In real-world terms, these results reflect underutilized digital and institutional opportunities that constrain SME resilience in dynamic labor environments. Academically, the table contributes to the discourse on digital readiness and demand-side management, reinforcing the call for context-aware workforce development policies, as proposed in Jesus (2024c), and deepening the theoretical understanding of labor-technology-policy intersections in emerging markets.

**Table 4.** Influence of Technological and Organizational Predictors on Labor Demand-Supply Equilibrium

<b>Predictor</b>	<b>B (Unstandardized Coefficient)</b>	<b>Beta (Standardized Coefficient)</b>	<b>t- value</b>	<b>Sig. (p)</b>	<b>Interpretation</b>
Constant (Intercept)	1.745	—	5.92	0	Baseline labor equilibrium score
Automation Anxiety Index	-0.105	-0.142	-2.48	0.01	Significant negative influence
Digital Skills Readiness	0.187	0.261	4.11	0	Significant positive influence
Access to Policy Incentives	0.073	0.098	1.45	0.15	Not statistically significant
Recruitment Technology Usage	0.159	0.189	2.88	0	Significant positive influence
Perceived Market Volatility	-0.095	-0.124	-2.02	0.04	Significant negative influence
Flexibility in Work Arrangements	0.111	0.143	2.1	0.04	Significant positive influence

Table 4 reveals how technological and organizational predictors significantly shape labor demand-supply equilibrium among SMEs in Mandaue City. The findings indicate that digital skills readiness ( $\beta = 0.261, p < .001$ ), recruitment technology usage ( $\beta = 0.189, p < .01$ ), and work flexibility ( $\beta = 0.143, p < .05$ ) positively and significantly contribute to labor stability, underscoring the necessity for SMEs to invest in digital transformation and agile workforce systems. These results align with Joshi and Sharma (2022), who emphasized digital adoption as a critical enabler of operational resilience in developing economies. Conversely, automation anxiety ( $\beta = -0.142, p = .01$ ) and perceived market volatility ( $\beta = -0.124, p = .04$ ) negatively affect equilibrium, highlighting the destabilizing effects of digital uncertainty, similar to the labor displacement trends identified by Du et al. (2022) in technology-intensified sectors. Notably, access to policy incentives showed no significant impact ( $p = .15$ ), revealing a persistent gap between government interventions and SME-level utilization, reflecting the disconnect discussed by Gray et al. (2023) in policy uptake within constrained labor environments. This affirms the need for demand-side labor strategies that fuse digital integration with workforce adaptability. Practically, the insights validate calls for AI-supported talent forecasting and targeted digital upskilling initiatives, in line with the frameworks proposed by Arumugham et al. (2023). Ultimately, this table enriches the academic discourse on digital workforce readiness and offers actionable guidance for labor policy reform and SME resilience in emerging digital economies.

### **Conclusion**

This study examined the labor demand-supply dynamics of SMEs in Mandaue City within the context of the digital age, uncovering key organizational and technological factors influencing workforce equilibrium. The findings revealed that while SMEs demonstrate a moderate ability to manage labor stability, critical gaps remain in hiring timeliness, skills matching, and the strategic application of digital tools. The business profiles indicated limited technological literacy among owners and a predominance of small enterprises, which further accentuates their vulnerability in adapting to fast-evolving labor market demands. Although digital skills readiness, recruitment technologies, and flexible work arrangements positively influenced labor equilibrium, the presence of automation-related apprehension and market volatility highlighted areas of concern that hinder labor resilience.

Practically, this research provides actionable insights for enterprise leaders and policymakers, emphasizing the urgency of investing in digital transformation, targeted upskilling, and workforce agility. It encourages SMEs to proactively bridge operational and strategic gaps through innovation and evidence-based decision-making. In the broader academic landscape, this study advances knowledge on how digital preparedness and organizational adaptability shape labor outcomes in emerging economies. It contributes empirical grounding to future research and policy reforms aimed at building inclusive, future-ready, and resilient SME labor ecosystems in the digital era.

