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# Design and Development of a Web-Based Operational Information System for Culinary MSMEs Using Agile Scrum

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**ABSTRACT**

In the era of digital transformation, Micro, Small, and Medium Enterprises (MSMEs) are increasingly encouraged to adopt operational digitalization to strengthen internal processes. This study aims to design and preliminarily evaluate an Agile Scrum-based operational information system intended to support internal efficiency in culinary MSMEs, particularly in transaction recording, processing speed, and inventory traceability. Prior to development, manual workflows showed slow transaction entry, inconsistent handwritten stock notes, and limited visibility for daily reconciliation—conditions used as qualitative baseline indicators for assessing potential efficiency improvements. The system was developed through three Agile Scrum sprints, with requirements gathered via observation and semi-structured interviews, modeled using Unified Modeling Language (UML), and evaluated through black-box functional testing and User Acceptance Testing (UAT). Black-box testing verified that core functions executed as intended, while early UAT feedback from five internal users produced an average satisfaction score of 86% on a Likert scale, indicating positive perceptions of usability, responsiveness, and reporting clarity. These findings represent preliminary perceptual evidence rather than demonstrated operational improvement, as no quantitative measurements—such as before–after transaction time, error rates, or reconciliation accuracy—were collected. Accordingly, the study does not claim proven efficiency gains but proposes an initial design that can be refined and empirically validated through future performance-based evaluations. The study contributes by positioning internal record-keeping digitalization as a practical entry point for MSME operational strengthening and by illustrating Scrum's contextual applicability in resource-constrained business environments.

## INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) remain the backbone of Indonesia's economy by contributing significantly to national GDP and absorbing the largest share of the workforce (Ministry of Finance RI, 2024). In Pekalongan Regency, the culinary MSME sector is one of the most active local industries; however, despite strong market demand driven by lifestyle shifts, accessibility, and cultural value (Dedi Harianto & Ahmad Ahmad, 2024), many businesses still struggle with daily operational inefficiencies, especially in transaction handling and stock

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control. These inefficiencies create delays, reduce service reliability, and constrain competitiveness in an increasingly pressured business environment (Rajagukguk & Rusadi, 2025). Therefore, the core research problem in this study is the absence of a structured digital system capable of improving operational accuracy and workflow efficiency. Digital transformation is no longer optional but a strategic imperative to address these internal weaknesses and support MSME sustainability (Agustian et al., 2023).

Despite that urgency, empirical findings show that culinary MSMEs commonly operate with informal, fragmented workflows—especially in procurement, stock handling, and daily transaction recording—leading to repetitive human errors, information delays, and poor inventory traceability (Maulana, 2024; Qisthina et al., 2025). However, limited research has examined how operational inefficiencies can be systematically addressed through structured software development methods in the MSME context. These inefficiencies not only reduce productivity but also create operational opacity, preventing owners from making accurate, data-driven decisions (Galib et al., 2024). The situation is worsened by constraints in financial capacity, digital literacy, and organizational maturity, establishing a persistent digital readiness gap between MSMEs and larger enterprises (I. R. Jallouli et al., 2023; Rupeika-apoga & Petrovska, 2022).

Existing literature on MSME digitalization remains largely concentrated on customer-facing technologies such as e-commerce, online marketing, and digital branding, indicating that most digital initiatives emphasize market visibility rather than internal process improvement (Ferdiansyah et al., 2019; Sofyan Alwi Fadillah et al., 2024). In contrast, recent studies highlight that operational capabilities—particularly inventory logistics, transaction control, and reporting accuracy—are critical foundations for business resilience, yet these aspects have received substantially less academic attention (Darmanto et al., 2024; Hadian et al., 2023). This imbalance results in MSMEs that appear digitally advanced externally but remain structurally vulnerable internally due to the absence of integrated operational controls—a condition conceptualized as cosmetic digitalization, where technology improves front-end appearance without resolving efficiency, transparency, or process integration at the back end (Hendrawan et al., 2024). This phenomenon reflects a persistent operational research gap: digital adoption is progressing at the front stage, while workflow modernization, stock traceability, and transaction governance at the backstage remains stagnant. Therefore, further empirical inquiry is needed to demonstrate that MSME digitalization should not be evaluated merely through market expansion, but through operational indicators such as reduced human error, improved traceability, and stronger data-driven decision-making, particularly within the culinary MSME context.

