Digitalizing small-scale fish farmers (SSFFs): utilizing WhatsApp group as virtual extension workers

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Abstract. In a variety of adoption models, research on information systems has revealed several variables that affect how well the system was received. At Semarang city in Indonesia, the intention of extension workers that utilized WhatsApp groups as virtual extension workers was examined. In this study, the model used the unified theory of acceptance and use of technology (UTAUT), which integrates four factors that determine the intention and utilization of a system: performance expectancy, effort expectancy, social influence, and facilitating conditions. Respondents of 21 SSFFs and extension workers from different areas of Semarang city were interviewed and data collected were analyzed using a qualitative approach. The result showed that the utilization of WhatsApp groups is generally effective in terms of performance expectancy, effort expectancy, social influence, and facilitating conditions. However, the usage is not yet as high as expected as some SSFFs remain inactive in the WhatsApp groups.

Key Words: aquaculture, fisheries, qualitative, small-scale fish farmers, virtual extension workers, WhatsApp group.

Introduction. The city of Semarang has a high fisheries potential, especially the potential for freshwater and brackish water aquaculture. Like other parts of Indonesia, the aquaculture industry is still dominated by small-scale fish farmers (SSFFs). To maximize the fisheries potential, the role of extension workers is very much needed to provide information and assistance to SSFFs (Kusmuntono et al 2022).

SSFFs in the city of Semarang are distributed in various areas and it is not uncommon that one SSFF and another are located at a considerable distance. Some fish farmers even have fish farm locations that are a bit difficult to reach by extension workers. The lack of intensive assistance can lead to problems so that the potential of aquaculture in the city of Semarang cannot be maximized. For this reason, it is necessary to find a solution and find an easier platform that can be used as learning media or counseling that can quickly provide information as well as solutions if SSFFs experience problems, both technical and non-technical.

Aquaculture extension workers in Indonesia have an important role in supporting SSFFs to carry out their fish farming business (Kusmuntono et al 2022). Currently, the number of extension workers is not proportional to the number of available fish farmer groups (Kusmuntono et al 2022). The number of extension workers throughout Indonesia is only 6,274 personnel, consisting of 2,537 civil servant extension workers, 1,987 auxiliary extension workers, and 1,750 self-funded extension workers spread across various regions (KKP 2021). Moreover, according to data from the Statistical Bureau of Semarang city (BPS Semarangkota 2022), the number of SSFFs in the city of Semarang is 1,168 people, while the number of extension workers from the Fisheries Service of Semarang City is only 8 people. This means that one extension worker must be able to guide approximately 177 people in fish farming. This was supported by Elfitasari et al (2019) who asserted that the number of extension services is insufficient compared to the number of SSFFs that require assistance. This very significant comparison between

the number of farmers and extension workers causes problems, such as the inefficient provision of information and assistance (Kusmuntono et al 2022). Locations that are far apart from one SSFF to the other are also an obstacle in assisting. The development of aquaculture technologies should be transferred to SSFF through extension workers, but with a limited number of extension workers, information cannot be rapidly conveyed.

This situation is in line with the research results by Elfitasari et al (2019) that the limited number of extension workers is one of the main problems experienced in the world of aquaculture in Indonesia. The task of extension workers, among others, is to assist SSFF as well as to provide aquaculture information and knowledge. The limited number of extension workers has resulted in aquaculture technology innovations that continue to develop which should be transferred to farmers through extension workers, but cannot be delivered evenly and quickly.

