Original Article

Utilization Of Developed And Transferred Technologies Of TVET By The Society In Addis Ababa For Combating COVID-19

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Abstract

Purpose – In this research work, emphasis is made on collecting society response and acceptance levels of technologies developed and transferred by TVET Institutions. Critical information on the technical and performance parameters of transferred technologies was received from many respondents who were closely associated with society.

Design/methodology/approach – Th**e** methodology included questionnaires based on 5-point Likert scale questionnaire with an objective to ascertain the acceptance levels of technologies developed and transferred by TVET Institutions. The questionnaire contained queries addressing variety of issues, like type of technologies developed and developing, manpower participating in technology development, problems associated with technology development and transfer. The methodology followed was based on the analysis of the response received on technical questionnaire that was designed and responses received from the people located in Addis Ababa city

Practical Implications: COVID-19 has been rising and mutating in many countries since it was discovered by the end of 2019. Many countries, including Ethiopia has seen the spike and fall of COVID-19 regularly. This non-linear behavior of COVID-19 infection rate curves around the world has prompted many educational institutions like TVET (Technical Vocational and Education Training) institutions located in Addis Ababa to develop and transfer technologies like hand washing machines, face masks, sanitizers and other anti-covid technologies. These equipment's posse's characteristic simple operational and quality properties like usability, functionality, efficiency, etc. This research will help to gather the technical information pertaining to design, quality and performance of Hand washing equipment's, face masks, Hand sanitizers and other equipment's from the society.

Findings - Divergent and constructive opinions were received from the society to improve and meet the ever-rising demand for anti-COVID-19 technologies. The user response on developed and transferred technology prove the usefulness to combat COVID-19 spread but also finds many applications with in the life of the public. Cronbach alpha reliability test value of 0.73 was obtained after analysis of the response data. The results prove the excellence and consistency of the responses received on the development and transferred technologies. Overall, the research findings help to build and transfer most robust, quality and cost-effective technologies that is a need of the hour to fight against COVID-19 transmission.

Originality/value – COVID-19 has posed many challenges to public and has resulted in many deaths in Addis Ababa and entire Ethiopia. This work is unique and would make valuable contribution and gather information from the society on the design and technical aspects of developed and transferred technologies by TVET Institutions used for combating COVID-19.

Keywords: Cronbach alpha, TVET Institution, Cronbach alpha, Hand washing machines, Hand sanitizers, Corona Virus, Reliability Test

Introduction

For the past year, the rise and fall of coronavirus infections are being witnessed with many successive infectious waves that have dominated all parts of the world and Ethiopia is no exception. With the COVID-19 infection rate coming under control in many counties there are many challenges that COVID-19 has posed to society. The public and students at large are facing regular shut down and lockdowns due to the spread of these viruses at the society level. Due to this dangerous rise and fall of the COVID-19 infection curves in many countries, many universities and institutions all around the world have started working on technologies like Hand sanitizers, UV sanitizers, face masks, hospital equipment's like ventilators, increasing the capacity of making oxygen to treat COVID-19, infected patients. Society is demanding anti-covid technologies at cheaper and more affordable prices so as to ensure the safety of people and allow them to successfully lead their daily lives.

Recent studies on technologies used for combating COVID-19 indicate the rise in the utility of new technology-based equipment's as reported by Boston Consulting Group in their recent survey on society's acceptance of COVID-19 technologies. Many countries have now started using digital media and technologies to communicate in a faster way and prevent the spread of COVID-19. In addition, many sensor-based hand washing stations, sanitizing robots, automatic soap, and hand dispensing systems are being developed and sold in the market today. Some have even conducted experimental studies on the acceptance of these technologies in different community circles.

Efforts are put to develop cost-effective and best quality technologies and transferred to society by many educational institutions today. This research paper focuses mainly on analyzing and seeking input from society for further development and improvement of technologies that have been developed and transferred by TVET Institutions for public use in and around Addis Ababa city.

The research questionnaire mainly focused on many technical aspects like the quality, sufficiency, ease of operation, timely delivery, cost effectiveness and service of the technologies that has been developed and transferred by TVET Institutions. The methodology followed was using purposive sampling technique involving participation of people in Addis Ababa. Collection of society response data was carried using questionnaire based on 5-point Likert scale measurements. The data analysis was carried out using SPSS software. Cronbach alpha value was calculated to check the reliability values of the response data. The overall society response data indicates the need for more and innovative technologies required to be developed and transferred since there are unseen challenges posed by COVID-19 till date.

