Chapter 2

LITERATURE REVIEW

In this chapter, a detailed review of existing literature related to the research is discussed. The studies related to the use of ICT tools in fisheries sector in various countries, adoption factors and the determining factors of adoption are discussed. The scope and relevance of the present study are also discussed.

2.1 Introduction

The major objective of the study is to understand the socio-economic impact of the usage of ICT tools and factors influencing its adoption in Kerala marine fisheries sector. This chapter is divided into three sections. First Section 2.2 deals with the socio-economic benefits of the usage of ICT tools. The second Section 2.3 presents the various studies that state about the influencing factors in the adoption of a new technology.

2.2 ICT and Socio-Economic Impact

Technology and technological change are the two major ingredient factors for economic growth and development. Invention and innovation make the technological change in its forms and operation. The diffusion of technology brings the technological change in practice. The potential benefit of any technology is analysed only when a new and more advanced technology is successfully diffused to a large number of end users.

The Section 2.2 has classified the relevant literature on socio-economic impacts of ICT into the literature of World, India, and Kerala. This systematic explanation of the related studies helps to get an idea of the research gap and to understand the importance of the present study.
2.2.1 World

Yamanaka (1982) has conducted a study on the application of space technology on the Japanese fisheries sector. He found that information such as sea temperature, oceanic circulations etc. are extremely useful and valuable to commercial fishermen, for which remote sensing technology is used. Various satellite information and LANDSAT data were used for disseminating information to fishermen for optimizing their fish catch. data and fishermen used it for communication purposes also. With the help of NIMBUS-7 (CZCS) satellite, the study found the data of schooling behaviour of fish and temperature patterns which indicate the dynamic aspects of the ocean, such as oceanic circulation, fronts, up-welling, etc. Coastal Zone Color Scanner (CZCS) which gave a clear picture of chlorophyll with the range of $r = 0.67 - 0.85$. All these factors played a significant role for the development of the Japanese Fisheries Industry. However, the study did not measure the usage level of this information about sea resources.

Akegbejo-Samsons (2006) conducted a study on pilot fishnet initiative (FNI), a model information network of the Ilaje Local Government area of Ondo State, Nigeria. FNI was established with the aim of networking all the fisher population in the administrative area through various means such as workshops, training courses, study tours, conferences and sharing printed publications of information. Various cooperative groups were used for the dissemination of information about the marketing and fish distribution through traditional methods like village meetings and modern communication methods such as Television, leaflets, radio, posters etc. The level of effectiveness of this information was observed for a period of six months. The study found that the ICT tools have larger coverage and more effectiveness. The study focused only on the role of FNI for extensive activities of technology diffusion but it lacks the measurement of its utility.

Omar et al. (2011) stated that there is a significant relationship between ICT and Community Development in the Malaysian coastal belt. Groups such as farmers, students, teachers, rural administrators, and entrepreneurs have benefited from the usage of ICT. It was found that the ICT tools such as GPS, Sonar system, wireless set, fisheries remote sensing, computer, internet, and mobile phones have offered large benefits to the Malaysian fishermen. These fishermen were encouraged to use the online services pro-
vided by the Department of Fisheries (DOF) and the Fisheries Development Authority of Malaysia (LKIM). DOF has introduced Networking System of Fisheries Information (NSFI) which provides services like E-training, E-extension, E-aquaculture, Vessel Monitoring System (VSM), E-license, E-fund, E-fishermen, and Fish Online. The study also found that that ICT tools have helped to increase the fishermen’s knowledge, rural community literacy level, communication process, and reduced the digital divide, and thereby enhanced the socio-economic development. ICT increased productivity and provided the right information for enhancing the fisheries inputs, weather, markets, new production techniques, and farming technologies. The study also cited various obstacles in the usage of ICT; such as lack of interest, risk factors, low bandwidth, lack of proper hardware and software, lack of appropriate infrastructure, low number of websites, weak telecommunication systems, high cost of access, increase in maintenance cost and lack of investment by private and public sectors. Technophobia, the negative attitude about modern technology, lack of social interaction and prejudiced beliefs are major social barriers in the adoption of ICT. A significant limitation of the study is that it focuses neither on the capability level of ICT usage of fishermen and nor identified determining factors.