In the current digital era, virtual extension service is one solution to overcome the limited number of extension workers (Elfitasari et al 2019). The use of the internet is expected to facilitate the activities of extension workers in assisting SSFFs through the utilization of smartphones (Ronaghi & Forouharfar 2020). Furthermore, according to Elfitasari et al (2019), virtual extension workers are an extension system by utilizing social media such as WhatsApp, Line, Telegram, and other means of social media to assist the performance of extension workers in supervising and assisting SSFFs. Other social media such as Facebook which provide community group for fish farmers has also proven to increase the knowledge of SSFFs (Elfitasari et al 2018). In recent years, extension workers and SSFFs in the city of Semarang have used WhatsApp groups as a form of communication to facilitate assistance (Apresia et al 2020; Septiara et al 2022). Farmers can exchange information quickly and solve problems without having to worry about distance and time. This is also supported by Purwatiningsih et al (2018) that internet usage can cut costs and eliminate distance and time constraints in the implementation of assistance. Moreover, SSFFs can discuss and exchange knowledge with other experienced farmers and can communicate with extension workers. In addition, Semarang extension workers can act as virtual extension workers by providing information online through this WhatsApp group.

UTAUT model*.* Effectiveness is the relationship between the system and the process of achieving results, where the more effective a system is, the process of achieving results will also be better. The indicators of effectiveness in this study using the unified theory of acceptance and use of technology (UTAUT) of Venkatesh et al (2003) namely performance expectancy, effort expectancy, social influence, and facilitating condition (Blut el al 2022).

Performance expectancy. Performance expectancy is known as the level of the user's trust in a system that the system will improve work performance (Venkatesh et al 2003). Perceived usefulness (perceived benefits) is compiled from 6 aspects: (1) users who use the system will solve work problems more quickly; (2) work performance improves by using the system; (3) increase in productivity; (4) the effectiveness of work will increase after using the system; (5) users feel ease after using the system and (6) the user senses the usefulness of the system in the work (Hernandez & Hernandez 2020; Venkatesh 2022).

Effort expectancy. Effort expectancy is the level of ease in using the system. The effort expectancy indicator has a construction model which is perceived ease of use, complexity, and strength of use. The perceived ease of use construction model has 6 aspects which are: (1) easy to learn; (2) the system can be used according to the will; (3) the system is clear and easy to use; (4) flexible system is used; (5) easy to understand; and (6) the system is easy to find users (Venkatesh et al 2003; Hernandez & Hernandez 2020; Venkatesh 2022).

Social influence. Social influence is the level of trust of the surrounding social environment towards the system used. The construction model of social influence

indicator is subjective norm, social factor, and image. The subjective norm construction model has 2 aspects. The first aspect, the system received support from people who know the user's habits. The second aspect, the system obtains the support of people close to the user. Each construction model is influenced by individual habits directly or indirectly, and the results of the use of technological systems are believed to be seen by others (Venkatesh et al 2003; Venkatesh 2022; Hernandez & Hernandez 2020).

Facilitating condition. Facilitating condition is the level of management and infrastructure that supports the use of the system. The construction model of facilitating condition indicators is perceived behavioral control, facilitating conditions, and compatibility. Perceived behavioral control has 5 aspects. The first aspect, the user has control over the system used. The second aspect, the material that is important to the system is owned by the user. The third aspect, the science of the system is owned by the user. The fourth aspect, the system provides opportunities and new science. The fifth aspect, the new system is compatible with the user style works (Venkatesh et al 2003; Hernandez & Hernandez 2020).

WhatsApp group*.* The development of the internet helps in the search for information about new technologies. This development also helps achieve productivity and increase income. WhatsApp application helps in accessing information about markets, government, and finance. WhatsApp is also a popular mobile application even in rural areas, including SSFFs who utilize this application to expand their market and fish farming network (Apresia et al 2020). The use of WhatsApp in Indonesia in 2021 reached 84.4 million people (Dihni 2021). WhatsApp group ease of use helps disseminate information to members of the WhatsApp group (Thakur & Chander 2018). WhatsApp group has many affordable features such as chat, voice notes, send pictures and videos. In addition, the internet needed for these features is not as big as when making video calls, so it is more affordable and can better overcome the uneven constraints of internet quality in various regions in Indonesia (Daheri et al 2020).