Technologies developed and transferred to society to combat COVID-19

Many technologies are being innovated in Ethiopia and TVET institutions to combat COVID-19 spread. The developed technologies range from fabricated hand wash machines to making ventilators that are aimed at combating the outbreak. TVETs and other NGOs (Non-Governmental Organization) have contributed to society different technologies ranging from mechanical ventilators to infection tracking software are collaboratively developed in many cases with the help of Ethiopian technology enthusiasts so as to prevent the spread of the virus.

Many of Ethiopia's Technology oriented coronavirus projects are basically aimed to solve the dearth of technologies available at the society level to combat COVID-19. Some of the Technology development organizations like TVETs manufacture technologies at a cheaper price and using local materials. Organizations like NERD (New Era Research and Development Center) are working on developing prototypes like emergency ventilators with the help of many multinational organizations.

Due to the highly infectious nature of COVID-19, many people's lives have drastically changed. People are finding it very difficult to fulfill their daily needs without engaging closely in activities related to having food in public places, work, friendship, entertainment, schooling, etc. In order to compensate for all difficulties, people are now going for many technologies innovated both mechanical and digital types to carry out these activities. Many service providers are involved in the delivery of food by taking online orders, liquor stores, grocery stores, laundry, and dry-cleaning services are also being provided through online requests now in Ethiopia.

Many Educational Institutions and universities are presently putting their efforts to educate and transfer technology being developed and help prevent the spread of the virus in public places Xi.V.Wang et.al (2021) has reviewed many applications of robotic technologies. They are of the opinion that robotic technology has the potential to leverage the workload in any medical organization treating COVID-19 patients. They reviewed 280 publications on robotic technologies used for combating COVID-19. Robotics help in the delivery of essential items in contagious areas, they also help in surgical applications. The authors also conclude that machine learning algorithms and Artificial Intelligence strengthen robotic applications. Yang Shen et.al (2020) carried out a similar analysis of robotics covering 200 reports on robotic systems. So, robots continue to be used in COVID-19 swab collection, conducting serological tests and in the diagnosis and analysis of swabs using automatic fluid handling robots.

Marie Lindblad et.al (2019) conducted experiments on the utility of automated UVC (ultra violet-C) decontamination units when used for decontaminating to burn ICU (Intensive Care Unit) at different positions. The UVC light is scattered and absorbed by the microbes which are prevented from further replication since the UVC attacked the RNA and DNA cells present in the microbes. They conclude that the amount of UVC dose would depend on how far the light source and the irradiated area and the shadows of the object are being formed. The authors conducted data analysis using SPSS Statistical Software.

Sera Whitelaw et.al (2020) reports the usage of digital technology in planning and analyzing the response measures imitated to combat COVID-19. They discuss many technical parameters which are digitally adopted to control the spread of COVID-19. In their study, they refer to COVID-19 control parameters like fatality rate (should be 1 %) and provides a detailed framework for the application of digital technology tools. They also refer to software used to record the patient data like the one used in the Singapore Ministry of Health (Upcode) and John Hopkins University (Health Map). Using digital technology, they are able to do efficient COVID-19 infected patient surveillance through digital cameras and software (Ninghao Zhu. et.al 2020; Jobie budd et.al 2020). Some of the digital technologies used are facial recognition technology, global positioning system (GPS) location and tracing analysis software, and smart watch application (used in Germany).

Ababu et.al (2016) developed a press tap handwashing device for enhancing hand hygiene practices in African countries. The main objective of their work was to provide cost-effective press-tap handwashing devices at schools and other public places. The installation of these press-tap handwashing devices has prevented cutting the communicable disease transmission cycle in public places.

Gbasouzor et.al (2014) worked on the development of automatic hand washing machines with drying facilities being provided along with hand washing units for the Nigerian community. The device was an automatic and touchless type. The authors developed a highly compatible and utility-oriented hand washing machine providing detailed calculations on the consumption of water, pressure requirements, heat requirements for drying, and the cost involved in the development of this unit (Shegun Victor Oluwatuyi.et.al, 2020). The authors are successful in developing this device, which is used in offices, domestic marketing centers, and near restrooms located in public places.

Research Methodology

In this research descriptive research methodology was used. The target population and the nature of the study are decided based on the quality and the extent of information that has to be collected so that the data can be analyzed both qualitative way and quantitative way. The characteristics of the present research work have a post-positivist worldview. This is a scientific approach to carry out the research and has a deterministic philosophy. The research encompasses technology transfer problems, research problems, and society research questions (Constantin Micrcioiu et.al, 2017; Harry N. Booe, et.al, 2012; Janice A.Husted et, al, 2000; Norman G, 2010).