Addressing this duality requires a development approach that is not only technically robust but also socially adaptive to the resource constraints of MSMEs. The Waterfall model, although providing structured documentation, operates through linear phases that offer limited flexibility in accommodating evolving user requirements, making it less suitable for dynamic small-scale projects (Pressman & Maxim, 2020). Likewise, Lean and Kanban emphasize waste reduction and workflow optimization, yet they do not offer formal mechanisms for iterative requirement validation through planned feedback cycles—an essential feature when specifications must rapidly adjust in MSME environments (Atmojo et al., 2024). In contrast, Agile Scrum facilitates short iterations, incremental value delivery, and continuous stakeholder involvement through structured sprints, which aligns more closely with small organizations that require flexibility, active user co-creation, and early risk mitigation (Judijanto et al., 2025; Schwaber & Sutherland, 2020). Despite these conceptual advantages, empirical validation of Scrum in culinary MSME operational systems—particularly those dealing with stock control and transaction traceability—remains limited, indicating the need for further investigation.

Agile methodologies are shown to support adaptable development in resource-constrained environments, allowing rapid feedback integration—an important requirement for culinary MSMEs that frequently adjust stock, pricing, and daily transactions (Judijanto et al., 2025). When combined with lean-oriented practices, iterative refinement can help reduce operational waste and reporting delays, which are common inefficiencies in small business workflows (Atmojo et al., 2024). Empirical cases in Indonesian MSMEs also suggest that Scrum ceremonies encourage close

collaboration between owners and developers, enabling shorter development cycles and continuous alignment with operational needs (Asri Yana Vita et al., 2023). Moreover, operational digitalization has been linked to better reporting accuracy and decision visibility, although the magnitude of its impact varies across contexts (Schaffernicht et al., 2023). Collectively, these findings indicate that Scrum's adaptability, short feedback loops, and collaborative validation are directly relevant to addressing stock traceability and transactional control problems in culinary MSMEs.

Therefore, this study aims to fill this research gap by designing and evaluating a Scrum-based operational information system that directly strengthens transaction traceability and stock accuracy while enabling continuous process adaptation. Thus, the contribution of this research is twofold: (1) offering empirical evidence that Agile Scrum can solve operational inefficiencies in culinary MSMEs, not only improve their market presence, and (2) positioning operational digitalization as a key determinant of MSME resilience in Indonesia's ongoing digital economy. This study not only enriches the theoretical discourse on MSME digital transformation but also provides actionable insights for practitioners and policymakers aiming to strengthen digital governance at the grassroots economic level.

## RESEARCH METHODS

This study used an Agile software engineering approach with the Scrum framework because of its iterative and collaborative nature, which is suitable for MSME system development requiring flexibility and ongoing feedback (Pressman & Maxim, 2020; Schwaber & Sutherland, 2020). As illustrated in Figure 1, Scrum guided the workflow through Product Backlog preparation, Sprint Planning, Sprint execution, Daily Scrum, Sprint Review, and Sprint Retrospective.

