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Transforming The Coastal Economy of Malang Through Fintech Innovation Toward Sustainable Food Security

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ABSTRACT
The utilization of financial technology (fintech) has become a key driver in transforming coastal economies that traditionally have limited access to formal financial services. This community service program focuses on implementing fintech innovations to promote economic independence and food security among coastal communities in Malang. Through education and mentoring activities, the program introduces various fintech applications such as digital payments, micro-investment platforms, and peer-to-peer lending that can be adopted by small-scale fishers and seafood processing entrepreneurs. In addition to improving digital financial literacy, the program facilitates collaboration among coastal communities, financial institutions, and fintech providers to build an inclusive digital economic ecosystem. The adoption of fintech is expected to expand access to capital, accelerate transactions, and strengthen local food supply chains. Ultimately, this initiative aims to create a more adaptive and resilient coastal economy while supporting sustainable food security in the Malang region.
Keywords: fintech, digital economy, coastal empowerment, financial inclusion, food security, Malang

INTRODUCTION

Indonesia, as the world's largest maritime country, has great potential in the fisheries and seafood processing sector, which is an important pillar in the local economy. However, despite having abundant natural resources, many coastal communities face structural challenges that hinder their economic development. One of the main problems faced is limited access to formal financial services. Many fishers and small entrepreneurs in the fisheries sector still rely on high-interest informal lending systems, as well as limited cash-based transactions, which reduce efficiency and transparency in their trade (Aker et al., 2016; Demirguc-et al., 2015). This results in limited access to the capital needed for business development and production capacity building. As a result, local food security becomes vulnerable and the potential of coastal economies cannot be maximized (Alon et al., 2019).

In the face of these challenges, financial technology (fintech) offers innovative solutions that can be applied in the context of coastal communities. Fintech, which includes digital technology-based financial services such as digital payments, peer-to-peer lending, and micro-investment platforms, can be an effective tool to increase financial inclusion in communities that have been marginalized from the formal financial system (Narain et al., 2018). The use of fintech can help introduce more efficient, transparent, and affordable financial services for coastal communities. It can also address the problem of dependence on high-interest informal loans and provide access to capital that was previously difficult to reach (Ozili, 2020). According to the World Bank (2018), fintech can accelerate the process of

financial inclusion, which is important for improving the quality of life and reducing poverty, especially in less developed regions.

However, despite the many potentials offered by fintech, its application in Indonesia's coastal communities is still limited. One of the main challenges is the low level of digital financial literacy among the community, as well as the limitations of digital infrastructure in many coastal areas (Zins et al., 2015). Many fishermen and small entrepreneurs do not have adequate access to technological devices or the internet, which hinders them from taking advantage of various digital-based financial solutions. In addition, although many studies have discussed the potential of fintech, its application in the fisheries and seafood processing sector is still minimal, although this sector has great opportunities to grow with the support of technology (Mohammed & Mahfouz, 2019).

The main goal of this community service program is to increase digital financial literacy among coastal communities, as well as introduce fintech solutions that can improve economic independence and food security. Through education and mentoring, this program aims to provide an understanding of various fintech services, such as digital payment applications, peer-to-peer lending platforms, and microinvestments, that can be utilized by fishermen and seafood processing entrepreneurs. By increasing financial literacy, it is hoped that coastal communities can access capital with lower interest rates, reduce dependence on informal loans, and increase transaction efficiency that strengthens local food supply chains (Surianto, 2017).

In addition, the program also aims to introduce access to more affordable and transparent capital, through peer-to-peer lending platforms and micro-investments that can help small businesses in developing their production capacity. For example, according to the World Bank (2020), the adoption of fintech in the fisheries sector can overcome the obstacles faced by smallholder fishers, such as limited access to credit and capital. By introducing digital finance platforms, fishermen can gain access to cheaper and flexible capital, which was previously difficult to obtain through traditional banking channels. This is expected to increase the productivity and sustainability of their business.

However, although fintech offers a lot of potential, there is a large gap in research regarding its application in coastal communities, especially in Indonesia. Research on fintech is often more focused on the application of technology in urban areas or other more economically advanced sectors. This creates a gap in understanding how fintech can be effectively adapted to support the economic empowerment of coastal communities that have unique challenges, such as limited access to adequate technology and infrastructure (World Bank, 2017). This gap also includes a lack of research exploring how fintech can be integrated with the fisheries and seafood processing sectors, which are particularly relevant for improving food security and economic independence (Zins et al., 2015).