The society response data is collected through the instrument (questionnaire that is based on a 5-point Likert scale) (Jacob J.et.al, 1971; Maeda & Hotaka, 2014; Mhd Forhad Hossain,et.al,2014; Meek.et.al,2007) carefully designed so

as to ensure maximum and useful information about technologies designed and transferred to combat covid-19. The respondents were asked to complete the questionnaire after developing a clear understating and analyzing relevant information asked in the questions. The questionnaire adhered to the basic standards of reliability and validity, which is the prime requirement in such research work.

Data Collection and Analysis

The sample size of this research involved 36 respondents. For the Likert scale-based questions, all the respondents replied and the response rate was 100 %. The total number of questionnaires distributed to respondents' communities in the Addis Ababa region was thirty-six (36). All the questionnaires were administered by a Federal TVET research team. The questionnaires were distributed to the society which was completed and returned. Table 1 shows the respondents data who took part in this research. The recorded responses showed a 99.99% response rate. The participants included community service employees and leaders. The respondent details were also collected which included respondent sex, age, educational status, and work experiences. 32 respondents (88.89%) were male and the remaining 4 (11.11%) were female.

The respondents' age in the study area has indicated that 12 (33.33%) and 24 (66.67%) of the population between 36-40 years, above 40 years of age respectively; this shows that the employee of the community in the active working age. Since the age group is younger staffs, they seek modern life, including modern systems, like Information Communication Technology (ICT).

Table 1 Background information of respondents

Background Information for Respondents			
Items	Measurements	Frequency	Percentage
Gender	Male	32	88.89
	Female	4	11.11
	Total	36	100
Age in years	25-30	0	0
	31-35	0	0
	36-40	12	33.33
	Above 40	24	66.67
	Total	36	100
Education	High school graduation	0	0
	Technical school graduation	0	0
	College diploma	0	0
	Bachelor's degree	20	55.56
	Master's degree	16	44.44
	Total	36	100
Experience in years	<1	0	0
	1-5	4	11.11
	6-10	4	11.11
	11-15	4	11.11
	21 and above	24	66.67
	Total	36	100.00

Concerning the qualification of respondents who are currently working at the community level, about 20 (55.56 %) of respondents were first-degree graduates and 16 (44.44%) were bachelor's degree and master's degree holders

respectively. Depending on the respondent's reaction one can conclude that most of the employees of the community were qualified first-degree holders followed by postgraduates. Therefore, the community needs to enable its employees towards seeking higher qualifications in first and second degree so that they can easily be trained to encourage individuals each other for the community's great performance and benefits. But the job service experience they had in the community is very good. Regarding the level of experience, employees had in the organization in table 1 clearly depicted as 4 (11.11%), 4 (11.11%), 4 (11.11%), and 24 (66.67%) of respondents served the community for less than one, one to five, six to ten, eleven to fifteen years and 21 years above respectively. The discussion indicates the workforce of the community is a mixture of new entrants and experienced employees and has the possibility to get the advantage of both.

The response data obtained through a questionnaire was used for data analysis. Documents containing responses obtained from the selected TVET Institutions who are developing and transferring technologies were analyzed. The method particularly enabled the researchers to quantitatively and qualitatively analyze the technologies and helps to identify the locations where the developed technologies were transferred. Observation on the developed and transferred technologies was carried out by visually testing the usefulness and quality of transferred technologies for the protection of COVID-19 using the checklists which included measurement parameters like usability, workmanship, functionality, effectiveness, efficiency, and sustainability of the developed and transferred technologies both at colleges and the areas were transferred and used.

Qualitative data were collected using a pre-structured evaluation and monitoring checklist prepared for each TVET Institutions and the users of the technology in the society that are developed and transferred to combat COVID -19. For the quantitative study, observation and checklists were used to determine the number of technologies developed and transferred as well as staff members participating in technology development and transferring. Then the participants was asked for the in-depth interview who were selected using judgmental/purposive sampling technique at the respective TVET colleges and selected randomly from the society. The responses received is also tested for its reliability using the Cronbach's alpha test as shown in Table 4 (Louangrath P.I et.al, 2018).

The quantitative data collected focused on a variety of issues, like technologies developed and developing, manpower participating in technology development in combating COVID -19. Problems associated with technology development and transfer at the colleges and usage of the technology transfer within the society for combating COVID-19 were studied qualitatively.

Results and Discussion

To assess the effort of TVET colleges in developing and transferring technologies for combating COVID-19 and to clearly analyze the response of the society in accepting these technologies and using for combating COVID-19 questionnaires using Likert 5 scale methods were delivered to the society in an interview.