Salia et al. (2011) assessed the effects of mobile phone usage on the artisanal fishermen in the Effutu Municipality of Ghana. They found that the usage of mobile phones among fishermen enhanced the efficiency of input and output markets for artisanal fishing and also improved their businesses relations and livelihoods. Usage of mobile phones resulted in market efficiency, better fish price, improved income, expanded markets network, improved safety at the sea, and easy communication between the family members and with other fishermen. One of the major findings of the study was that the fishermen used their mobile phones as ‘umbilical cords’ which connected them to their suppliers\(^1\), buyers and families. This has reduced the transaction costs tremendously and the risk involved in the supplies of essential goods, and also enabled them to access information in minimum time. These frequent interactions helped the fishermen them to build trust and confidence among them in their businesses. Through Principal Component Analysis, the study found four major categories of reasons for using mobile phones, namely cost

\(^1\)(70% of the fishermen visited more than two landing centres which show statistically significant rate, \(Z= 10.074, p<0.05\))
reducing factors, safety factors, coordination factors, and market expansion factors. The cost reduction factors loaded most strongly on three items, with loadings ranging from 0.76 to 0.79 and 27.9% of variance. Safety factors (loadings of ranging of PCA was from 0.76 to 0.80, with 14.5% of the variance) refer in particular to the usefulness of the phone during the time of emergencies such as engine breakdowns, change in weather conditions etc. The study revealed that mobile phones helped the fishermen to expand their markets by finding new customers and to best prices from within and outside their local landing sites. Among the service providers the best service was given by Vodafone (96%). The major challenge was facing by fishermen using mobile phone is the problem of network coverage. In effect, mobile phones helped the fishermen to make informed decisions on who, where and how much to sell their fish catch. The study focused only on the mobile phone technology and not studied about other ICT technologies.

Shaffril et al. (2012) carried a pre-test study to understand the reliability of the usage of ICT tools such as; GPS, sonar, echo sounder, the wireless set and mobile phone among the fishermen of Port Dickson, Malaysia. The study found that ICT tools helped the fishermen in saving time, more money, saving the life, and fuel. They did a pre-test process among 30 randomly chosen registered fishermen and applied a reliability analysis and thus developed the Unified Theory of Acceptance and Use of Technology (UTAUT) model\(^2\). Cronbach alpha value of measured parameters was ranging from 0.714 - 0.970, whereas performance expectancy showed 0.949, social influence showed 0.860, facilitating condition 0.897, behavioural intention 0.856, effort expectancy 0.933 and voluntariness of use showed the highest value of 0.970. The study focused on how ICT projects such as Rural Internet Center and Rural Info Center in encouraging the usage of ICT in the community. A major limitation of the study was not measuring the diffusion rate of each ICT tools.

Omar et al. (2012) studied the role of ICT in the socio-economic development of fishermen and found that mobile phones, GPS, sonar, radio, television and internet were benefited for the poor people. The study found that mobile phone are the most preferred tool for enhancing the (97%) market efficiency, made information faster and cheaper, helped to communicate with their friends, relatives Meteorological Department, access to

\(^2\)UTAUT is the modified version of Technology Acceptance Model (TAM). Davis Jr (1986) proposed Technology Acceptance Model (TAM) to address why users accept or reject information technology
market buyers and also helped to new update new events. The study found GPS (31.5%) as the second most preferred tool after mobile phone. GPS helped the fishermen to identify the location and to ensure their safety. They also found that the fishermen resorted to the radio (45%) and TV (65%) also for updating the market prices and weather information. The results revealed that ICT brought about significant improvement in their life.