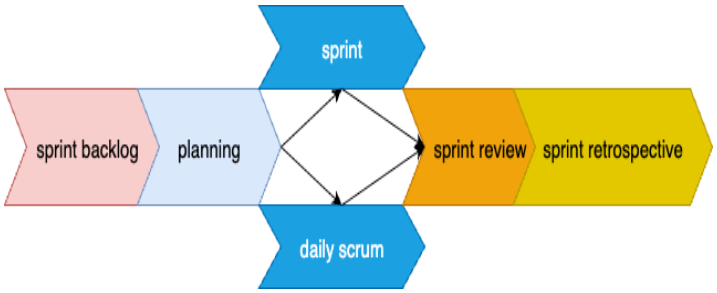


Figure 1. Scrum Framework Phases

System requirements were collected through short field observations over three operational days to examine how transactions were recorded, how stock was monitored, and where delays or errors commonly occurred. These observations were supported by semi-structured interviews with the owner, cashier, and kitchen staff to identify problems related to processing speed, accuracy, and data visibility (Mosser et al., 2022). All findings were compiled into a Product Backlog and later visualized using Unified Modeling Language (UML) diagrams to ensure that the expected system processes could be communicated clearly (Ambayu & Hartomo, 2022). Development was carried out in three Sprints of approximately two weeks, following the standard Scrum Guide (Schwaber & Sutherland, 2020). Each Sprint produced an increment that was reviewed directly by MSME representatives, while reflections from Sprint Retrospectives were used to improve the next iteration (Mosser et al., 2022). Functional evaluation was performed through black-box testing to check whether transaction input, stock updates, and reporting functions produced the expected output without system failure (Pressman & Maxim, 2020). Perceived usability was examined through User Acceptance Testing (UAT) using a five-point Likert questionnaire completed by five internal users—including the owner and operational staff—to provide an initial indication of system acceptance.

## RESULTS AND DISCUSSION

### Result

The requirement identification process resulted in four essential system features that were determined to be the highest operational priorities for culinary MSMEs, namely transaction recording, stock reporting, product management, and account management. These requirements were documented in the Product Backlog as presented in Table 1, with transaction recording and stock reporting ranked as the most critical functionalities due to their direct influence on service continuity and inventory control. This finding aligns with previous studies highlighting that operational digitalization significantly improves reliability and daily business performance in MSMEs (Jing & Fan, 2024).

**Tabel 1.** User Story dan Product Backlog

| No. | User Story (As a …, I want …, so that …) | Feature / Backlog Item | Priority |
|---|---|---|---|
| 1 | As a cashier, I want to record transactions quickly so that the service becomes more efficient. | Transaction Recording | High |
| 2 | As an owner, I want to view accurate stock reports so that I can monitor inventory levels effectively. | Stock Reporting | High |
| 3 | As a staff member, I want to add and update product data so that inventory information remains accurate. | Product Management | Medium |
| 4 | As an owner, I want to manage user accounts so that system access is well controlled. | User Account Management | Medium |

System design was documented using Unified Modeling Language (UML) to ensure alignment between user needs and development outcomes. The interactions between actors and the system are visualized in Figure 2, while data structures are illustrated in Figure 3. The clear modeling of access boundaries and entity relationships supports communication among stakeholders and reduces potential design inconsistencies during implementation (Mosser et al., 2022).

