

Empowering the Economic and Entrepreneurship Council of 'Aisyiyah Gresik through Open-Source ERP Implementation for Business Process Optimization of Milkfish Bone Floss Production

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Abstract

Micro, small, and medium enterprises (MSMEs) play an important role in strengthening community economies, yet most of them still face obstacles in managing their business processes because of their reliance on manual administrative systems. The same problem was encountered by the Economic and Entrepreneurship Council (Majelis Ekonomi dan Kewirausahaan, MEK) of the 'Aisyiyah Gresik Branch, the community partner of this programme, which manages an enterprise producing shredded floss made from milkfish bones. This community-service programme aims to strengthen the managerial capacity of the partner through the implementation of an *open-source* Enterprise Resource Planning (ERP) system as a digital solution for integrating raw-material procurement, inventory, production, sales, and business administration. The programme was carried out using a Participatory Action Research (PAR) approach in which the partner was actively involved throughout the stages of needs identification, business process mapping, ERP configuration using Odoo, mentoring, implementation, and evaluation. The results show that the ERP system was successfully configured to match the characteristics of the partner's enterprise through the Inventory, Manufacturing, Purchase, Sales, and Accounting modules. Implementation of the system enabled the compilation of a *Bill of Materials* (BoM), the digitalisation of inventory data, and a more structured and integrated recording of the production process. Beyond improving the quality of data management, the programme also enhanced the understanding and skills of the management team in operating the ERP system, so that administrative processes became more effective, better documented, and easier to trace. The mentoring provided encouraged a shift in working patterns from manual record keeping towards data-driven business management. Open-source ERP implementation therefore proves to be an effective alternative solution for supporting the digital transformation of MSMEs, and it has the potential to be replicated in similar business groups as an effort to improve operational efficiency, decision-making quality, and business competitiveness.

Keywords: Open-source ERP; MSMEs; Odoo; milkfish bone floss; digitalisation.

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Introduction

Micro, small, and medium enterprises (MSMEs) constitute a strategic sector that contributes significantly to national economic growth through job creation, income distribution, and the intensification of regional economic activity. MSMEs are one of the business sectors that make a substantial contribution to driving economic growth in Indonesia, and the number of MSMEs in the country has tended to increase (Badan Pusat Statistik, 2021). The Government of Indonesia intends to assist MSMEs along the value chain in adopting technologies capable of increasing their output and market share (Kemenperin, 2018). In Indonesia, MSMEs dominate the structure of the business world

and serve as the main buffer of the economy, particularly in the processed-food sector, which is directly linked to the utilisation of local resources (Kementerian Koperasi dan UKM RI, 2023). Nevertheless, most MSMEs still face a range of obstacles in managing their business processes, especially in administration, inventory control, production recording, financial management, and the provision of information that supports decision making. The digitalisation of business processes is one of the most widely recommended strategies for improving the operational efficiency, productivity, and competitiveness of MSMEs in the era of digital transformation (Entrepreneurship, 2021).

Advances in information technology have driven a paradigm shift in business management from manual systems towards integrated systems. One of the technologies most widely used in enterprise management is Enterprise Resource Planning (ERP). ERP is an information system that integrates various business functions such as purchasing, inventory, production, sales, and finance into a single database, so that it is able to generate real-time information and reduce data redundancy (Fathoni, Asih, et al., 2024). A range of studies has shown that ERP implementation improved business process efficiency, accelerated report preparation, increased data accuracy, and supported more accurate decision making (Lewin Boehlke et al., 2015). For MSMEs, the use of open-source ERP is a more realistic alternative because it does not require high licence fees, can be readily developed in line with organisational needs, and is supported by a broad user community (Fathoni et al., 2022).

One community organisation with the potential to develop a digitally based enterprise is the Economic and Entrepreneurship Council (MEK) of the 'Aisiyiah Gresik Branch. This organisation runs women's economic empowerment activities through the production of milkfish bone floss, a processed product that converts milkfish bone waste into a food of high economic value, as shown in Figure 1. This innovation not only adds value to fishery waste but also supports the concept of the *circular economy* through the reuse of waste as a marketable product. Milkfish bone floss has been marketed at various bazaars, in souvenir shops, and through social media, so that it offers considerable scope for business development (pwmu.co.id, 2019).