Bolong et al. (2013) found that technology usage was recognized as one of the ways of increasing productivity through the study of the readiness to use geographical positioning systems (GPS) by younger fishermen in their fishing operation. The study found that 80% of young fishermen of Malaysia used mobile phone and GPS was used only by 25%. The study also identified significant and positive correlations between GPS usage and young fishermen’s income \( (r = 0.194, p < 0.05) \) and usage of echo- sounders and young fishermen’s income.\( (r = 0.209, p < 0.021) \). To analyse this, they developed an Extended Technology Acceptance Model (ETAM). The model was pre-tested for the reliability analysis and used Cronbach alpha test to understand the knowledge, problem, usage, and readiness of young fishermen in Malaysia. The major limitation of the study is that the research used only reliability analysis to study the impact of ICT in the fishing sector.

Zaremohzzabieh et al. (2014) used Structural equation model to find out the factors influencing acceptance of ICT tools among 400 Malaysian fishermen. They applied Unified Theory of Acceptance and Use of Technology (UTAUT) model and its attributes to test behavioural intention of the use of ICT tools and used the Structural Equation Model (SEM) to test the relationship of ICT, age and experience. The study found the variance of 25% in the adoption of ICTs which was due to user intention, facilitating condition, performance expectancy, and effort expectancy with the help of UTAUT. Factors such as, facilitating condition \( (\beta = 0.7CR = 1.136, p = 0.00) \), performance expectancy \( (\beta = 0.138CR = 1.987, p = 0.047) \), and effort expectancy \( (\beta = 0.197CR = 3.304, p = 0.000) \) were found main influencing element of ICT usage. The study also found a moderate effect on the age and experience of fishermen in using ICT tools and their analysis. The major limitation of the study is that the researcher used only external determining factors in the adoption of ICTs and failed to use internal and organisational factors.
2.2.2 India

Information and Communication Technologies (ICT) play a very important role in economic growth and development of India. (Jakhar, 2005) concluded that ICT has contributed profusely to promoting the economic growth of the nation through employment generation, GDP contribution, exports and to development of the industry.

Gine and Klonner (2008) conducted a study in Tamil Nadu on the diffusion of plastic reinforced fibre boat (FRP) and analysed the income inequality status among the fishermen. They found that wealthier entrepreneurs adopted the FRP earlier than the rest and the technology adoption widens the gap between the rich and the poor. But after the entire community completed the introducing FRP, the inequality dropped to a lower level than before. This implies that, in the long run, the innovation benefited the poor more than proportionately as suggested by Kuznet’s (1955) in his inverted ‘U’ shaped income distribution curve. The study found that constraints of credit and uncertainty cited as the major problems in the adoption of FRP. The study also found that adoption of new technology and inequality in income increased in the initial period (Gini index was increased from 0.34% to 0.38%) and after adoption, average income was increased and the inequality between rich and poor decreased substantially to 0.31. The study was also observed that only the boat-owning fishermen made the operation of fibre plywood boat (FRP) economically viable by optimally resolving the trade-off between maximizing daily catches and harming the gear. Adoption was preferred to non-adoption if

\[
(1/1+r)t \times yF > yC + ra0,
\]

where substituting for \( t \) and simplifying get

\[
yF > yC + rK.
\]

\( Y_f \) is income from fibre boat, \( yc \) income from cattamaram, \( ra \) is total wealth, and \( k \) is an investment. This study was based only on the income aspects of the adoption and did not focus on any other constraints in the adoption of a new craft.

De et al. (2008) studied the uses of ICT tools among the aquaculture farmers in the various state of India. They stated that improved communication and information access was directly related to the social and economic development of aquaculture farmers. The study focused on the role of Agricultural Technology Information Centres (ATIC) which serves as a single window system with an objective to help farmers and other stakeholders. It provided a solution to their location-specific problems related to aquaculture farming.
and made available all the technological information. The study also revealed that ATIC played a major role for the effective use of ICT projects in various parts of India, like e-choupal for helping the poor to improve their lives through the application of ICT, named Aqua Choupal in Andhra Pradesh. It found that modern communication technologies helped to improve communication, dissemination of information and sharing the knowledge and skill of farmers. The major drawback of the study is that it analysed only the supply side of the dissemination of information about new technologies and not the capability of farmers’ knowledge on the new technology of the adoption.