The data collected included the need and utilization of technologies to combat COVID-19, the Cost-effectiveness of TVET developed and transferred technologies as compared to one's purchased from the market and the matching of the TVET transferred technologies with purchased ones. Questions also covered on the transferred technologies from TVET Institutions and their quality at use and different technologies transferred from TVET institutions being utilized to Combat COVID-19. Some questions focused on collecting data on the sufficient number of technologies being transferred from TVET Institutions and multipurpose usage of TVETs technology, other than the designed function. Finally, questions also covered the timely importance of TVETs technologies and the Serviceability of TVET College technologies for a long time.

Analysis results are presented in Table 3 which shows the response received for questionnaires on the 5-scale method. In Table 3, a total of 36 respondents replied to the questionnaires and their response frequency and percentage distribution is shown. The questionnaires were grouped according to their relative closeness in concept and analyzed

accordingly. For the question, if there was a strong need and effort to combat COVID-19, 27 (75%) and 9 (25%) respondents responded as very agree and agree respectively. This result is displayed in Table 2 and Figure 1. The result shows that the effort of society is high in combating COVID-19.

At the same time, the idea that stresses the use of different technologies to combat COVID-19 was forwarded to society. In this issue, 12 (33.3%) and 24 (66.7%) respondents said very agree and agree respectively. As seen in table 2 and figure 1 maximum of the respondents agreed that different technologies are in use to combat COVID-19. Thus, the opportunity to use different technologies for combating COVID-19 is high within the society.

Table 2: Technology development and Transferred effort in combating COVID-19 Issues Response by the Society Related Issues

Item	Description
Question 1 (Q1)	There is a strong need and effort to combat COVID-19
Question 2 (Q2)	Different Technologies have been used to combat COVID-19
Question 3 (Q3)	Most corona virus preventing technologies was purchased in the market
Question 4 (Q4)	To Combat COVID-19 different technologies transferred by TVET institutions'' have been utilized
Question 5 (Q5)	Comparing to technologies purchased from the market Developed and transferred technologies form TVET are cost effective
Question 6 (Q6)	Transferred technologies form TVET institutions' are easy to use and better in quality than the purchased one
Question 7 (Q7)	A sufficient number of technologies have been transferred from TVET colleges and used effectively
Question 8 (Q8)	Users have been using transferred technologies match more than the purchased types
Question 9 (Q9)	The transferred technologies form TVET colleges have been duplicated and distributed in the society sufficiently
Question 10 (Q10)	Qualities of technologies transferred form TVET colleges are match better than technologies purchased in the market for the same purpose
Question 11 (Q11)	Large verities of technologies have been transferred to the society and utilized for designing purpose
Question 12 (Q12)	There is a need in the society to use more technologies transferred form TVET colleges to combat Covid-19
Question 13 (Q13)	Transferred technologies from the TVET institutions are timely important
Question 14 (Q14)	Transferred technologies from TVET colleges may serve for a long time
Question 15 (Q15)	Transferred technologies may be used for varies purposes other than the designed function

Table 3: Respondents frequency for each question as per the Likert scale rating

Questions	Respondents	Respondents (frequency/percentage) rating					Total
		Very Agree (VA)	Agree(A)	Not Decided (ND)	Disagree(D)	Very Disagree (VD)	
Q1	36	27(75%)	9(25%)	0%	0%	0%	100%
Q2	36	12(33.3%)	24(66.7%)	0%	0%	0%	100%
Q3	36	0%	0%	2(5.6%)	30(83.3%)	4(11.1%)	100%
Q4	36	13(36.1%)	21(58.3)%	0%	2(5.6%)	0%	100%

Q5	36	12(33.3%)	23(63.9%)	0%	1(2.8%)	0%	100%
Q6	36	14(38.9%)	21(58.3%)	0%	1(2.8%)	0%	100%
Q7	36	0%	16(44.4%)	5(13.9%)	15(41.7%)	0%	100%
Q8	36	9(25%)	19(52.8%)	2(5.6%)	6 (16.7%)	0%	100%
Q9	36	10(27.8%)	25(69.4%)	0%	1(2.8%)	0%	100%
Q10	36	0%	23(63.9%)	4(11.1%)	9(25%)	0%	100%
Q11	36	0%	19(52.8%)	7(19.4%)	10(27.8%)	0%	100%
Q12	36	17(47.2%)	18(50%)	1(2.8%)	0%	0%	100%
Q13	36	20(55.6%)	13(36.1%)	3(8.3%)	0%	0%	100%
Q14	36	13(36.1%)	23(63.9%)	0%	0%	0%	100%
Q15	36	14(38.9%)	22(61.1%)	0%	0%	0%	100%

