

Content awareness and satisfaction of DTI virtual seminar amid Covid-19

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Abstract

This research article aims at the analytical assessment of content awareness and the audience satisfaction of a virtual seminar held by Defence Technology Institute (DTI) while the world has been affected by the Covid-19 pandemic. The questionnaires were designed to transform qualitative data from 40 attendees of DTI key stakeholders attending the seminar into quantitative information. The quantitative analysis for statistical proof was proposed to achieve quantitative results that were followed by interpretation and discussion. Grounded in the classical test theory definition of reliability and the tenets basic to Likert-scale measurement methodology. As for the attendees satisfaction, quantitative research with at least one variable measured by a Likert-type scale, while the qualitative data will be analyzed through content analysis. The findings lead to the conclusion that the virtual seminar among Covid-19 was statistically successful and matched the objectives of the knowledge network. Moreover the organizer was successfully able to modify the seminar due to the Covid-19 pandemic ensuring the safety of the attendees and staff while maintaining the quality of the seminar, and further improving the attendees satisfaction.

Keywords : Knowledge management, Satisfaction, Likert-type scale, Virtual seminar, Covid-19 pandemic, Network forum

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1. Introduction

Defence Technology Institute (DTI) was established to research and develop large-scale projects according to the Defence Council. To figure and approve for implementing, studying, researching project, and other related activities or continually develop defence technology.

The Knowledge Management Division which is under the supervision of Knowledge and Publication Management Department of DTI takes responsibility in the systematic administration and management of knowledge to enable knowledge retrieval and sharing for application and exploitation, and the fostering, support and provision for the activity or process of knowledge sharing and exchange. Therefore, the seminar was organized by coordinating with the military and higher education institutions to create a network of academic knowledge management in defence technology and industry and further knowledge from renowned academic institutions leading to the international transfer of knowledge sharing, networking and knowledge management.

There are several methods to assess the satisfaction and success of knowledge management. Janus addressed in [1] that some indicators in measuring the effectiveness of knowledge sharing where most organizations would set such targets as benchmarks to be attained in a given period of time. One of intermediate-outcome indicators was improved collaboration among staff or between departments. A number of literature were devoted to statistical analysis of the knowledge management results. The authors in [2] conducted an exploratory study and suggested

that a knowledge and innovation view could enhance service differentiation but demanded a proper engagement approach where social ties were paramount to success. The work in [3] proposed the methodology based on the basic open questionnaires Framework for Information System Due Diligence (FISDD), data analysis, and at the end questionnaire related to the data gathering process.

It was suggested in [4] for the use of an Integrated Management Information System (IMIS) with cognitive agents for acquiring and acquisition sub-processes in a collective knowledge processing in the IMIS. It aimed [5] to determine whether and to what extent the attributes of organic structure contributed to the creation and sharing of knowledge from the empirical study obtained through the survey of 150 respondents, employed in 30 companies from several industries, in the Republic of Serbia. The questionnaires were adapted to the needs of the study and were developed based on the theoretical knowledge and findings of several previous studies on the processes of knowledge creation and knowledge sharing. A regression method was used to test all the hypotheses.

The authors of [6] aimed to uncover the combinations of knowledge sharing mechanisms that organizations in a science and technology park in Brazil used to share managerial and technical knowledge. They adopted a qualitative approach that used a fuzzy set qualitative comparative analysis to analyze data that were gathered from 51 managers of organizations in a science and technology park. The results showed that knowledge sharing happened regardless of the type of knowledge. More recently, the study in [7] followed the design science research

paradigm and employed mixed methodology, combining quantitative learning analytics with qualitative analysis of notable segment replay instances by viewers of online video lectures. The work of [8] was set to develop a belief-value-satisfaction model based on social cognitive theory. This paper was aimed to explain how relational virtual community (RVC) members' beliefs on individual features and environments could be transformed into satisfaction through social learning strategies.

The COVID-19 pandemic has affected many parts of our lives. Following social distancing recommendations, many organizations have shifted their in-person conferences to virtual meetings. And while online events like webinars existed before COVID-19, virtual conferences further present benefits and challenges to navigate for attendees. For example, you can attend more than one conference to help your professional development needs while saving money on travel. However, the primary challenge of attending a virtual conference is that you lose out on the face-to-face networking aspect. No matter the benefits and challenges to a virtual conference, remember the reasons why you are attending, which most likely have to do with presenting and learning about research, gaining professional development skills and networking with others.

This current research study took a combined approach of technological Zoom-based teleconference, traditional questionnaire entry survey, and simple statistical analysis to tackle the study objective of assessing content awareness of the virtual seminar amid the Covid-19 pandemic. The following three main parts of this research article address the seminar in its contents and

assessment, the proposed statistical analysis, and the analytical interpretation that leads to the results that conclude the article. Further study was suggested to for the extension of the study of this kind to the post-seminar assessment.

2. Materials

2.1 The Seminar of Knowledge Network Forum 2020

The seminar of Knowledge Network Forum is a Defence Technology Institute or DTI annual event and in 2020 titled "Multisensor Detection and Aerial Robot" was held on 12 November 2020 at Venus Room 3 – 4, Impact Exhibition Hall, Impact Muang Thong Thani, Nonthaburi, Thailand [9]. As the name implies, the event is to keep strong Institute's knowledge network with stakeholders.