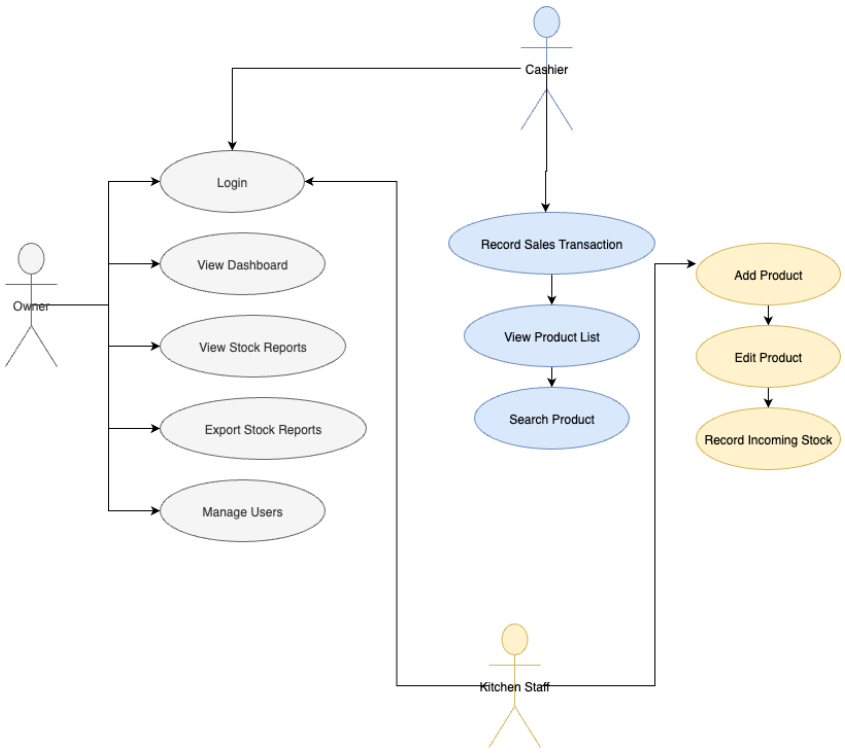


**Figure 2.** Use Case Diagram of the Operational Information System

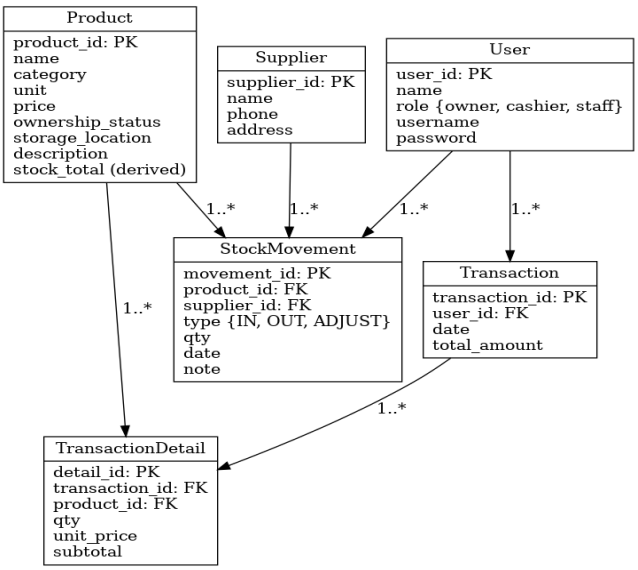


**Figure 3.** Class Diagram of the Operational Information System

The system was developed iteratively using the Scrum workflow shown in Figure 1, executed across three two-week sprints. Each sprint delivered functional improvements that could be directly evaluated by users, consistent with Agile principles of rapid feedback and incremental value creation (Schwaber & Sutherland, 2020). The resulting web-based prototype includes a login interface (Figure 4), a product management module (Figure 5), and a stock reporting feature (Figure 6), which enables MSME owners to generate data-driven decisions by exporting inventory reports. These results further support prior evidence that Scrum effectively enhances system development efficiency in MSME environments (Abtokhi et al., 2023).