Virtual extension workers*.* A new paradigm emerged for extension workers after the development of information technology. Assistance is no longer required to always be face-to-face and can utilize information technology to communicate with SSFFs. Online extension workers have the advantages of continuous availability (real-time), delivering a lot of information, fast information dissemination and it saves time. Online extension systems can be entered into all aspects, production, management, marketing, and development (Prayoga 2018).

The development of information technology such as mobile phones and the internet can support farmers in obtaining information. Virtual extension workers make it easy for SSFFs to manage marketing activities and aquaculture processes. SSFF benefits economically by implementing this system compared to the previous classical offline system. These advantages are obtained because access to information technology is developed widely and massively even in remote areas. SSFF can promote its results through a virtual network. The dissemination of information can be carried out quickly through an online extension network so that SSFFs can transmit their knowledge to other farmers (Twumasi et al 2021).

Material and Method

Methodology*.* This study was carried out with a qualitative approach. The determination of respondents utilized the purposive method, where respondents have been selected through several predetermined criteria. The criteria of the selected respondents are SSFFs that belong to WhatsApp groups managed by the extension workers. Respondents must also willingly take part in the research and are willing to make time for the interview. There were 21 SSFFs as selected respondents from 3 different WhatsApp groups managed by 3 extension workers. The WhatsApp groups were brackish water SSFF, freshwater SSFF in Mijen area and freshwater fish farmer group in Gunung Pati

area. The extension workers were also interviewed as informants to validate the respondents' answers. The extension workers for the Semarang city Fisheries office are divided into groups based on their working area. This way, it saves more time if they need to do field visits to SSFF groups if they are located in the same area. The data for this research were collected in 2021 over a period of 3 months.

Questions used in this research were constructed using the effectiveness of technology indicators based on Venkatesh et al (2003) unified theory of acceptance and use of technology theory (UTAUT theory) which are performance expectancy, effort expectancy, social influence, and facilitating condition.

Analysis. The analysis involves three steps which are the identification, examination, and interpretation of the data obtained. Data verification used triangulation of in-depth interview data, as well as observation of communication from WhatsApp groups and data from the interview with extension workers.

Result and Discussion. Based on the interview and observation, the four pillars on the effectiveness of technology utilizing WhatsApp group (WAG) created by extension workers, the results obtained are shown in Table 1.

Table 1

Response on the effectiveness of technology by SSFFs

Indicators	*Brackish water forum group*	*Freshwater fish farmer group Mijen*	*Freshwater forum group Gunung Pati*
Performance expectancy	- faster communication; - faster information; - increase productivity.	- easier to obtain information; - faster information; - increase productivity; - one did not increase productivity.	- faster information; - productivity has not increased.
Effort expectancy	- ease communication; - ease information.	- ease communication; - easily active in the WAG; - there is a member that faces difficulty using the WAG.	- ease communication; - easy to use WAG.
Social influence	- support by family; - support between SSFFs.	- supported by family; - supported by extension workers.	- supported by family and other SSFFs.
Facilitating condition	- problems discussed and solved in the WAG; - discussion is not optimized.	- the solution to the fish farming problem is obtained from WAG.	- invitation to meetings; - solutions have not been met in WAG.

According to Table 1, WAGs have made SSFFs experience a shorter time to obtain information from extension workers. Thus, saving time and increasing productivity, although some respondents feel that the WAG did not assist them much in increasing productivity. Nevertheless, by utilizing WhatsApp groups, SSFFs experienced the ease of the way they communicate with extension workers and other SSFFs. Through observation in the WhatsApp groups, overall communication showed that it was supported by family, fellow SSFFs, and extension workers. In the group discussion, SSFFs receive answers fast for both important information and solving problems that emerged although some of the SSFFs on the contrary feel that problems were not solved using WAG.

Performance expectancy. Performance expectancy is the level of trust or expectation of a system's performance by the users. Based on the interview, the results in performance expectancy indicators are shown in Figure 1.