Figure 1. Milkfish bone floss product

Despite this promising market potential, preliminary observation showed that business management at MEK 'Aisiyiah Gresik was still carried out conventionally. Raw-material purchasing, inventory recording, production, product distribution, and the recording of financial transactions were all still performed using notebooks or simple worksheets. As a result, data across functions were not integrated, so that preparing business reports took a long time and was prone to recording errors. The management team also found it difficult to determine the actual condition of raw-material stock, to calculate production requirements, and to evaluate business performance as a whole. These problems risk

lowering operational efficiency and hampering business development if they are not addressed promptly.

The field visits also revealed that the partner had a strong commitment to improving the professionalism of its business management through the use of digital technology. Discussions with the MEK management team led to an agreement that the information system to be adopted had to be easy to operate, free of high licence fees, and capable of integrating production and business administration activities. The programme documentation records the process of identifying the partner's needs, taking an inventory of the milkfish bone floss products, and gathering information on the production flow as the basis for designing an ERP system suited to the characteristics of the partner's enterprise.

On the basis of these conditions, the community-service team proposed the implementation of an open-source ERP system using Odoo as a solution for digitalising business processes. This system was selected because it provides a range of modules that can be implemented incrementally according to the needs of MSMEs, including Inventory, Manufacturing, Purchase, Sales, and Accounting (Fathoni, Sri Asih, et al., 2024). In this programme, a *Bill of Materials* (BoM) was compiled, inventory data were digitalised, and product data were configured, so that all of the enterprise's main activities could be documented within a single integrated system. ERP implementation was oriented not only towards the use of software but also towards strengthening human-resource capacity for professional, data-driven business management.

Unlike most MSME mentoring programmes, which focus solely on digital marketing or entrepreneurship training, this community-service programme emphasises the transformation of internal business processes through the adoption of an ERP system that integrates production, inventory, sales, and financial administration. This approach is expected to improve operational efficiency, enhance the quality of managerial information, and serve as an ERP implementation model that can be replicated in women's business groups and other food-sector MSMEs.

Accordingly, the objectives of this community-service programme are: (1) to identify the business process requirements of MEK 'Aisyiyah Gresik; (2) to implement an open-source ERP system as a means of digitalising the production process and business administration; and (3) to improve the effectiveness of managing the milkfish bone floss enterprise through an integrated information system. The results are expected to serve as a model of MSME empowerment based on digital transformation that supports the competitiveness of small enterprises in Indonesia.

Method

This community-service programme was conducted using a *Participatory Action Research* (PAR) approach, which positions the partner as an active subject at every stage. This approach was selected so that the solution developed would correspond to the partner's real needs while also improving the ability of the members of the Economic and Entrepreneurship Council (MEK) of 'Aisyiyah Gresik to manage their enterprise independently. All stages were carried out collaboratively by the community-service team, students, and the MEK management team, so that the technology implementation process was oriented not only towards the use of software but also towards strengthening human-resource capacity. The programme comprised the following stages.

1. Identification of partner needs

This initial stage was conducted through field observation, interviews, and discussions with the MEK management team in order to obtain a comprehensive picture of the business processes then in

operation. The purpose was to identify existing conditions, the main problems, and the information-system requirements expected by the partner. In addition to observing the production process, the team took an inventory of product types, raw materials, procurement processes, sales mechanisms, and the administrative recording system already in use.

The preliminary observation showed that business administration was still carried out manually, so that the recording of raw-material purchases, inventory, production, sales, and finance was not integrated. These conditions provided the basis for designing the *open-source* Enterprise Resource Planning (ERP) implementation programme. Documentation of the initial visit records the discussion with the partner in identifying ERP implementation requirements as the foundation for formulating the digital solution.

The observation data were then analysed to map the business process flow, from raw-material procurement, production, and inventory control to product sales and the recording of financial transactions. This stage aimed to construct the business process model that served as the basis for ERP configuration. A *Bill of Materials* (BoM) was subsequently compiled to represent the structure of raw-material requirements in the production of milkfish bone floss. The BoM served as the system's reference for calculating material requirements and supported more systematic production planning.

2. Open-source ERP configuration

The next stage was the configuration of the ERP system using Odoo, which was selected because it is *open-source*, readily extensible, and well suited to the characteristics of MSMEs. Configuration was carried out by entering master data on products, raw materials, units of measure, and product categories, and by compiling the *Bill of Materials* on the basis of the production composition used by the partner. Several core modules were also configured, namely Inventory, Manufacturing, Purchase, Sales, and Accounting, so that all business activities could be integrated within a single database. The initial implementation produced inventory data documented digitally through the Inventory module.