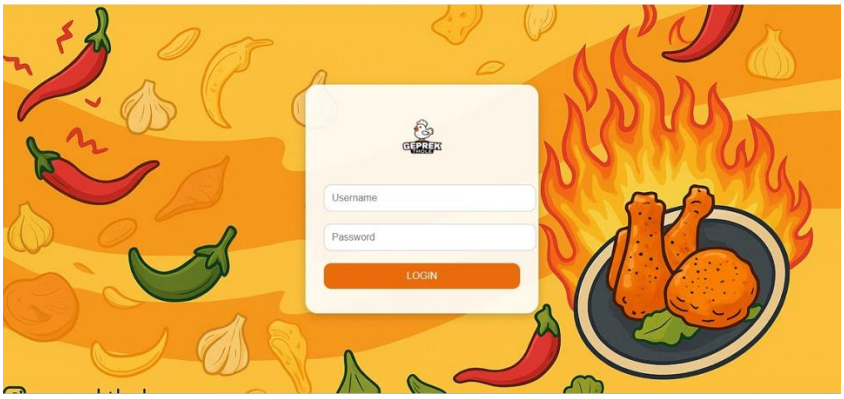


**Figure 4.** Login page display

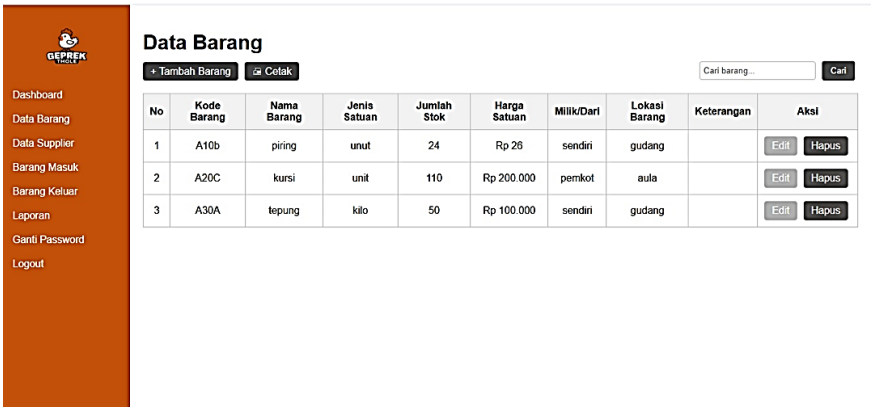


**Figure 5.** Display of the goods data management module

Cetak

Geprekthole Inventory
Jalan Raya Wonoyoso No. 47 Kab. Pekalongan
Telp: 088221217969 | Email: Arufadib111@gmail.com

Laporan Data Barang

| No | Kode Barang | Nama Barang | Jenis Satuan | Jumlah Stok | Harga Satuan | Milik/Dari | Lokasi Barang | Keterangan |
|---|---|---|---|---|---|---|---|---|
| 1 | A10b | piring | unut | 24 | Rp 26 | sendiri | gudang | |
| 2 | A20C | kursi | unit | 110 | Rp 200.000 | pemkot | aula | |
| 3 | A30A | tepung | kilo | 50 | Rp 100.000 | sendiri | gudang | |

**Figure 6.** Inventory report display

The iterative implementation progress is summarized in Table 2, showing complete delivery of prioritized features within three sprints and demonstrating the effectiveness of the Scrum approach for MSME-scale development. Following the completion of all prioritized features, black-box testing was performed to verify functional correctness of each module.

**Table 2.** Sprint Implementation Summary

| Sprint | Backlog Items | Output Deliverables | Status |
|---|---|---|---|
| Sprint 1 | User authentication, Product CRUD | Login page, Product management module | ✓ Done |
| Sprint 2 | Supplier management, Stock movement (in/out) | Supplier module, Transaction handling | ✓ Done |
| Sprint 3 | Stock reporting, Change password, UI refinement | Exportable stock report, User profile update | ✓ Done |

Functional validation was conducted through black-box testing to ensure that each feature operated according to the defined specifications. As presented in Table 3, all functional tests passed successfully, indicating strong reliability and input validation throughout the system (Pressman & Maxim, 2020).

**Table 3.** Functional Testing Results

| Feature | Test Result | Status |
|---|---|---|
| Login | The system accepts valid input and rejects incorrect credentials | Passed |
| Product Management | Product data can be added, edited, and deleted successfully | Passed |
| Supplier Management | Supplier data can be created and updated successfully | Passed |
| Incoming Goods | Incoming goods are recorded accurately according to input | Passed |
| Outgoing Goods | Outgoing goods are recorded accurately according to input | Passed |
| Reporting | Reports can be displayed and exported successfully | Passed |
| Change Password | User password can be updated successfully | Passed |

User Acceptance Testing (UAT) involved five respondents—the owner, cashier, and kitchen operators—selected through purposive sampling because they directly use the system and possess the work experience necessary to assess operational performance, a common approach in MSME research that prioritizes experiential relevance (Diawati, 2025). The 86% satisfaction score was calculated from the mean of a five-point Likert scale converted into a percentage to measure perceptions of usability, transaction speed, and reporting accuracy, following user-perception evaluation practices frequently applied in MSME performance studies (Sugito, 2024). These findings represent feedback from the full user group in a single-case MSME, rather than a generalizable statistic. The positive distribution—40% very satisfied and 35% satisfied—along with minor concerns regarding mobile optimization, indicates functional acceptance while highlighting areas for iterative refinement.