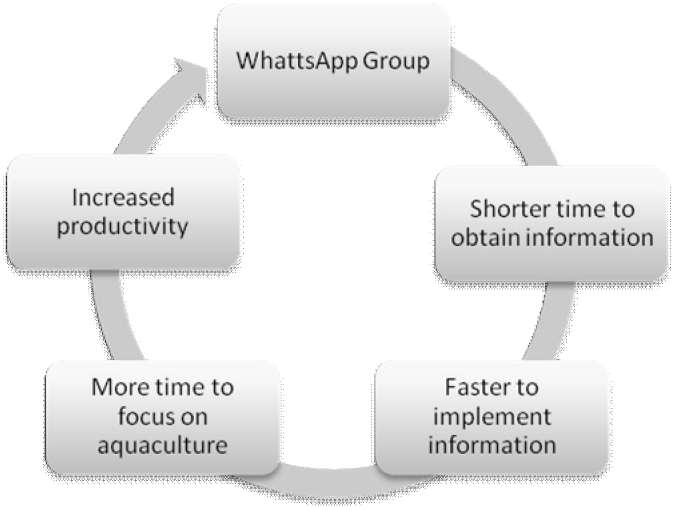

Figure 1. Performance expectancy on utilization of WhatsApp group.

Utilizing WAG to communicate with extension workers has shortened the time for SSFFs to obtain information. This shows that it solved their initial problem of longer time to receive information from extension workers. WhatsApp groups have proven to accelerate communication and information from extension workers to SSFFs. The communication referred to in the result was communication with extension workers as well as with other SSFFs in the group. WhatsApp application itself is known as a communication tool that delivers information rapidly and easily without being limited by space and time by utilizing the internet network used on smartphones (Apresia et al 2020). Although WhatsApp Group can help speed up the delivery of information, unfortunately, was not utilized to the maximum by some of its members. According to extension workers, important information such as training invitations or data collection was responded to slowly by some SSFFs, and sometimes there was even no response. The reason that SSFFs was lack of enthusiasm to respond is that they were busy with work and only limited to reading the information, or sometimes the information was missed. Other possible reasons are that they are not interested in conveying information (Annisa 2020) or SSFF had no internet packages, or simply lazy to respond (Sugandi et al 2019).

The results of interviews of respondents and WhatsApp groups observations confirmed that WhatsApp group facilitates faster information. WhatsApp groups can facilitate information between respondents as farmers and extension workers so that this can add information about fish farming. This was reinforced by Jabbar et al (2021), which state that WhatsApp is a social media that is used to communicate in conveying information quickly. This is also reinforced by Dahdal (2020), who stated that WhatsApp can accelerate communication and coordination, and delivery of information that is quite effective.

Information shared in the WhatsApp group includes new technology, government assistance, available training including how to solve aquaculture problems, and other related information. The faster the SSFF obtains various information has made the SSFF quicker to implement this information. The WhatsApp groups have become an important platform for extension workers and SSFF to continuously share information and discuss aquaculture issues to solve problems. This is reinforced by Wahyuni et al (2017) who state that the frequency of communication affects the number of information obtained, and the more information obtained, the more knowledge gained. This way, whatever information is needed or problems encountered by SSFF can be solved in a shorter amount of time since WhatsApp accelerates effective communication and information delivery.

WhatsApp group increases productivity for SSFF since they no longer need to wait for a long time for extension workers to arrive at their fish ponds to discuss and solve problems. This way SSFF can focus more on their fish farms and be more productive. Based on the results of the analysis, respondents experienced an increase in their

productivity after joining the WhatsApp group. Marketing by utilizing WhatsApp groups can also increase productivity in terms of profit. Utilization of promotions in the WhatsApp group is fairly easy because it is only required to inform the product of the WhatsApp group and wait for a response from other members of the WhatsApp group. According to Hafiar & Lukman (2018), the use of WhatsApp groups for promotion is more effective and interactive and does not cost a lot of money. However, the utilization of promotions on WhatsApp groups by SSFF is not as high as expected. Nevertheless, respondents feel that Whatsapp group can be utilized to the maximum and can help improve product selling. According to Bagdare (2021), WhatsApp social media has a pretty good role in product marketing and can be used to achieve promotional or advertising goals.