Table 4 Cronbach's Alpha Test results

Data sources	Cronbach's Alpha	Number of Items	Comments
Society	0.73	36	Excellent and consistent

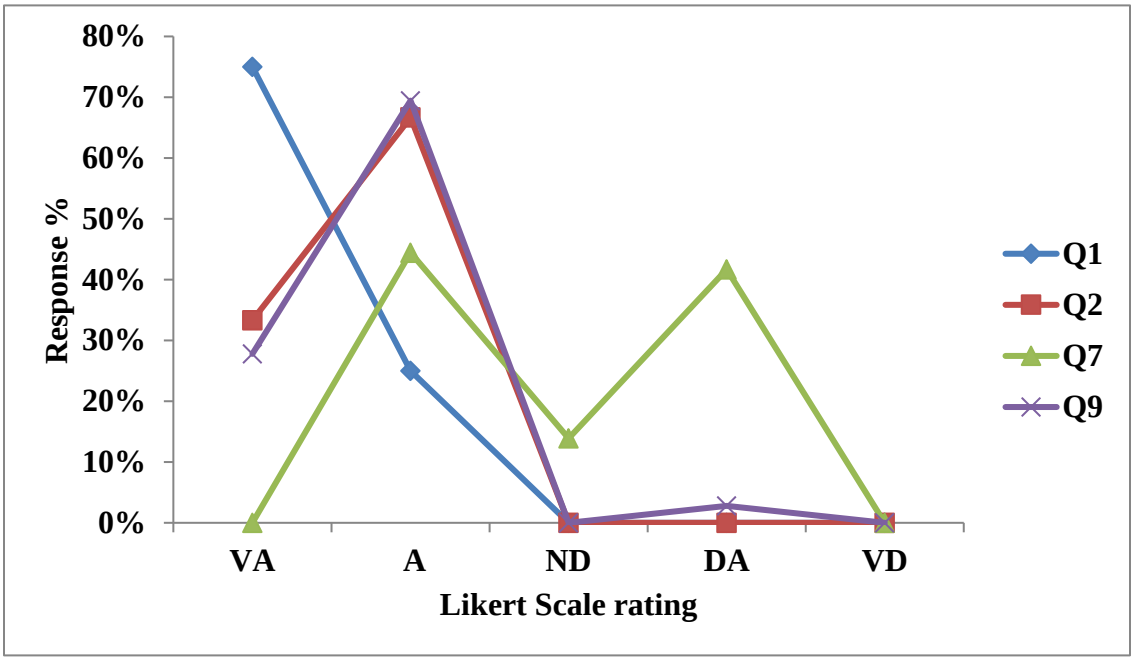

Fig 1. Graphical representation of responses relating to the need and sufficiency of different technologies

As seen in Table 2 & 3 and figure 1 shows the response data received and graphically represented for the need and sufficiency of different technologies in Addis Ababa to combat COVID-19. For the issue regarding the transfer of sufficient technologies from TVET Institutions and their effectiveness in applications (Q7). 44.4%, 13.9% and 41% respondents responded as agree, not decided and disagree respectively. Although a maximum of respondents (44.3%)

agreed that the technologies are sufficient and working effectively, 41.7 % of respondents did not agree with the sufficiency and effective use of the transferred technologies. In this case it is required to work hard at increasing the quantities of technologies for combating COVID-19 and improve their quality to assure effectiveness in the working condition.

Regarding duplication and distributions of transferring technologies sufficiently 27.8%, and 69.4% of respondents replied as very agree and agree respectively (Q9). However, 2.8% of respondents disagreed. From the result, it is possible to generalize those technologies developed and transferred by TVET Institutions in Addis Ababa are duplicated and transferred sufficiently to combat COVID -19.

Taking the above responses into account it is possible to conclude that there is a need to combat COVID-19 within the society by supplying a sufficient quantity of developed and transferred technologies which at present are not sufficient and are not working effectively. Though the assumption is that quantities are not sufficient, however, attempts and plans to distribute the technologies sufficiently are to be initiated.

Regarding cost effectiveness of technologies and users' response in using the developed and transferred technologies certain issues, including application of different technologies to combat COVID-19, purchased technologies usage, comfort ability and easiness of technologies developed from TVET colleges and purchased technologies for the same purpose were considered and results are displayed in table 2,3 and figure 2.

Tables 2, 3, and figure 2, show the data and graphical representation of data received on technologies transferred from TVET Institutions to society. It is clear that in the questionnaire stated as most coronavirus preventing technologies were purchased in the market (Q3), 5.6% respondents, 83.3%, and 11.1 % respondents replied as not decided, disagree and very disagree respectively, indicating that purchased technologies are not widely used to combat COVID-19.