Once the system had been configured, the community-service team introduced the MEK management team to the basic concepts of ERP and to the practical use of the system. The training material covered product data management, raw-material recording, inventory management, the recording of sales transactions, and the production process using the Manufacturing module. Direct mentoring was then provided so that participants would be able to operate the system independently in their day-to-day business activities. A *learning by doing* approach was used to deepen users' understanding of the function of each module.

3. System implementation and trial

In the implementation stage, the ERP system began to be used in the partner's operational activities. The management team entered inventory data and raw-material purchase transactions, compiled the *Bill of Materials*, and recorded production output using the configured system. The whole process was accompanied by the community-service team to ensure that the data entered corresponded to actual field conditions. Trials were conducted incrementally, beginning with inventory management and the recording of the production process and extending to the use of the e-commerce website, so that all modules could function in an integrated manner.

The final stage was an evaluation of the programme to determine the degree of success of the ERP implementation. The evaluation was conducted through direct observation, interviews, and discussions with the partner concerning the ease of use of the system, the fit between its features and business needs, and the constraints still encountered during implementation. In addition, conditions before and after

ERP implementation were compared on the basis of several indicators, namely: (1) the production recording system; (2) inventory management; (3) compilation of the *Bill of Materials*; (4) integration of transaction data; and (5) users' ability to operate the system.

Results and Discussion

Initial condition of the partner

The programme began with field observation and discussions with the management team of the Economic and Entrepreneurship Council (MEK) of the 'Aisyiyah Gresik Branch in order to identify the existing condition of the business processes of the milkfish bone floss enterprise, as shown in Figure 2. The observation showed that the partner had successfully developed a processed product based on milkfish bone waste into a value-added food product. The product was marketed through bazaars, souvenir shops, and local marketing networks, giving it good prospects for business development. However, the increase in production capacity had not been accompanied by the adoption of an information system capable of supporting integrated business management.



Figure 2. Identification of the needs of the community-service partner

Documentation of the initial visit shows the process of identifying the partner's needs through direct discussion with the management team. At this stage, information was obtained on the mechanisms of raw-material purchasing, the production process, inventory recording, and the preparation of financial reports, all of which were still performed manually. As a consequence, business information was dispersed across various recording media, which made business control and evaluation difficult.

On the basis of this identification, several main problems were found and prioritised for resolution:

- (1) raw-material inventory records were not documented systematically;
- (2) the production process had no standard for *Bill of Materials* recording;
- (3) purchase and sales transactions were not integrated;
- (4) business reports were still prepared manually;
- (5) the information required for decision making was not available quickly.

These findings indicate that the partner's main problem lay not in product quality but in the governance of business information. ERP implementation was therefore focused as a solution for improving the quality of business management through the digitalisation of business processes.

Implementation of Enterprise Resource Planning (ERP)

Based on the results of the needs analysis, the community-service team implemented an open-source ERP system using Odoo, as shown in Figure 3. The system was configured to match the characteristics of the business processes of the milkfish bone floss enterprise, so that only the modules genuinely required by the partner were activated. The first implementation stage was the compilation of master data covering products, raw materials, units of measure, product categories, and inventory storage locations. The compilation of master data is an important stage because all transactions within an ERP system refer to these data. With structured master data in place, transaction recording became more consistent and data duplication was minimised.