The uniqueness and novelty of this service program lies in its integrated approach and is based on collaboration between coastal communities, financial institutions, and fintech service providers. This approach aims not only to introduce technology, but also to provide ongoing mentoring so that coastal communities can effectively utilize technology in their daily lives. The program introduces fintech applications specifically designed to meet the needs of the fisheries and seafood processing sectors, as well as a peer-to-peer lending platform that provides more flexible and affordable access for small businesses on the coast. This collaboration aims to create an inclusive digital economy ecosystem, which supports the sustainability of small businesses and strengthens local food security in coastal areas (Schindler et al., 2019).

Thus, this community service program has a significant contribution in creating a fintech-based empowerment model that can be widely adopted by coastal communities. Through increasing digital financial literacy, access to capital, and improving the efficiency of economic transactions, this program aims to have a positive long-term impact on the economic empowerment of coastal communities in Malang and other coastal areas in Indonesia. These innovations not only open up new opportunities for economic growth, but also strengthen sustainable food security and improve the quality of life of coastal communities.

METHOD

This community service program has been successfully implemented with the aim of increasing digital financial literacy among coastal communities, introducing relevant fintech solutions, and improving access to capital and economic transaction efficiency. The method applied involves three main

interrelated stages: planning, implementation, and evaluation. Each stage is designed to provide a sustainable impact and enhance the economic empowerment of coastal communities.

1. **Planning**

   In the initial stages, a series of planning activities have been carried out to ensure that the program runs in accordance with the needs and challenges faced by coastal communities. The following are the activities that have been carried out:

   1) Survey and Needs Analysis: An initial survey was conducted to identify the level of digital financial literacy as well as the challenges faced by coastal communities in the Malang area. The survey involved interviews with fishermen, seafood processing entrepreneurs, and local financial institutions. The survey results show that coastal communities face limitations in accessing formal financial services and digital technology. Therefore, this program emphasizes education and mentoring based on the needs of the local community, as suggested by Narain et al. (2018).
   2) Partner Identification and Collaboration: The program successfully established partnerships with several local financial institutions, fintech service providers, and educational institutions to ensure the smooth implementation of the program. This collaboration allows the program to obtain adequate resource support and provide access to relevant fintech platforms, such as digital payments and peer-to-peer lending platforms. Collaboration with local fintechs is essential, as expressed by Schindler et al. (2019), to ensure wider access to technology in coastal areas.

2. **Implementation**

   The implementation of this service program has been carried out successfully through a series of education, training, and direct assistance activities to coastal communities. The main activities that have been carried out are:

   1) Education and Training: Educational activities are carried out through face-to-face training sessions and online-based training. Given the limitations of time and space, the training was held in the form of interactive classes that discussed the basics of using fintech, digital payment applications, as well as the use of peer-to-peer lending platforms and micro-investments. The training also includes case studies relevant to the fisheries and seafood processing sector. Zins et al. (2015) emphasize the importance of practice-based teaching, which has been implemented by engaging participants in a hands-on simulation from scratch.
   2) Intensive Mentoring: After the training, participants are given one-on-one mentoring to ensure they can implement what they have learned. Mentoring is carried out by mentors who are experienced in the use of fintech applications. Mentors assist participants in opening digital accounts, making transactions, and accessing various fintech platforms. This mentoring lasted for several weeks, with the aim of ensuring participants could overcome the technical obstacles they faced. Martha (2020) suggests that this mentoring is essential to increase the success rate of technology adoption, which has been proven to be effective in this program.
   3) Simulation and Field Practice: To strengthen participants' understanding, the program also involves hands-on simulation using the tools provided. In addition, participants were given the opportunity to make real transactions using fintech applications. For example, fishermen and seafood processing entrepreneurs are guided to make digital payment transactions with local and out-of-region buyers. Alon et al. (2019) suggest that this field practice-based approach is very beneficial in increasing the adoption of effective technologies, which are implemented in this program.
   4) Penyuluhan tentang Pengelolaan Keuangan: Sebagai bagian dari upaya meningkatkan literasi keuangan secara menyeluruh, kegiatan penyuluhan dilakukan untuk mengajarkan pentingnya pengelolaan keuangan, seperti pencatatan keuangan, perencanaan keuangan, dan pengelolaan modal usaha. Ini bertujuan agar masyarakat pesisir dapat memanfaatkan hasil yang diperoleh melalui penggunaan fintech dengan bijak dan efektif. Demirguc-Kunt et al. (2015) menunjukkan bahwa pengelolaan keuangan yang baik adalah kunci untuk memaksimalkan manfaat dari adopsi fintech.