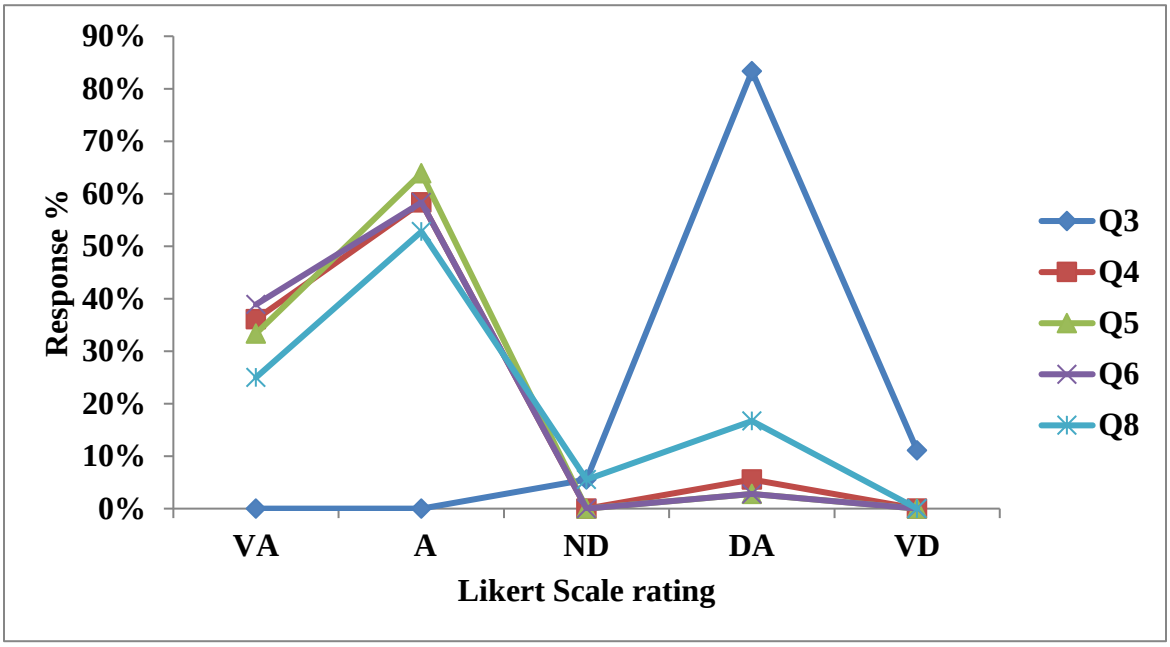

Fig 2. Graphical representation relating to responses received on availability and technologies transferred from TVET Institutions to society

To combat COVID-19 different technologies transferred from TVET institutions has been utilized was another questionnaire presented to the society, the reply contained 31.1%, 58.3% and 5.6% respondents responded as very

agree, agree and disagree respectively (Q4). This implies that the transferred technologies from TVET poly technical colleges in the Addis Ababa city have high responses by the society and are widely used in combating COVID-19.

For the questionnaire stated as comparing two technologies purchased from the market developed and transferred technologies from TVET are cost effective (Q5), 33. 6% and 63.9% and 2.8%respondents very agree, agree and disagree respectively. In this case the transferred technologies from TVET colleges are cheaper than the purchased one from the market for the purpose of combating COVID-19. Hence it is required to transfer more technologies to the society as the cost is affordable.

Regarding the issue about easiness and better quality of transferring technologies transferred from TVET colleges than the purchased one 38.9%, 58.3%, and 2.8 % respondents responded as very agree, agree, and disagree (Q15). In this case, according to the response of the society, the transferred technologies from TVET Institutions are easy to use and have better quality than the purchased technologies. In this case, the TVET colleges shall increase, transferring of their developed technologies to the society as appreciation is given for the products in combating COVID-19.

The questionnaire forwarded to the society also stated if users have been using transferred technologies more than the purchased types 25%, 52.6%, 5.6%, and 16.7% respondents confirmed as very agree, agree, not decided, disagree respectively (Q8). Though a total of 77.6% of respondents answered positively indicates that society is using transferred technologies from TVET Institutions, there are also some issues to be checked why the transferred technologies are not being used by the society fully.