Solanki et al. (2008) analysed the usage of satellite data particularly Ocean Colour Monitor (OCM) for chlorophyll concentration and sea surface temperature (SST) by fishermen of Gujarat to identify the fish potential zones (FPZ). OCM data helped the scientists to retrieve information on ocean colour parameters such as, phytoplankton pigment (i.e., chlorophyll concentration) which helped in the estimation of certain fish shoals in the Arabian Sea. The study also observed the anti-cyclone eddies using satellites which helped the fishermen not to operate in such an area of the sea. The study has estimated the FPZ areas and distributed the information to the fishermen, which helped them to identify specific regions of fish shoals and it increases their fish catch. However, the study did not mention how effectively the fishermen were able to use GPS and other ICT tools for fishing, without which locating the FPZ is very difficult.

Joshi and Ayyangar (2010) conducted a study about the use of satellite communication technology for fishing in India. They found that satellite communication was one of the most preferred medium of communication which helped the fishermen to access timely, reliable and accurate information on meteorological and oceanographic parameters. The ICT tools such as radio, wireless sets (marine walkie-talkie), and mobile phones, were useful for effective communication among the fishermen. The study found that the affordable ICT gadgets like the mobile phone have helped the fishermen to effective communication. The study also found that Remote sensing application was primarily used for identification of PFZ and forecasting of weather and cyclone in Indian coastal regions. But, these tools were not put to effective use by those fishermen who, prefer deep sea fishing. They concluded the study by stating that the satellite communication was an effective solution for the fishermen community and it would reduce the distance barrier.
However, they were sceptical about the usage of this tool by these fishermen. The major limitation of the study is that the study has provided a generalised idea about communication technologies without any experimental studies.

Govindaraju and Mabel (2010) studied the role of VKC (Village Knowledge Center) in a coastal village, initiated by the local Parish Council in Kovalam in Southern Tamil Nadu. The main objective of VKC was to serve the people with the e-governance, e-agriculture, e-education, e-health and other services free of cost. The study revealed that the people of Kovalam was accessing the services of VKC and did not show any disinterest in the introduction of new technology. Fishermen of this coastal village used mobile phone with GPS services for fishing and related activities. The study also revealed the massive influence of VKC’s in the daily life of students and the women of the fishing community. VKC has helped to spread awareness about technologies among the villagers and thus brought social development in the region. The major limitation of this study is that it studied about the role of the organisation in the dissemination of the information only and ignored the adaptive capacity of each fisherman in using ICT tools.

Gangadhar (2011) found the correlation between the innovation in the field of information flow and its application in deriving larger benefits through sectoral development. Mobile phones played the role of carriers and conduits of information and helped the fishermen for reducing the information asymmetries in fisheries markets. Mobile phones helped to coordinate the economic activities of the market and helped to maximize the revenue through information about price in various markets. He also found that the ICT helped the fishermen to spend less time idling on shore and at sea, and owners and agents went to the landing centres only when they had received information (via mobile phones) about their boats. The study concluded that the claimed that the markets became more efficient and thereby the uncertainty of information the price dispersion has reduced. ICTs contributed constructively both to livelihoods enhancement and poverty reduction of fishing communities. The major limitation of the study is that it focused only on the usage of mobile phones among the fishing community.
2.2.3 Kerala