Effort expectancy. The result of the effort expectancy in utilizing the WhatApp group is shown in Figure 2.

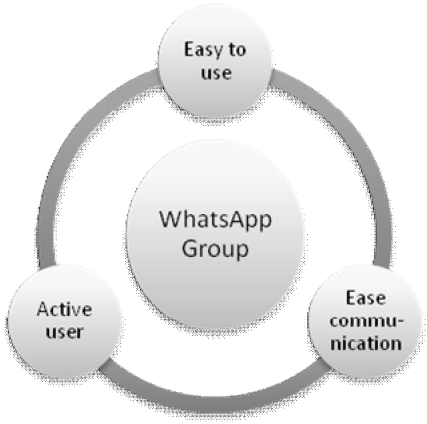

Figure 2. Effort expectancy on the utilization of Whatsapp group.

Effort expectancy is a level of trust or expectation of the ease provided by a system. The results of the analysis of effort expectancy indicators are divided into three aspects. The first aspect, the WhatsApp group facilitates communication and information exchange. The second aspect, the WhatsApp group is easy to use. The third aspect is the activeness of respondents in the WhatsApp group.

The result obtained from the first aspect is WhatsApp group as an online counseling media effectively ease communication and information exchange. WhatsApp group of fish farmers makes it easier for extension workers in the city of Semarang to convey information. Distance and time are no longer obstacles for farmers and extension workers to provide or obtain information. The ease of communication and information exchange in WhatsApp groups can be a solution to the constraints of the limited number of extension workers in Semarang. In addition, good communication can reduce misunderstandings that can adversely affect fish farming activities. According to Jabbar et al (2021), WhatsApp can facilitate communication and information delivery from both individuals and groups.

The result obtained from the second aspect is WhatsApp group is easy to use by participants. According to respondents, the use of WhatsApp only requires touching the smartphone screen. The easy use of WhatsApp groups will not burden SSFF, so this system can be used and distributed for a wider range. This is reinforced by Dev et al (2019) who stated that WhatsApp is an application that does not have age barriers and economic strata, and it is used for discussing work or business-related communication issues. The discussion includes technical fish farming topics, farming administration, socialization of farming, and overcoming problems that occur. Respondents who are active with extension workers will be more aware of the fish farming activities that they carry out and the respondents will be more familiar with the extension workers. This is reinforced by Obiero et al (2019), which stated that farmers and fishery extension workers need to communicate with each other to share information or knowledge and to

cooperate. Whatsapp features include chat messages, voice and video calls, group chats, and sending photos, videos, documents, and voice mail messages. All these features are very helpful for SSFFs and easy to use, as communication media. According to Fauzi (2017) and Narti (2017), in January 2017 WhatsApp application users reached 1.3 billion active users every day. Whatsapp is one of the social media communication applications in the form of chat in real-time and can send files in the form of photos, videos, audio, location, and contact numbers. This way, all members in the WhatsApp group can share photos and videos of their fish ponds or fish in real-time and discuss any emerging situation that needs instant assistance.

The result obtained from the third aspect is activeness because most respondents are active in the WhatsApp group. The activeness of the farmers in the WhatsApp group will increase the union and friendship between SSFFs in Semarang city. The activeness of the respondents is also evidence of the ease of use of WhatsApp groups by SSFFs.

Social influence. The result of the analysis suggests that the social influence aspect can be illustrated in the Figure 3.