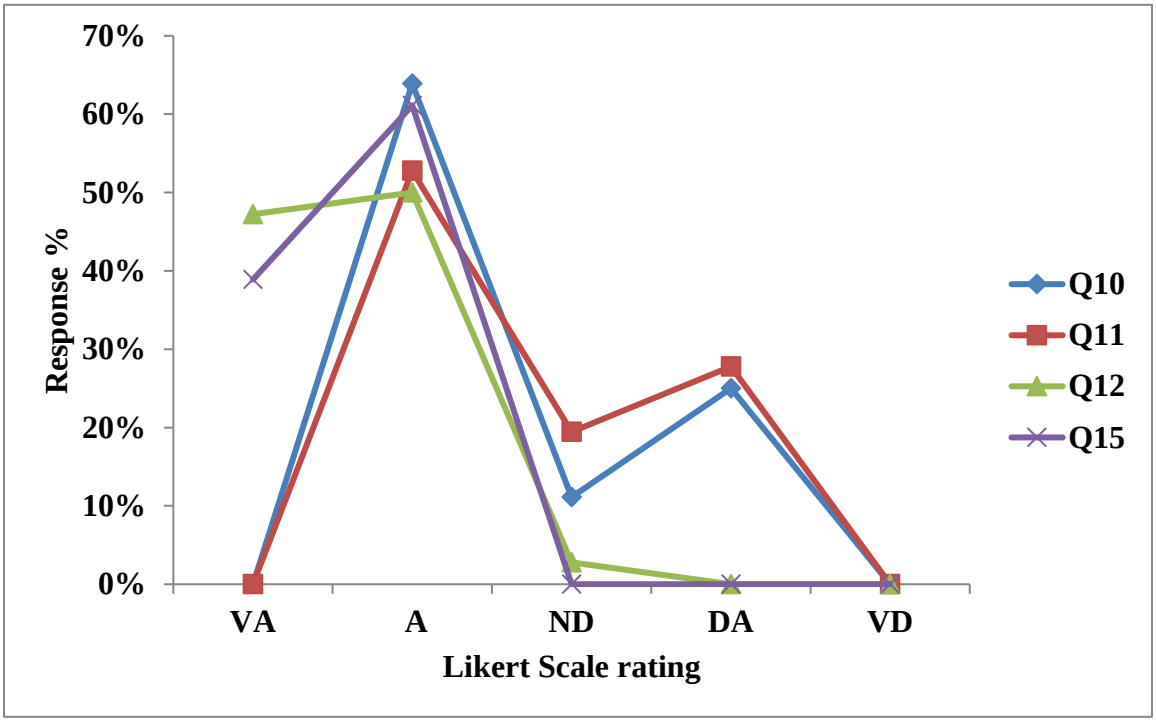

Fig 3 Graphical representation of data relating to quality, Quantity and application aspects of TVET technologies

A variety of transferring technologies and their responses or applications by the society in combating COVID-19 related questionnaires were proposed to the respondents selected among the society. The aim of such questionnaires was to assess how society accepted these technologies and how it utilizes them for the designed purpose. In this case,

as seen in table 2,3 and figure 3, for the issue that concerns the betterment of the quality of technologies transferred from TVET colleges than technologies purchased in the market for the same purpose, 63.9%, 11.1%, and 25% of respondents forwarded their responses as agree, not decided and disagree respectively (Q10). In this regard, maximum respondents (63.1%) were agreeing about the betterment of the transferred technologies. This may be considered as the effectiveness of these technologies and show the effort of TVET colleges in producing quality products better than the purchased types in the market for the same purpose. However, 25% of respondents disagreed with the betterment of the quality leads the TVET colleges to work more on qualities of technologies produced for combating COVID-19.

In these groups of questionnaires, the other issue forwarded to the society respondents was whether larger varieties of technologies have been transferred to the society and utilized for designing purposes. 52.8%, 19.4%, and 27.8 % respondents responded as agree, not decided, and disagree. Here, though the maximum number of respondents agreed that there are varieties of transferred technologies in use and about 46% of respondents replied negatively. In this regard, there is a need to increase the types of technologies that are used to prevent the society from the spread of coronavirus, and adding extra effort to develop and transfer more varieties of technologies is the assignment of TVET Institutions in the Addis Ababa city.

As seen in table 2, 3 and figure 3 for the issue regarding if there is a need in the society to use more technologies transferred from TVET colleges to combat COVID-19, 47.2%, 50% and 2.8% respondents respond very agree, agree and not decided (Q11). Here it is possible to understand that the need of the society is high in utilizing varieties of technologies to prevent themselves from corona virus and this also confirms that the transferred technologies have not been transferred in large quantities and varieties, which pushes the TVET polytechnic colleges to again increase their effort in developing and transferring more technologies essential in combating COVID-19 in the city.