Studies on the impact of ICT tools in the marine sector of Kerala are very limited. Most of the studies are related to the usage of mobile phone among fishermen. Abraham (2007) studied the influence of mobile phones among the fishermen in Kerala and observed that the introduction of mobile phones reduced the risk of fishing. Mobile phones helped to reduce the uncertainty of price fluctuations in the fisheries sector and thereby enhanced the productivity and quality of the fish catch. Fishermen use the mobile phone to share information about life-saving equipment, fishing location and fish pricing. Mobile phones played a significant role in Kerala marine industry. The study found that more than 80% of the total respondents believe that mobile phone is very useful for fishing activities. The major beneficiaries of the mobile phone are fish merchants, transporters (50% got productivity gain and profit by reaching on time) and agents whose waiting time has been reduced by seventy per cent. The study clearly found that the use of mobile phone in fishing has led to gains in productivity and existence of Marshallian surplus (sum of consumer and producer surplus), which reduced the mismatch between the demand and supply in the fishing sector. The use of mobile has also improved the welfare and standard of living of fishermen community. The major limitation of this study is that only looked at mobile phones as ICT tools by ignoring the role of other ICT tools.

Jensen (2007) has studied about the use of mobile phone among the fishermen in Kerala. He found that the use of mobile phone reduced price dispersion in fish markets, (declined from 60-70 to 15% or less), and reduction in fish wastage. He claimed that the fisheries sector transformed from a collection of essentially autarkic fishing markets to a state of near-perfect spatial arbitrage due to the usage of mobile phones. He also found that the use of mobile phone helped the fishermen to increase profits by eight percent, reduced consumer price by four percent and enhanced consumer surplus by six percent. He used the monotone likelihood ratio property, a property ratio assuming two probability density functions (PDFs) \(^3\) of fish catch zone and Bayes-Nash equilibrium methods for analysing the effective use of mobile phones communication in the sector. The study

\(^3\)PDF shows \((x_i/H)\) and \(f(x_i/L)\) where catchment zone can be either a high (H) or low (L) density state. The catch for fisherman \(i\) thus follows the distribution \(f(x_i/d)\), where \(x_i\) takes values from zero to \(x_{max}\). So that \((x_i/H)\) and \(f(x_i/L)\) is increasing in \(x\), i.e., catches are more in high density than low-density areas.
found that the mobile phone helped the fishermen to sell their fish in the non-local market if their high catch yields more profit (more than operating cost plus transport charge) than the local markets. He conducted the study on the usage of mobile phone and its benefits among the fishermen but did not mention about the benefits of other ICT tools such as GPS, wireless set and beacon for enhancing their income and welfare.

Pillai and Nair (2010) has conducted a study on the use of Potential Fishing Zone (PFZ) information generated by the Indian National Centre for Ocean Information Services (INCOIS) by ring seiners along the Kerala coast during the period 2006-2010. They found a positive and significant relationship between PFZ and the occurrence of commercially important pelagic fishes. The study found that PFZ data was useful for artisanal, motorized and small mechanized ring seine fishermen to help to catch more pelagic fish resources and thereby improves their income. The study analysis also showed that the catch per unit effort (CPUE)\(^4\) of fish was more in notified areas compared to non-notified areas. The study also found that SST based advisories were more and the advantageous for locating mackerel, tuna, anchovies and carangids fishes, whereas Chlorophyll based advisories were more and the advantageous for locating matured oysardine. The study revealed that the quantity of fish caught in notified areas is about 2 to 6 times more, the percentage of monetary benefit obtained in notified areas is about 2 to 7 times more than the usual. The major limitation of this study is that it is focused on the experimental study by using specific data which could not be generalised. This study lacks the clarity on the usage level of GPS, which is the main technology for successful application of PFZ information.

Sreekumar (2011) studied the social and cultural dimension of the adoption of mobile phones among fishermen in Kerala. He stated that fishermen in Kerala use mobile phones due to cultural and ecologically factors. He found that they used mobile phone to transfer information about the availability accessibility of fish in a particular area. The study also found that the usage of mobile phone helped to improve cooperation among the marginalized group of fishermen, especially in sharing information about fishing location, safety and rescue in the sea. He called the mobile phone gadget as ‘collectivist machine’

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\(^4\)Catch per unit of fishing effort (CPUE) is the total catch divided by the total amount of effort used to harvest the catch.
due to its benefits. The study found that the presence of collusion behaviour of buyers due to the mobile phone marginalised women fish vendor. The major limitation of the study is that it did not mention the use of other ICT tools which are also prime cause for enhancement of income and welfare of the fishermen.