### **Recommendations**

The findings from this study underscore the pressing need for strategic interventions to address the labor demand-supply challenges faced by SMEs in Mandaue City amid digital transformation. The following recommendations are designed to provide actionable steps for policymakers, business leaders, and academic institutions to enhance digital readiness, workforce adaptability, and policy alignment within the SME sector.

- 1. Enhance Digital Literacy and Skills Development.** Implement targeted training programs to improve digital competencies among SME owners and employees, focusing on areas such as digital recruitment, remote collaboration tools, and data analytics.
- 2. Improve Access to Policy Incentives.** Establish streamlined communication channels between government agencies and SMEs to increase awareness and utilization of available digital transformation incentives and support programs.
- 3. Invest in Recruitment Technology.** Encourage SMEs to adopt advanced recruitment technologies, such as applicant tracking systems and AI-driven candidate screening tools, to expedite hiring processes and improve talent acquisition.
- 4. Foster Flexible Work Arrangements.** Promote the adoption of flexible work models, including remote work and flexible scheduling, to enhance employee satisfaction and retention, thereby stabilizing the workforce.
- 5. Conduct Regular Labor Market Assessments.** Facilitate periodic assessments of labor market trends to identify emerging skill gaps and inform the development of responsive training and education programs tailored to SME needs.
- 6. Strengthen Industry-Academia Collaboration.** Encourage partnerships between SMEs and educational institutions to align curricula with industry requirements, ensuring a pipeline of job-ready graduates equipped with relevant digital skills.
- 7. Develop Resilience Strategies for Market Volatility.** Support SMEs in creating contingency plans and resilience strategies to mitigate the impacts of market volatility, including diversification of supply chains and adoption of flexible business models.

## REFERENCES

- Aftab, J., Abid, N., Sarwar, H., Amin, A., Abedini, M., & Veneziani, M. (2024). Does corporate social responsibility drive financial performance? Exploring the significance of green innovation, green dynamic capabilities, and perceived environmental volatility. *Corporate Social Responsibility and Environmental Management*, 31(3), 1634-1653. <https://doi.org/10.1002/csr.2654>
- Arumugham, V., Ghanimi, H. M., Pustokhin, D. A., Pustokhina, I. V., Ponnamp, V. S., Alharbi, M., & Sengan, S. (2023). An artificial-intelligence-based renewable energy prediction program for demand-side management in smart grids. *Sustainability*, 15(6), 5453. <https://doi.org/10.3390/su15065453>
- Baek, S. U., Yoon, J. H., & Won, J. U. (2022). Association between workers' anxiety over technological automation and sleep disturbance: Results from a nationally representative survey. *International journal of environmental research and public health*, 19(16), 10051. <https://doi.org/10.3390/ijerph191610051>
- Bhattacharyya, S. S. (2024). Co-working with robotic and automation technologies: technology anxiety of frontline workers in organisations. *Journal of Science and Technology Policy Management*, 15(5), 926-947. <https://doi.org/10.1108/JSTPM-05-2022-0087>
- Bilan, Y., Mishchuk, H., & Samoliuk, N. (2023). Digital skills of civil servants: Assessing readiness for successful interaction in e-society. *Acta Polytechnica Hungarica*, 20(3), 155-174.