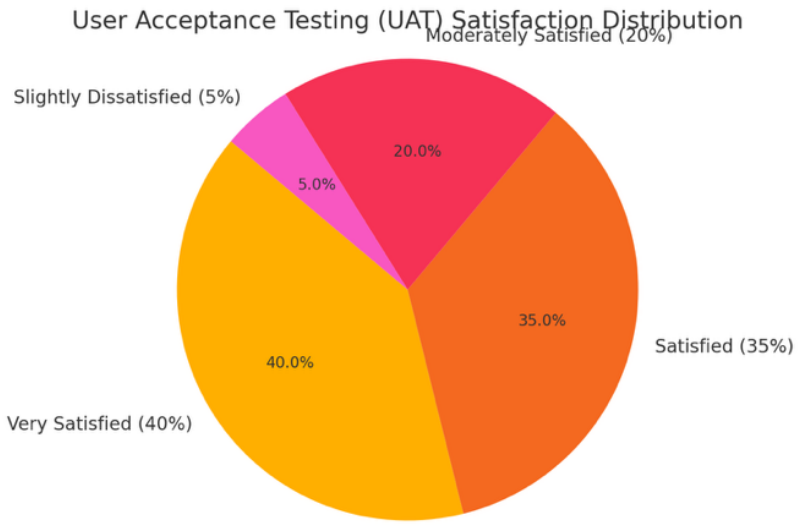


**Figure 7.** User Acceptance Testing (UAT) Satisfaction Distribution

## Discussion

The UAT results indicate generally positive perceptions of the prototype, reflected in an average satisfaction score of 86% and a majority of respondents reporting high satisfaction. These responses suggest possible reductions in transactional friction and improved clarity in stock reporting; however, because the evaluation relies entirely on subjective perception from a very small internal sample (n=5), the findings should be interpreted as indicative rather than evidence of operational improvement. Perceptual usability is an early adoption signal in MSMEs, but objective validation—such as before–after measurements of transaction time, error rates, or reconciliation accuracy—is required to substantiate any claims of performance gains.

The iterative adjustments made during development reflect Agile Scrum's emphasis on continuous feedback, but this study does not provide comparative validation against alternative development methods. Existing studies note shorter development cycles and adaptive coordination in small firms adopting Scrum (Abtokhi et al., 2023) and improved user alignment through iterative feedback (Hendrawan et al., 2024); in this study, the contribution is more modest, limited to revisions in interface layout and feature prioritization.

Compared with research that prioritizes customer-facing digitalization (Fardiansyah et al., 2022), this case highlights the internal functions most relevant to culinary MSMEs, particularly transaction recording and inventory traceability—an underexplored focus in local MSME digitalization literature. Minor dissatisfaction concerning mobile responsiveness and interface simplicity suggests constraints linked to minimal feature design, display scaling, or device literacy, and should guide subsequent design revisions.

Methodologically, the exclusive reliance on internal respondents introduces familiarity bias and prevents generalization; broader sampling involving external actors and the use of standardized instruments such as the System Usability Scale (SUS) would strengthen future evaluations. Overall, the study does not demonstrate confirmed operational benefits but offers preliminary perceptual evidence of usability and relevance for a single MSME context, with improvement points that align with Agile's iterative nature and provide opportunities for longitudinal assessment.

## CONCLUSION

This study presents a prototype web-based operational system for a culinary MSME developed through three Agile Scrum sprints, with black-box testing indicating that core functions operated as intended. Early feedback from five internal users suggested positive perceived usability for recording transactions and documenting stock, but these perceptual results cannot be

interpreted as evidence of performance improvement, operational reliability, or broader implementation success. Given the absence of quantitative measurements and the limited internal sample, the findings should be treated as preliminary and context-specific rather than generalizable. Future evaluations should incorporate objective indicators—such as transaction time, error rates, reconciliation stability, and system fault tolerance—and involve more diverse user groups while applying standardized usability instruments (e.g., SUS). Accordingly, the study does not claim causal effects on efficiency or competitiveness but instead offers an initial indication that internal record-keeping digitalization may be relevant for MSME operations and provides a basis for iterative refinement and further empirical research.