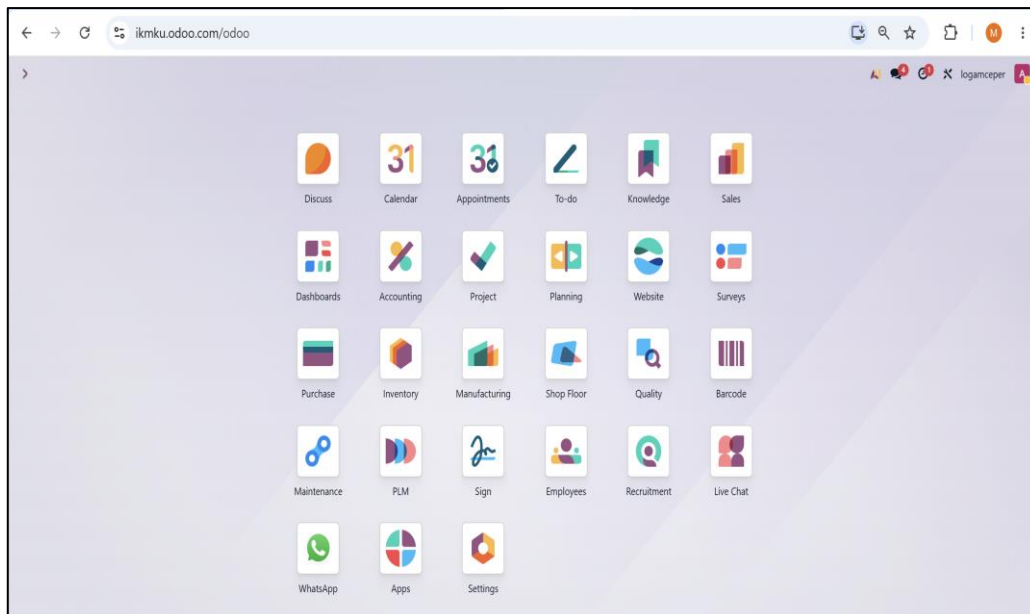


Figure 3. Interface of the open-source Odoo system

A *Bill of Materials* (BoM) was subsequently compiled to represent the structure of the raw materials required in the production of milkfish bone floss. Compiling the BoM allows the system to calculate raw-material requirements automatically on the basis of the quantity of product to be produced, as shown in Figure 4. The programme documentation shows that the BoM was compiled together with the partner, so that the production formula, which until then had been transmitted only orally, could be documented within the ERP system.

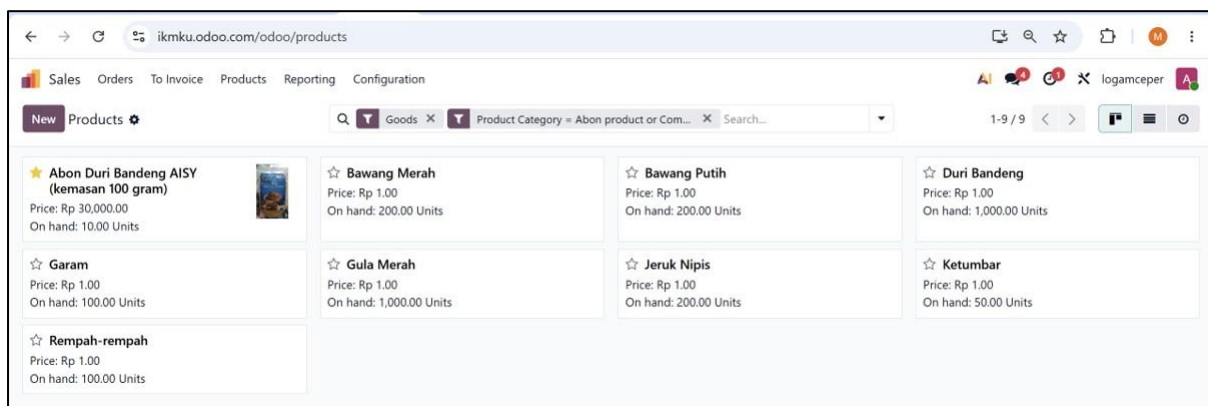


Figure 4. Display of the product and the *Bill of Materials* in the ERP system

The next stage of implementation concerned the Inventory module. This module was used to record all movements of raw materials and finished products, so that the state of inventory could be known in *real time*. Before ERP implementation, the management team had to carry out physical checks to determine the quantity of stock available. After the system had been adopted, inventory information could be obtained directly from the system, making production planning more effective. The Inventory module screens in the programme documentation show that all inventory data had been digitalised and could be monitored centrally.

In addition, the Manufacturing, Purchase, Sales, and Accounting modules were configured as the foundation for business process integration. Although not all operational transactions were carried out entirely within the ERP system during the programme, the configuration of these modules gave the partner an overview of the interconnected business process flow, from raw-material purchasing and production to sales and the preparation of financial reports. The success of ERP implementation is determined not only by technological readiness but also by users' ability to operate the system. Once the configuration process was complete, the community-service team therefore delivered training and mentoring to the MEK management team.

During the mentoring process, participants' understanding of the concept of business process digitalisation improved. At the start of the programme, most participants were still accustomed to manual record keeping and therefore needed time to grasp the ERP workflow. After several mentoring sessions, however, participants began to understand how to enter data independently and how the modules within the system relate to one another. This result indicates that the success of ERP implementation in MSMEs is influenced not only by the sophistication of the software but also by the process of knowledge transfer to users. Participatory mentoring allows the partner to appreciate the benefits of the system and thereby increases readiness to adopt digital technology.