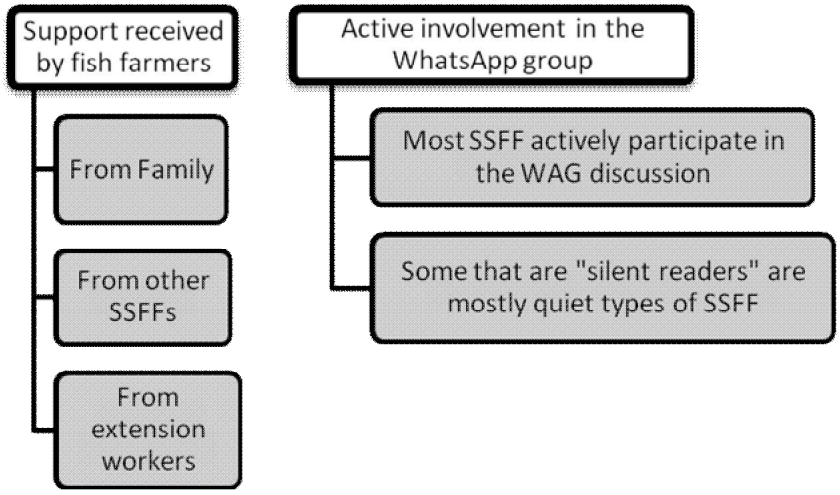

Figure 3. Social influence on the utilization of WhatsApp group.

Based on the results of research on the effectiveness of virtual extension workers through WhatsApp groups, social influence indicators are a level of trust or expectations for the social support of the use of the system. Social influence is used to determine the social support capacity around system users. The result of the analysis of social influence indicators is that online counseling utilizing WhatsApp groups is effective because it is supported by other farmers, families, and extension workers. The social environment of SSFFs in Semarang city supports the virtual counseling system with WhatsApp groups, so this system works well. According to Jabbar et al (2021), social media including WhatsApp easily creates a forum for communicating and exchanging ideas. This makes it easy to communicate and comment on a variety of topics and cases discussed by other individuals.

The activeness to participate in discussions of each subject shows that it is different. Some respondents actively participate in discussions on Whatsapp Group, while some are quiet "silent readers" and do not participate in the discussion. Some respondents are very busy so they do not have time to actively participate in discussions. The activeness of each member of the group is an important element during a discussion on WhatsApp group. According to Hermawan et al (2017) and Afnibar & Fajhriani (2020), the participation of each member in a group is the main element in achieving goals and sustainability in a group activity. Communication is the process of delivering messages between individuals both directly and indirectly and fostering closer relationships with others.

The result of observations in WhatsApp groups also showed that respondents were supported by the families of respondents, especially their wives, support among

respondents, and support from extension workers for the respondents. This shows that the communication carried out by respondents is quite effective in discussing fish farming counseling in WhatsApp groups. The support that is increasingly received by SSFFs will affect the results of fish farming activities carried out. This is reinforced by Elfitasari et al (2019), who stated that the lack of support from extension workers is a problem that quite affects fish farming activity. Fish farmers need close assistance during the implementation of fish farming activities to minimize any unforeseen circumstances.

Facilitating condition. Based on the analysis, the result of this research illustrates the facilitating condition as shown in Figure 4.

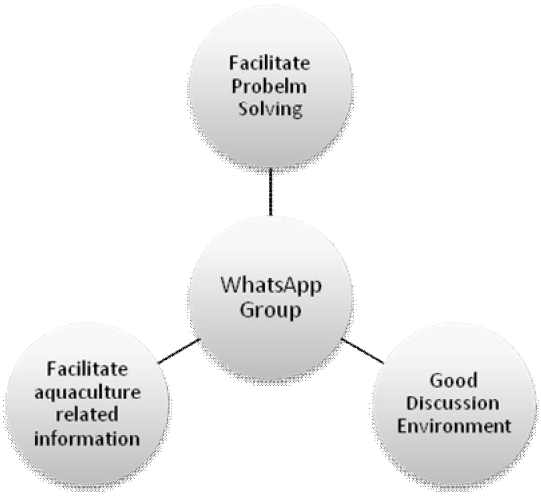

Figure 4. Facilitating conditions on the utilization of WhatsApp group.