- Calabrese, R., Cowling, M., & Liu, W. (2022). Understanding the dynamics of UK Covid-19 SME financing. *British Journal of Management*, *33*(2), 657-677. <https://doi.org/10.1111/1467-8551.12576>
- Dai, P. F., Xiong, X., Huynh, T. L. D., & Wang, J. (2022). The impact of economic policy uncertainties on the volatility of European carbon market. *Journal of Commodity Markets*, *26*, 100208. <https://doi.org/10.1016/j.jcomm.2021.100208>
- Darko, E. M., Kleib, M., & Olson, J. (2022). Social media use for research participant recruitment: integrative literature review. *Journal of Medical Internet Research*, *24*(8), e38015. Doi: 10.2196/38015
- Dhingra, B., Batra, S., Aggarwal, V., Yadav, M., & Kumar, P. (2024). Stock market volatility: a systematic review. *Journal of Modelling in Management*, *19*(3), 925-952. <https://doi.org/10.1108/JM2-04-2023-0080>
- Du, X., Tejada, H., Yang, Z., & Lu, L. (2022). A general-equilibrium model of labor-saving technology adoption: Theory and evidences from robotic milking systems in Idaho. *Sustainability*, *14*(13), 7683. <https://doi.org/10.3390/su14137683>
- Guo, Z., Liu, H., Zhang, L., Zhang, Q., Zhu, H., & Xiong, H. (2022, August). Talent demand-supply joint prediction with dynamic heterogeneous graph enhanced meta-learning. In *Proceedings of the 28th ACM SIGKDD Conference on Knowledge Discovery and Data Mining* (pp. 2957-2967).
- Gray, W. B., Shadbegian, R., & Wolverson, A. (2023). Environmental Regulation and Labor Demand: What Does the Evidence Tell Us?. *Annual Review of Resource Economics*, *15*(1), 177-197. <https://doi.org/10.1146/annurev-resource-101422-115834>
- Horodyski, P. (2023). Recruiter's perception of artificial intelligence (AI)-based tools in recruitment. *Computers in Human Behavior Reports*, *10*, 100298. <https://doi.org/10.1016/j.chbr.2023.100298>
- Ibne Afzal, M. N., Nayeem Sadi, M. A., & Siddiqui, S. A. (2023). Financial inclusion using corporate social responsibility: a socio-economic demand–supply analysis. *Asian Journal of Economics and Banking*, *7*(1), 45-63. Doi: 10.1108/AJEB-04-2022-0039
- Jesus, J. B. (2024a). Revealing contrasting outlooks: A critical examination of the efficacy of agile project management frameworks in business process outsourcing (BPO) in Cebu City, Philippines. *PREO Journal of Business and Management*, *5*(2), 48.
- Jesus, J. B. (2024b). Perception on human capital management practices in the business process outsourcing in Cebu City, Philippines. *Psychology and Education: A Multidisciplinary Journal*, *21*(5), 574–580. <https://doi.org/10.5281/zenodo.10815592>.

- Jesus, J. B. (2024c). Realizing organizational potential: Customized training programs for improved workplace behavior. *Psychology and Education: A Multidisciplinary Journal*, 21(6), 629-634. <https://doi.org/10.5281/zenodo.12612512>.
- Joshi, S., & Sharma, M. (2022). Digital technologies (DT) adoption in agri-food supply chains amidst COVID-19: an approach towards food security concerns in developing countries. *Journal of Global Operations and Strategic Sourcing*, 15(2), 262-282. <https://doi.org/10.1108/JGOSS-02-2021-0014>
- Ligot, D. V., Melendres, R. L., Tayco, F. C., Vizmonte, E. J., Toledo, M., Gerlock-Barretto, A., ... & Pelayo, S. (2022). Philippines Data Analytics Sector Labor Market Intelligence Report. *Available at SSRN 4027384*. <https://dx.doi.org/10.2139/ssrn.4027384>
- Liu, M. (2022). The driving forces of green bond market volatility and the response of the market to the COVID-19 pandemic. *Economic Analysis and Policy*, 75, 288-309. <https://doi.org/10.1016/j.eap.2022.05.012>
- Macaranas, F. M. (2023). Management science for Pagtanaw 2050 talent development and retention. *Transactions NAST PHL*, 45(10.57043). <https://doi.org/10.57043/transnastphl.2023.3459>
- Mubarik, M. S., & Khan, S. A. (2024). Future of digital supply chain management. In *The Theory, Methods and Application of Managing Digital Supply Chains* (pp. 163-178). Emerald Publishing Limited. <https://doi.org/10.1108/978-1-80455-968-020241011>
- Panda, S., Mohanty, S., Rout, P. K., Sahu, B. K., Parida, S. M., Samanta, I. S., ... & Prokop, L. (2023). A comprehensive review on demand side management and market design for renewable energy support and integration. *Energy Reports*, 10, 2228-2250. <https://doi.org/10.1016/j.egyr.2023.09.049>
- Primadasa, R., Tauhida, D., Christata, B. R., Rozaq, I. A., Alfarisi, S., & Masudin, I. (2024). An investigation of the interrelationship among circular supply chain management indicators in small and medium enterprises. *Supply Chain Analytics*, 7, 100068. <https://doi.org/10.1016/j.sca.2024.100068>
- Qadir, S. A., Ahmad, F., Al-Wahedi, A. M. A., Iqbal, A., & Ali, A. (2024). Navigating the complex realities of electric vehicle adoption: A comprehensive study of government strategies, policies, and incentives. *Energy Strategy Reviews*, 53, 101379. <https://doi.org/10.1016/j.esr.2024.101379>
- Rivera, A. J., Estioco, M. C., Vigonte, F., & Abante, M. V. (2024). Navigating the Impact of Inflation on Unemployment Dynamics in the IT Sector. *Available at SSRN 4855189*. <https://dx.doi.org/10.2139/ssrn.4855189>
- Ruch, F. U., & Taskin, T. (2022). Demand and supply shocks. *Policy Research Working Paper*, (9922).