## REFERENCES

Abtokhi, A., Fahmi, H., & Sari, W. P. (2023). The Efficiency of Scrum Model for Developing Research and Publication Management Systems in Indonesia. *International Journal of Computing and Digital Systems*, *13*(1), 149–158. https://doi.org/10.12785/ijcds/130112

Agustian, K., Mubarok, E. S., Zen, A., & Malik, J. (2023). *The Impact of Digital Transformation on Business Models and Competitive Advantage*. *1*(2), 79–93. https://doi.org/10.61100/tacit.v1i2.55

Ambayu, G. L., & Hartomo, K. D. (2022). Analisis dan Pengujian Sistem Informasi Penjualan Produk UMKM Menggunakan Metode Scrum. *JATISI (Jurnal Teknik Informatika Dan Sistem Informasi)*, *9*(3), 2016–2028. https://doi.org/10.35957/jatisi.v9i3.2229

Asri Yana Vita, D., Raihan, R., & Zulfachmi, Z. (2023). Implementasi Metode Scrum pada Transformasi Bisnis Lokal UMKM Tanjungpinang. *Jurnal Bangkit Indonesia*, *12*(2), 46–52. https://doi.org/10.52771/bangkitindonesia.v12i2.249

Atmojo, M. E., Darumurti, A., & Hanif, N. A. (2024). Agile Governance in Optimizing Digital Literacy for Micro, Small and Medium Enterprises (MSMe) in Kulon Progo Regency. *Journal of Local Government Issues*, *7*(1), 68–82. https://doi.org/10.22219/logos.v7i1.29981

Darmanto, T., Syaepulloh, R., Rahayu, A. S., Fauzi, L. A., Nasrullah, Y. F., & Ibadurrahman, G. F. (2024). Implementation of point of sales at Kopi Lentera using agile methods and scrum framework. *Keynesia : International Journal of Economy and Business*, *3*(2), 141–154. https://doi.org/10.55904/keynesia.v3i2.1246

Dedi Harianto, & Ahmad Ahmad. (2024). Jurnal Nuansa: Publikasi Ilmu Manajemen dan Ekonomi Syariah. *Jurnal Nuansa : Publikasi Ilmu Manajemen Dan Ekonomi Syariah*, *3*(1), 28–34. https://journal.arimbi.or.id/index.php/Nuansa/article/view/1474

Diawati, P. (2025). *MSME GROWTH IN A LEARNING PERSPECTIVE : AN EXAMINATION OF WORK EXPERIENCE , SELF-EFFICACY , AND FINANCIAL LITERACY*. *13*(2), 211–235. https://doi.org/10.32497/keunis.v13i2.6262

Fardiansyah, M., Nur, A. W., Arief, A., & Hizbullah, I. (2022). Agile Scrum Untuk Platform E-Commerce Umkm Kuliner : Studi Kasus Toko. *Jurnal Pedimas Pasifik*, *01*(01), 57–65. file:///C:/Users/LENOVO/Downloads/9.+Pendikmas+Assaf+&+Imam.pdf

Ferdiansyah, D., Hoiriyah, & Umam, B. A. (2019). Perancangan Dan Pembangunan Aplikasi E-Commerce Berbasis Web Untuk Meningkatkan Penjualan Pada Toko Jaket Kulit Naufal. *J u r n a l I D E A L I S V o l . 3 N o . 1*, *September*, 151–153.

Galib, M., Faridah, Muharram, & Thanwain. (2024). JOURNAL OF ECONOMICS AND REGIONAL SCIENCE Transformasi Digital UMKM : Analisis Pemasaran Online dan Dampaknya terhadap Ekonomi Lokal di Indonesia. *Journal of Economics and Regional Science*, *4*(2), 115–128.