3. Evaluation and Monitoring

After the training and mentoring activities are completed, evaluation and monitoring are carried out to measure the impact of this program and ensure the sustainability of the use of fintech by coastal communities. The following are the evaluation activities that have been carried out:

1) Implementation Stage Evaluation: Evaluation is conducted by collecting feedback from participants through questionnaires and interviews. The results of the evaluation showed a significant increase in participants' digital financial literacy, as well as mastery of fintech applications for daily transactions. Aker et al. (2016) emphasized that this evaluation is important to measure the effectiveness of training and ensure that the promised benefits are achieved.
2) Continuous Monitoring: After the training, follow-up monitoring was conducted for six months to evaluate whether participants continued to adopt fintech technologies in their transactions and whether there were any positive changes in their economic performance, such as increased revenue or transaction efficiency. Monitoring is carried out through direct communication with participants and program partners. The World Bank (2020) emphasizes that post-training monitoring is essential to measure the long-term impact of fintech use in more remote communities.
3) Program Feedback and Improvement: The program also includes collecting feedback from participants to further improve and develop the program. Based on the results of the evaluation, several changes were made to improve the training materials and increase the effectiveness of mentoring. Schindler et al. (2019) suggest that feedback from participants is critical to the continued development of these community service programs.

4. Expected and Achieved Outcomes

The results of this service program are expected to have a significant impact, including:

1) Improvement of Digital Financial Literacy: Participants have successfully understood the basics of digital finance and used fintech applications for daily economic transactions.
2) Wider Access to Capital: Participants have easier and more affordable access to capital sources through peer-to-peer lending and micro-investment platforms.
3) Efficiency and Transparency in Transactions: The use of digital payments has accelerated transactions and increased transparency in coastal economic activities.
4) Sustainability of the Digital Ecosystem: Strong collaboration between coastal communities, financial institutions, and fintech service providers in building an inclusive and sustainable digital ecosystem.

RESULT AND DISCUSSION

RESULT

This community service program aims to increase digital financial literacy among coastal communities, introduce relevant fintech solutions, and improve access to capital and economic transaction efficiency. All activities are carried out in a structured method, which includes three main stages: planning, implementation, and evaluation. Here are the results achieved after the program runs.

1. Improving Digital Financial Literacy

One of the key outcomes achieved was a significant increase in digital financial literacy among participants. Before the program began, most of the fishermen and small entrepreneurs involved had no knowledge of financial technology or digital financial applications such as e-wallets, digital payments, and online transfer services. They rely more on cash-based transactions, which are often limited by the availability of physical money and are less efficient.

After participating in a series of trainings given, more than 70% of participants were able to independently use digital payment applications and e-wallets. Participants can make online transactions, send money, and accept payments using digital platforms. This shows that practice-based training approaches are very effective in improving their understanding of financial technology, which was previously considered complicated and unaffordable.

These results show that with the right education and training, coastal communities can quickly adopt new technologies that can speed up transactions and improve their economic efficiency.

2. Access to Capital Resources

One of the main obstacles faced by coastal communities, especially fishermen and small entrepreneurs, is the limitation in accessing affordable sources of capital. Most of them rely on informal loans with high interest rates, which puts a heavy strain on their finances.

This service program introduces peer-to-peer lending (P2P) platforms and micro-investments as a more affordable and transparent financing alternative. After participating in training and receiving direct assistance, a number of business groups began to explore loans through this digital platform. Some fishermen groups and seafood processing entrepreneurs have managed to access financing to purchase new equipment and expand their production capacity.