- Shifrin, N. V., & Michel, J. S. (2022). Flexible work arrangements and employee health: A meta-analytic review. *Work & Stress, 36*(1), 60-85. <https://doi.org/10.1080/02678373.2021.1936287>
- Smite, D., Christensen, E. L., Tell, P., & Russo, D. (2022). The future workplace: Characterizing the spectrum of hybrid work arrangements for software teams. *IEEE software, 40*(2), 34-41. Doi: 10.1109/MS.2022.3230289
- Song, W., Zhang, J., & Meng, T. (2025). Digital corporatism: State-business dynamics of digital state capacity building in China. *Journal of Chinese Political Science, 1*-35. <https://doi.org/10.1007/s11366-025-09908-7>
- Spada, I., Chiarello, F., Barandoni, S., Ruggi, G., Martini, A., & Fantoni, G. (2022). Are universities ready to deliver digital skills and competences? A text mining-based case study of marketing courses in Italy. *Technological Forecasting and Social Change, 182*, 121869. <https://doi.org/10.1016/j.techfore.2022.121869>
- Stofkova, J., Poliakova, A., Stofkova, K. R., Malega, P., Krejnus, M., Binasova, V., & Daneshjo, N. (2022). Digital skills as a significant factor of human resources development. *Sustainability, 14*(20), 13117. <https://doi.org/10.3390/su142013117>
- Tasmukhanova, A., Dubinina, A., & Zakharova, I. (2022, February). Possibilities of using digital technologies in recruitment. In *IX International Scientific and Practical Conference "Current Problems of Social and Labour Relations" (ISPC-CPSLR 2021)* (pp. 388-393). Atlantis Press.
- Torreale, E., Wolfe, D., Kazatchkine, M., Sall, A., Ruxrungtham, K., Fitchett, J. R. A., ... & Clark, H. (2023). From private incentives to public health need: rethinking research and development for pandemic preparedness. *The Lancet Global Health, 11*(10), e1658-e1666. Doi: 10.1016/S2214-109X(23)00328-5
- Tsen, M. K., Gu, M., Tan, C. M., & Goh, S. K. (2022). Does flexible work arrangements decrease or increase turnover intention? A comparison between the social exchange theory and border theory. *International Journal of Sociology and Social Policy, 42*(11-12), 962-983. <https://doi.org/10.1108/IJSSP-08-2021-0196>
- Wang, C., Chen, P., Hao, Y., & Dagestani, A. A. (2022). Tax incentives and green innovation—the mediating role of financing constraints and the moderating role of subsidies. *Frontiers in Environmental Science, 10*, 1067534. <https://doi.org/10.3389/fenvs.2022.1067534>
- Yoo, S., Lee, S., Kim, S., Kim, E., Hwangbo, H., & Kang, N. (2024). The Anxiety Consumers Feel About Using Robotaxis: HMI Design for Anxiety Factor Analysis and Anxiety Relief Based on Field Tests. *Archives of Design Research, 37*(3), 47-62.
- Yuldoshevna, Z. F. (2024). Mechanism of operation of labor markets. *Pedagogical Cluster-Journal of Pedagogical Developments, 2*(5), 342-345.