Impact of ERP implementation on the partner

ERP implementation brought about substantial changes in the business governance of MEK 'Aisiyiah Gresik. These changes were evident not only in the use of technology but also in the way the management team handled business information. Before implementation, all record keeping was performed manually using notebooks and simple worksheets. After the adoption of ERP, information on raw materials, products, and inventory began to be documented within a single integrated system. This made data retrieval easier and reduced the risk of losing information as a result of dispersed record keeping.

The adoption of the *Bill of Materials* also benefited production control. The raw-material formula, previously known only through experience, is now documented within the system, which facilitates the standardisation of production. Raw-material requirements can therefore be calculated more accurately and production planning has become more systematic. With respect to inventory management, use of the Inventory module improved the partner's ability to monitor stocks of both raw materials and finished products. Inventory information that had previously been obtainable only through physical inspection is now available digitally, which accelerates decision making, particularly when raw materials are to be purchased or the next production run is to be planned.

ERP implementation also had an impact on human-resource capacity. Through mentoring, the management team gained new experience in using an information system as a tool for business management. This improvement in competence constitutes important capital for the sustainability of digital transformation within the organisation. The changes that occurred after ERP implementation are summarised in Table 1. They show that ERP implementation had a positive impact on the partner's

business governance, particularly with regard to data integration, administrative efficiency, and human-resource capacity.

Table 1. Comparison of conditions before and after ERP implementation

Aspect	Before implementation	After implementation
Inventory recording	Manual	Digital, through the ERP system
Product data	Unstructured	Integrated master data
<i>Bill of Material</i>	Not documented	Compiled within the system
Stock monitoring	Manual physical checking	<i>Real-time</i> information
Production documentation	Limited	Documented in the ERP system
User competence	No prior exposure to ERP	Able to operate the basic ERP modules

The results of this programme show that the implementation of *open-source* ERP can serve as one alternative digitalisation solution for MSMEs with limited resources. Unlike commercial software, which requires high licence fees, *open-source* ERP allows an organisation to implement the system incrementally in line with the needs of its business processes. This finding is consistent with a range of studies reporting that the success of ERP implementation in small-scale organisations is influenced more by the fit between the system and user requirements (*fit to business process*) than by the complexity of the software's features. In this programme, the system was not developed by adding many new functions; rather, it was configured to match the characteristics of the milkfish bone floss production process. This approach made user adaptation easier and improved the prospects for sustained use of the system.

Furthermore, the programme shows that MSME digitalisation involves not only the adoption of technology but also a change in working culture. The mentoring provided during implementation succeeded in raising the partner's awareness of the importance of accurate data recording as a basis for decision making. The principal benefit of ERP implementation is therefore not merely the availability of a computer application but the emergence of business governance that is more systematic, transparent, and well documented.

Conclusion

The community-service programme carried out with the Economic and Entrepreneurship Council (MEK) of the 'Aisyyah Gresik Branch successfully implemented an open-source Enterprise Resource Planning (ERP) system as a means of digitalising the management of the milkfish bone floss enterprise. Implementation proceeded through the stages of identifying the partner's needs, mapping business processes, configuring the ERP system, training, mentoring, and evaluating system use. The participatory approach adopted encouraged the partner's active involvement throughout implementation, so that the system developed corresponded to the operational needs of the enterprise.

The adoption of the Inventory, Manufacturing, Purchase, Sales, and Accounting modules brought positive changes to the partner's business governance. The ERP system is able to integrate inventory data, the production process, and business administration within a single database, so that record keeping has become more structured, better documented, and easier to trace. In addition to improving administrative efficiency, ERP implementation also supports the standardisation of production through

the compilation of a *Bill of Materials* (BoM) and strengthens the partner's capacity for inventory control and production planning.

From the perspective of community empowerment, the programme succeeded in improving the knowledge and skills of the MEK management team in using digital technology as a means of business management. The mentoring provided during implementation gave the partner practical experience in operating the ERP system and thereby increased their readiness to pursue digital transformation on a sustained basis. ERP implementation thus produces change not only in the technological dimension but also in the human-resource capacity required to manage the enterprise more professionally and on the basis of data.

In future, the ERP system that has been adopted can be developed further through the use of the *Customer Relationship Management* (CRM) and *e-commerce* modules, so as to support market development and more comprehensive decision making. Integration with digital marketing and data analytics is expected to improve the competitiveness of milkfish bone floss in an increasingly competitive market. The mentoring model developed in this programme also has the potential to be replicated in women's business groups and other food-sector MSMEs with similar business process characteristics.

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