For example, a group of fish processing entrepreneurs who previously struggled to obtain capital from formal financial institutions are now starting to use microloan services with much lower interest rates, allowing them to increase production and expand the distribution of their products. This proves that fintech can overcome the problem of financial access in coastal communities that have been marginalized from traditional banking services.

3. Transaction Acceleration and Business Efficiency

Prior to the adoption of digital technology, most economic transactions among fishers and traders in coastal areas were carried out in cash, which often hampered smooth transactions and slowed down the trading process. In addition, the reliance on cash also leads to non-transparency in the recording of transactions.

After the implementation of the digital payment system, transactions between fishermen, traders, and consumers became faster and more efficient. By using digital payment applications, transactions can now be made instantly and recorded automatically. This reduces the time previously required to calculate cash and reduces the risk of errors in transactions.

In addition, digital payments also make the trading process more transparent, as all transactions are recorded within the platform, which allows for easier monitoring and auditing. This program proves that technology can speed up transaction processes and improve efficiency in the local food supply chain, which is critical to creating a more responsive and stable market.

4. Digital Ecosystem Collaboration and Development

During the implementation of the program, collaboration between various parties is one of the keys to success. The program not only focuses on introducing technology to coastal communities, but also develops an inclusive digital ecosystem by involving fintech service providers, local financial institutions, and local governments.

Through group discussions facilitated by the program, fishers and small entrepreneurs began collaborating with fintech service providers and local financial institutions to build community-based digital economy networks. This not only allows them to use technology, but also to play an active role in building networks that support the growth of the digital economy in coastal areas.

A clear example of this collaboration is the formation of a working group that serves as a liaison between fishermen, entrepreneurs, and fintech service providers. The group aims to ensure wider access to technology and strengthen the sustainability of the digital ecosystem in coastal areas. The participants not only became users of technology, but also contributed to building a more inclusive community-based digital economy.

5. Implementation Challenges

Although this program has managed to record significant achievements, there are several challenges that must be faced in its implementation. One of the main challenges is the limitation of internet infrastructure in some coastal areas that still have difficulty accessing digital services stably. This hinders the implementation of digital transactions regularly, especially in areas with limited internet connections.

In addition, smartphone ownership in some households is also an obstacle. Although most of the participants have been taught how to use fintech applications, some of them still struggle because they do not have the necessary devices. This challenge requires further collaboration with local governments, fintech service providers, and educational institutions to provide wider access to technology.

DISCUSSION

This community service program aims to increase digital financial literacy and empower the economy of coastal communities through the use of financial technology (fintech). During the implementation of the program, we managed to achieve a number of significant achievements that not only supported the public's understanding of fintech, but also introduced new solutions for capital access, transaction efficiency, and the development of a community-based digital ecosystem. The following are the results achieved in the implementation of this program.

1. **Improving Digital Financial Literacy**

   One of the most encouraging results is the increase in digital financial literacy among coastal communities. Before the training began, the majority of participants, including fishermen and seafood processing entrepreneurs, were unfamiliar with digital-based financial services. Most of them still rely on cash-based transactions, which clearly limits their flexibility and economic efficiency.

   However, after a series of training and mentoring tailored to local needs, more than 70% of participants managed to master fintech applications, such as e-wallets and digital payment applications. Most participants now feel confident in making online transactions, sending money, and accepting payments through digital platforms. This training has proven to be effective because it is designed to be practice-based, where participants directly try to use the application on the device provided.

   Through this practice-based approach, we observed how participants can directly benefit from the app in their daily lives. They can now manage transactions more efficiently, which ultimately helps accelerate economic turnaround at the local level. This achievement also reminds us of the importance of technology-based education as the main foundation for building economic independence in societies that were previously marginalized from the formal banking system.

2. **Access to Capital Resources**

   Previously, business groups in coastal communities faced great difficulties in obtaining access to capital. Most of them rely on informal loans with very high interest rates, which often puts a strain on their small businesses. The program aims to open alternative access to more affordable sources of financing through peer-to-peer lending and micro-investment platforms.

   After being introduced to this fintech solution, many business groups began to explore microloans with lower interest rates. A significant example comes from a group of processed fish entrepreneurs who have been struggling to increase their production capacity. After gaining access to the P2P lending platform, they managed to secure capital to update production equipment and expand their distribution market.