Facilitating condition indicator is a perspective of conditions that facilitate the running of the system. According to Venkatesh et al (2003), facilitating conditions is an assessment of the extent to which users believe that there is an organizational and technical infrastructure to support the use of the system.

Facilitating condition in this study refers to the state and features of the WhatsApp group that facilitates online assistance. Based on the results of the analysis, facilitating condition indicators are divided into three aspects. The first aspect of the WhatsApp group provides discussion with an informal and comfortable atmosphere, thus it creates a good discussion environment. The second aspect, the WhatsApp group facilitates problem-solving and the third aspect, the WhatsApp group facilitates the delivery of information related to aquaculture.

The informal atmosphere referred to here is the use of language that is not formal which was shown by the use of stickers and images, so that the SSFFs are comfortable expressing themselves. WhatsApp groups provide a comfortable discussion for most of its members. Discussions in the WhatsApp group itself can help the role of extension workers in identifying problems or needs of farmers, so that extension workers can provide the information needed by farmers quickly and appropriately. According to Ragasa (2020), extension workers act as motivators who can influence the decisions of farmers and become a bridge between farmers and related institutions. This is also reinforced by Setiawan & Permatasari (2020) who stated that information from WhatsApp groups can be disseminated to targets that are not included in the WhatsApp group.

The result obtained from the second aspect is WhatsApp groups effectively facilitate problem-solving. One role of extension workers of them is to provide solutions to problems experienced by farmers. Based on the observation of the brackish water SSFF group, some brackish water ponds are affected by seawater seepage, so the dike became submerged and fish swim out of the pond. The solving of these problems can be done quickly in WhatsApp groups without having to meet with extension workers directly. This is reinforced by Nurmalia et al (2013), that extension workers are expected to help

farmers in increasing production, transferring new information and technology, and identifying and solving problems faced by farmers.

The result obtained from the third aspect is WhatsApp group effectively facilitates the delivery of information related to fish farming. The information referred to were notices, invitations, and more general information such as land certification. Information that is important for the continuity of fish farming can be immediately conveyed through WhatsApp groups, making it easier for extension workers to provide information, without having to visit farmers one by one. According to Ratnadila et al (2019), fishery extension workers play a role in helping the target determine the choice of technology to be used by giving considerations on the use of technology such as cost and revenue considerations, market risk and marketing channels as well as the quality and quantity of products needed by consumers. In order for the information provided in accordance with the needs of the target, the extension workers need to constantly follow the development of science and technology.

Nevertheless, there are a few setbacks regarding the use of WhatsApp. Based on the interview in the freshwater forum, respondents feel that the WhatsApp group has not solved their problems. Members rarely ask about problems that occur because sometimes there is no response from other members so they choose to contact personally to the person who can help them. Another reason is that the respondents prefer extension workers to come to their place so that they can see firsthand how to handle it. Furthermore, sometimes if the questioning was carried out through chat or phone, problems cannot be resolved since it is difficult to explain and demonstrate problem-solving through WhatsApp. According to Prasetiyo et al (2021), WhatsApp can be used very efficiently as a means of sending information such as material in the form of video, voice notes, images, and text but has obstacles such as poor signal connection and limited interaction.

Conclusions. Small-scale fish farmers (SSFFs) utilize WhatsApp as means of communication with extension workers as well as fellow fish farmers. Extension workers in Semarang city developed these WhatsApp groups to ease their duty in giving information and assisting SSFFs. The findings suggest that WhatsApp groups are effective in terms of performance expectancy, effort expectancy, social influence, and facilitating conditions. However, a few setbacks still occur occasionally but still facilitate the main function of the WhatsApp group which is to quickly deliver and ease information transfer and solve problems of SSFFs.

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Conflict of interest. The authors declare that there is no conflict of interest.

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