Hadian, N., Hayati, N., & Hakim, M. (2023). Technology Acceptance Models of E-Commerce Adoption in Small and Medium-Sized Enterprises: A Systematic Review. *G-Tech: Jurnal*

*Teknologi Terapan*, *8*(1), 125–133. https://doi.org/10.33379/gtech.v8i1.3577

Hendrawan, S. A., Chatra, A., Iman, N., Hidayatullah, S., & Suprayitno, D. (2024). Digital Transformation in MSMEs : Challenges and Opportunities in Technology Management. *Jurnal Informasi Dan Teknologi*, *6*, 141–149. https://doi.org/10.60083/jidt.v6i2.551

Jallouli, I. R., Anis, M., Tobji, B., Belkhir, M., Soares, A. M., Casais, B., Economy, D., & Technologies, E. (2023). *Digital Economy. Emerging Technologies and Business Innovation* (R. Jallouli, M. A. Bach Tobji, M. Belkhir, A. M. Soares, & B. Casais (eds.); Vol. 485, Issue September 2023). Springer International Publishing. https://doi.org/10.1007/978-3-031-42788-6

Jing, H., & Fan, Y. (2024). Digital Transformation, Supply Chain Integration and Supply Chain Performance: Evidence From Chinese Manufacturing Listed Firms. *SAGE Open*, *14*(3), 1–18. https://doi.org/10.1177/21582440241281616

Judijanto, L., Prananingrum, D. K., Rukmana, A. Y., Amalia, M. R., & Syailendra, S. (2025). Adaptation of Agile Project Management to Small Scale Projects in the Indonesian MSME Sector. *The Eastasouth Management and Business*, *3*(02), 300–305. https://doi.org/10.58812/esmb.v3i02.418

Maulana, F. R. (2024). From Traditional to Digital: Exploring the Online Marketing Transformation of Culinary Micro, Small, and Medium Enterprises (MSMEs) in Karawang Indonesia. *Open Access Indonesia Journal of Social Sciences*, *7*(5), 1773–1788. https://doi.org/10.37275/oaijss.v7i5.269

Mosser, S., Pulgar, C., & Reinharz, V. (2022). Modelling Agile Backlogs as Composable Artifacts to support Developers and Product Owners. *Journal of Object Technology*, *21*(3). https://doi.org/10.5381/jot.2022.21.3.a3

Pressman, R. S., & Maxim, B. R. (2020). *Software Engineering: A Practitioner's Approach*. McGraw-Hill Education. https://books.google.co.id/books?id=Enn2zQEACAAJ

Qisthina, N. A. C., Andarwati, M., & Putri, D. M. (2025). Desain sistem informasi inventaris barang untuk Usaha Mikro Kecil dan Menengah (UMKM) berbasis website. *Journal of Information System and Application Development*, *3*(1), 47–57. https://doi.org/10.26905/jisad.v3i1.15396

Rajagukguk, D. L., & Rusadi, U. (2025). Digitalization and Globalization: Transformation of Umkm in the Digital Era. *Journal of Social Political Sciences JSPS*, *6*(1), 15–24.

Rupeika-apoga, R., & Petrovska, K. (2022). Barriers to Sustainable Digital Transformation in Micro- ,. *Sustainability (Switzerland)*, *14*.

Schaffernicht, S. K., Türk, A., Kogler, M., Berger, A., Scharf, B., Clementschitsch, L., Hammer, R., Holzer, P., Formayer, H., König, B., & Haluza, D. (2023). Heat vs. Health: Home Office under a Changing Climate. *Sustainability (Switzerland)*, *15*(9), 1–24. https://doi.org/10.3390/su15097333

Schwaber, K., & Sutherland, J. (2020). Scrum Guide 2020. *Agile Metrics : Agile Health Metrics for Predictability*, *November*, 133–152.

Sofyan Alwi Fadillah, Nico Chandra, & Cyntia Rivatunisa. (2024). Implementasi Agile Scrum Pada Pembuatan Website Sistem Informasi Manajemen Kuliner. *Decode: Jurnal Pendidikan Teknologi Informasi*, *4*(1), 301–315. https://doi.org/10.51454/decode.v4i1.357

Sugito, S. (2024). *The Effect of Total Quality Management on MSME Performance with the System Management Accounting Information as Moderating Variable*. *4*, 4100–4113.