   This success is in line with financial inclusion theory which suggests that wider access to finance provides greater opportunities for people to grow their businesses and improve their well-being. In this case, financial technologies such as peer-to-peer lending are a bridge for people who previously had difficulty accessing formal financing, in accordance with the concept put forward by Demirguc-et al. (2015) about the importance of reducing barriers to financial access among marginalized individuals.

3. **Transaction Acceleration and Business Efficiency**

   The adoption of digital payment applications among fishermen and traders also has a significant positive impact on the efficiency of economic transactions. Previously, many transactions were done manually, time-consuming, and prone to miscalculations. Cash-based systems are severely limited by the availability of physical money needed to complete transactions.

However, once introduced to digital payment apps, program participants can make transactions instantly and more securely, without having to rely on cash. With a more structured and automated recording system, transaction transparency has increased, and business actors can now record every transaction digitally.

In this regard, the theory of digital economy efficiency expressed by Brynjolfsson & McAfee (2014) proves to be relevant, where digital technology, especially in the form of digital payment applications, speeds up transactions and reduces transaction costs. This program not only accelerates the circulation of goods and money, but also increases much-needed transparency in the economic transactions of coastal communities. These results show that technology can improve operational efficiency in the local economy by introducing faster, safer, and more organized systems.

4. Digital Ecosystem Collaboration and Development

One of the distinguishing aspects of the program is the development of strong collaboration between coastal communities, local financial institutions, and fintech service providers. Through group discussions and various meeting sessions, we have succeeded in building an inclusive digital ecosystem for coastal areas. Previously, coastal communities were only consumers of fintech services, but with this program, they have also begun to play an active role in building community-based digital economy networks.

This form of collaboration has involved various parties, such as fishermen, seafood processing entrepreneurs, as well as financial institutions and fintech service providers. The group's discussions facilitated by the program resulted in an agreement to expand digital networks that support the development of coastal economies. This shows that community-based economic empowerment can be built through synergies involving various local actors.

The Innovation Ecosystem Theory put forward by Moore (1993) describes the importance of collaboration between various parties in creating sustainable innovation. Through the collaboration, the program has successfully integrated various critical elements in the larger digital ecosystem, which supports the economic sustainability of coastal communities.

5. Implementation Challenges

However, despite many positive outcomes achieved, infrastructure challenges remain a significant problem. Some coastal areas still experience limited internet access that hinders the smooth implementation of fintech in daily life. In addition, smartphone ownership is still low in some households and is also an obstacle in the use of fintech applications.

In line with the theory of Digital Divide described by Norris (2001), limited access to digital technology and infrastructure can exacerbate economic inequality. Therefore, while financial technology offers many benefits, the opportunities to access these technologies should be expanded so as not to create further gaps.

To overcome this, the solutions we implement include collaboration with internet service providers to improve connectivity in coastal areas as well as the provision of subsidized smartphones to households that do not have the devices needed to access fintech applications. In addition, we are also engaging local governments to support this initiative in the long term.

CONCLUSION

Community service programs focused on economic empowerment of coastal communities through the application of financial technology (fintech) have succeeded in achieving a number of significant achievements. The program has succeeded in increasing digital financial literacy among coastal communities, with more than 70% of participants able to operate digital payment applications and money transfer services independently. This proves that practice-based training is very effective in introducing fintech concepts that were previously unfamiliar to coastal communities.

In addition, access to capital is made easier through peer-to-peer lending and micro-investment platforms, which provide a low-interest financing alternative to the informal loans that were often used previously. Thus, the program has succeeded in reducing reliance on high-interest loans, providing opportunities for small businesses to thrive.

The adoption of digital payment applications has also succeeded in increasing transaction efficiency. By using this app, fishermen and traders can conduct transactions faster, safer, and more transparently, which speeds up the circulation of goods and money in the local economy. This efficiency supports stability and faster response in the local food supply chain.

Last but not least, this program has succeeded in encouraging collaboration between the fishing community, financial institutions, and fintech service providers. This collaboration has created an inclusive community-based digital economy ecosystem, strengthening the digital network that supports more sustainable coastal economic development.

However, while the program has provided many benefits, challenges related to limited internet infrastructure and low digital device ownership in some households are still barriers that need to be overcome in order for the benefits of the program to be enjoyed more widely.

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