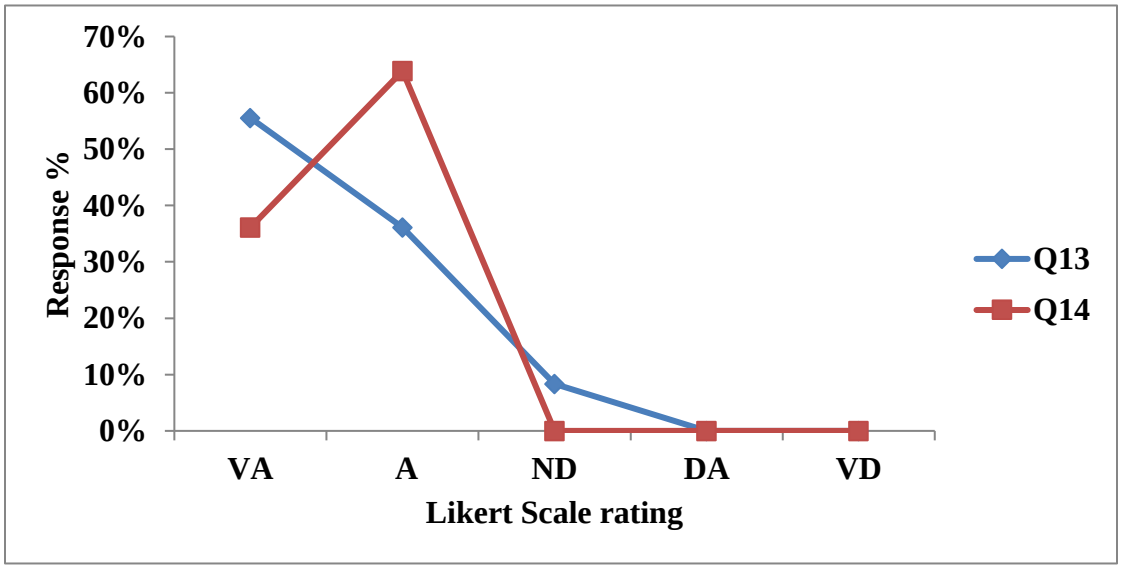

Fig 4 Graphical representation of response to timely transfer and life of transferring technologies

The last questionnaire raised in these categories was that on the issue of whether transferred technologies can be used for various purposes other than the designed function. 61. 1% and 38.9% of respondents confirmed as very agree and agree respectively. In this case, the transferred technologies are multi-purpose types, and widening their applications may reduce the economy that can be expended to purchase different technologies for individual purposes (Q15). In other words, the versatility of applications of transferring technologies avoided purchasing a single technology for a single application.

The other group of questionnaires contains the time related ideas. The main idea of these questionnaires was to assess whether the technologies are provided on time and serves for extended time in combating COVID-19 within the society. The results obtained from the analysis are displayed in table 2, 3 and figure 4. As seen in Tables 2, 3, and figure 4 which is a graphical representation of data received in timely transfer and life of transferred technologies from TVET institutions (Q13). 55.6%, 36.1%, and 8.3% respondents replied as agree, very agree, and not decided respectively. In this regard, since maximum respondents chose to be positive about the development and transferred technologies by TVET colleges for providing coronavirus protection was timely important. This shows that the TVET Institutions in Addis Ababa city were alert in combating COVID-19 and showed their great effort in this regard.

Regarding the questionnaire, if transferred technologies from TVET colleges may serve for a long time, 36.1% and 63.95 % of respondents confirmed that the transferred technologies can serve for a long time in combating COVID-19 (Q14). This implies that the transferred technologies were manufactured from strong and good quality materials and the fabrication methods used were appropriate. The respondents also considered the technologies are durable and serve long enough.

Conclusion

Society response analysis on the acceptance of technologies developed and transferred to a public utility and around Addis Ababa city for combating COVID-19 proves the effort put by TVET institutions is progressing well and is aiming to serve the people of Addis Ababa. The response reliability test results show a Cronbach alpha value of 0.73 which is excellent. Many of the responses received show good agreement for the development of technologies and that is being transferred so far from TVET institutions is good. However, sufficient technologies need to be developed and transferred to meet the demand at the earliest time. The technologies that are being developed and transferred by TVET Institutions are of better quality as compared to those that are available in the market. The majority of the respondents feel that the technologies are delivered in time and are serving with better life and ease of operation. Some technological improvement responses are helpful to improve the mechanism of the technologies that are being transferred to society. The results also help to build and evolve new programs and strategies to develop technologies and transfer to the society so as to give better protection to the public against COVID-19 transmission.

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Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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