Srinivasan and Burrell (2013b) found that mobile phone was a rapidly diffused ICT tool in Kerala fisheries sector which helped the fishermen to get the right market price for their catch. They found that fishermen used the mobile phones to communicate with their family members about their schedules of fishing and other personal matters. They were also used mobile phone for calling auctioneers and export dealers rather than the buyer for a better price. The latest market information also accessed through the mobile phone while they are at the sea. They found that fishermen of Kerala use GPS and echo-sounder along with mobile phones to share fishing location among the fishermen. They also use wireless set to connect with the shore and other fishermen in case of any emergency situations such as insufficient fuel, damaged engine etc. The study found that fishermen used GPS to mark and specify the exact location of fish shoals. The study has concentrated only on the benefits of ICT tools in Kerala marine sector and not studied the diffusion or adoption of ICT tools among the fishermen.

Steyn and Das (2016) conducted a study about the role of the mobile phone in Kerala fisheries sector and they found some contrary results to that of Jensen (2007). They found that mobile phone was used by the fishermen for getting finance, knowing the time of landing of their boat, price information etc. also. The study also claimed that Jensen (2007) presented his study as an over-generalization by considering different market condition, oceanography, fish species, weather patterns, infrastructure, market practices, and more as unique. The study found that fishermen used mobile phones not to determine the market price, but, to communicate to the land on bad weather. He found that multi-day fishing boat (trawlers) use ICT tools such as GPS, echo sounder, and wireless set along with the mobile phone. The study also found that the fishermen did not use the mobile phone for their economic welfare, but used it for the enhancement of emotional and social welfare.

From this comprehensive literature review, the present study observed that most of the
studies have considered only the use of mobile phone as ICT tool in the fishing sector. All the studies focused only on the benefits of the mobile phones in fishing and generalized the capability of the use of new technology by the fishermen is ignored. No study in Kerala has conducted on the usage and benefits of ICT tools other than the mobile phone. The fishermen are using GPS, echo-sounder, wireless set and beacon, especially the traditional small-scale motorised fisher population. Further, understanding the present usage level of ICT tools small-scale fishermen of motorised fishing crafts will immensely help to make future marine policies for the fisheries sector. Thus, the present research work carried out to study systematically about the importance and usage level of all available ICT tools for fishing among the small-scale motorised fishermen.

### 2.3 ICT and its Determinants

A clear understanding of the determining factors of the adoption of a new technology is crucial for analysing the intensity of adoption of the technology. The success of an effective ICT diffusion is perceived in terms of the factors that influence technology adoption (Peansupap and Walker, 2005). Rogers Everett (1995) claims that relative advantage, compatibility, complexity, trialability, and observability are the main internal factors that affect the adoption of new technology in a social system. Also, geographical difference, culture, skill development, infrastructure (Hall and Khan, 2003), and organisational support (Wilson et al., 2002) facilities are the external factors influences the adoption process. Factors such as management skill, individual interaction, new technology, and work environment are found to have a positive influence on ICT diffusion in the Australian construction sector (Peansupap and Walker, 2005). Government policies, human capital, wealth, and infrastructure facilities are found the influencing factors of ICT expansion in five Latin American countries (Ngwenyama and Morawczynski, 2009). Researchers in agriculture sector found that factors like infrastructure, level of income, and human capital (education, technical skill, social networks) have led to a significant influence on adoption of a new technology (Feder and Slade, 1984; Rahm and Huffman, 1984).

Related knowledge and experience of innovation are associated with the faster rate
of adoption process of a technology (Dickerson and Gentry, 1983). Stoneman and Kwon (1996) states that, profit is increased when a new technology is adopted which determined the rank and stock effect in the UK engineering industry during 1982-86. Del Aguila-Obra and Padilla-Melendez (2006) found a contrary result in his study. He found that the size of a company or a firm does not influence the adoption of internet technologies but the managerial capabilities of people influence for the same. The smaller the size of the firm, the greater is the possibilities of using external advice for adopting Internet technologies. Because small firms usually have fewer managerial capabilities. Arvanitis and Hollenstein (2001) have studied the adoption behaviour of Swiss manufacturing firms in the field of Advanced Manufacturing Technology (AMT). They found that benefits and costs of adoption, the firm’s ability to absorb knowledge from other firms, firm size, and experience are the main influencing factors in the adoption of a new technology. Bandiera and Rasul (2006) found that the family and friends are major influencing factors of the adoption of new crop among farmers of Zambezia region of Northern Mozambique. He found that the shape of the adoption process shows an inverse-U. This is due to the social effects of the individual adoption decision were positive when there were a few adapters in the individual’s information network, and negative when there were many adopters.

Based on the available studies, the present study has segregated the various factors that affect the adoption of a new technology into three categories namely, internal, external and organisational factors (Butler and Sellbom, 2002). Table 2.1 shows the different categories of determinant factors of adoption of a new technology.
### Table 2.1
Studies related to determining factors in adoption of a new technology

<table>
<thead>
<tr>
<th>Area/Sector</th>
<th>Authors</th>
<th>Internal factors</th>
<th>External factors</th>
<th>Organisational factors</th>
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<tbody>
<tr>
<td>Agriculture</td>
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<td>Income</td>
<td>Social influence</td>
<td>R&amp;D</td>
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<td></td>
<td>Kripa and Mohamed (2008)</td>
<td>Tariff</td>
<td>Social system</td>
<td>Farm size</td>
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<td></td>
<td>Mittal et al. (2010)</td>
<td>Cost</td>
<td>Time</td>
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<td></td>
<td>Mazuki et al. (2013)</td>
<td>Ease of use</td>
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<td></td>
<td>Ofuoku et al. (2008)</td>
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<td></td>
<td>Walker (1969)</td>
<td></td>
<td>Culture</td>
<td>Work place</td>
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<td></td>
<td>Hollenstein (2004)</td>
<td></td>
<td>Occupational status</td>
<td>Size of industry</td>
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<td></td>
<td>Giunta and Trivieri (2007)</td>
<td></td>
<td>Age</td>
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<td></td>
<td></td>
<td>Social influence</td>
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<td></td>
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<td>Experience</td>
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<td>Service</td>
<td>Karshenas and Stoneman (1993)</td>
<td>Relative advantage</td>
<td>Social interaction</td>
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<td></td>
<td>Rogers (1995)</td>
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<td></td>
<td>Kargin and Basoglu (2006)</td>
<td>Compatibility</td>
<td>Demonstration</td>
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<td></td>
<td>Baliamoune-Lutz (2003)</td>
<td>Observability</td>
<td>Education</td>
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<td></td>
<td>Wareham et al. (2004)</td>
<td>Profit</td>
<td>Age</td>
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<td>Massini (2004)</td>
<td>Usage</td>
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<tr>
<td></td>
<td>Macharia and Nyakwende (2009)</td>
<td>Income</td>
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<td></td>
<td>Lee et al. (2011)</td>
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Source: Compiled from the previous studies

### 2.4 Summary

The literature survey shows that ICT tools benefited the fishermen in various ways including enhanced communication, understanding the distribution of fish resources, enhancing the fish catch, and for improving their income. The epidemic approach was used as one of the main approaches to the diffusion of a new technology in the agricultural sector. There are various diffusion models successfully tested empirically in the agriculture and industry sectors such as Logistics, Bass, and Gompertz methods. There are several factors influencing the adoption of a new technology in the sector, suggested by various researches.