Figure 1 up was the banner the organizing team used to advertise the seminar among former and new targeted network members. That was a very important piece of information that attracted seminar attendees to participate in the forum since the announcement was made during August to December 2020 amidst the second wave of Covid-19 worldwide. However, the virus situation in Thailand was significantly eased out and the forum was widely embraced by key persons from DTI's stakeholders as seen in Figure 1 down.

2.1.1 Seminar overview

The Knowledge Management Division which is under the supervision of Knowledge and Publication Management Department of DTI, Thailand has the function of, and takes responsibility in the systematic administration and



Fig.1 Banner for advertisement (up) and key persons photo from the seminar (down).

management of knowledge to enable knowledge retrieval and sharing for application and exploitation, and the fostering, support and provision for the activity or process of knowledge sharing and exchange. The activity summarized from the seminar and reported herein was to reflect such function and responsibility of the division. The objectives of the seminar were twofold; 1) to create a forum that enables knowledge and experience sharing and 2) to create the network of knowledge administering and acquisition among the stakeholders in the ministry of defense and beyond, and 3) to introduce advanced defense knowledge and technology to personnel from the ministry of defense and security, private and academic sectors.

The division team planned and managed the seminar which was organized by a professional organizer, and financed by DTI in an annual budget. The organizer was tasked with a smooth, interactive, and live seminar infrastructure whose video footage could be revisited at a

publicly announced website, still photography, and online registration. The language medium used in the seminar was Thai. Three Thai presenters working as a professor at universities in Japan, Hong Kong, and Singapore were invited to deliver lectures. The lecturer from the National University of Singapore was formerly invited to a 2018 seminar and kind to extend the network further to Osaka University and City University of Hong Kong. Most importantly, the seminar helped to promote Thailand's Meetings, Incentives, Conventions and Exhibitions or MICE, which refers to a particular type of tourism in which large groups, usually planned well advance are brought together for some particular purpose.

2.1.2 Infrastructure for virtual seminar

The seminar was designed such that before, during, and after activities were accessible online. Thus, the professional organizer needed to make sure that such concept was realized via a reliable communications infrastructure. Figure 2 left was the online registration form being used for interested stakeholders to register online provided that they received an exclusive invitation letter from the institute. That was to ensure the limited but truly targeted participation was achieved. To follow the Thai government upon Covid-19 restrictions was another reason for the limited number of the online registration.



Fig.2 Activities before (left), during (middle), and after (right) the seminar.

Activities during the seminar were central to the success and needed broadband wireless internet to enable such live seminar interaction among the audience in Thailand and the lecturers in Singapore, Hong Kong and Japan (Figure 2 middle). The website to the activities in the forum was available for access to the attendees and all the networked stakeholders (Fig. 2 right). The Zoom video conference created the required communication infrastructure using a 10 GB speed internet. The system was perfect at test but with a slightly problematic effect due to several bandwidth-greedy functions such as audio, online and offline backup tasks were simultaneously occupying the traffic. However, nothing considered as a major defect to cause the complete stop to the seminar was seen throughout the seminar.

2.1.3 Seminar contents

The seminar had 4 important parts, each of which was presented by 1 presenter and lasted at least 45 minutes for each lecture with 15 minutes for questions and answers, see Figure 3. Four parts had four different topics including 1) Aerial-Terrestrial-Aquatic Robots (ATA-Robots) for search, rescue and inspection in an ATA Extreme Environment, 2) Introduction to swarm operations for UAVs, Advancing Aerial Robots with Mechanical Intelligence, and 3) Multi Target and Multi Sensor Detection in Autonomous Vehicles. The first content was delivered with aiming to demonstrate the capability of Cyber media Center of Osaka University, Japan. Research output extracted from projects funded to the Center by various sources was outlined to sections that included Aerial-Terrestrial Robot, Aerial-Aquatic Robot, and Mapping and Teleoperation. To the entirety

The Seminar of Knowledge Network Forum 2021 "Multi Sensor Detection and Aerial Robot" 12 November 2021	
Venue: Venue Room 3 - 4 Impact Exhibition Hall, Impact Muang Thong Thai	
Morning Room 3-14 08:00 - 08:00 P.M.	Registration
08:30 - 08:45 P.M.	Group Captain Dr Chuanrui Komwong Director of Knowledge and Publication Management Department, Defense Technology Institute to address the role of the seminar
08:45 - 09:00 P.M.	A/C Chief Marshal Dr Pancha Praditwanok Director General, Defense Technology Institute to address the opening speech
09:00 - 10:45 P.M.	Topic of Seminar: "Aerial Terrestrial Aquatic Robots (ATA-Robots) for search, rescue and inspection in an ATA Extreme Environment" by Assistant Professor Dr Prichuan Inthasorn from Kyushu Institute of Design, Osaka University
10:50 - 11:00 P.M.	Coffee Break
11:00 - 12:00 P.M.	Topic of Seminar: "Introduction to the seminar presentation for UAVs" by Associate Professor Dr Sudhikang Sagarwan from Mechanical Engineering Department, National University of Singapore
12:00 - 02:00 P.M.	Coffee Break
02:00 - 03:00 P.M.	Topic of Seminar: "Advancing Aerial Robots with Mechanical Intelligence" by Associate Professor Dr Jitaying Chuanwattanasorn from the Robotics and Intelligent Systems Laboratory, City University of Hong Kong
03:00 - 04:00 P.M.	Coffee Break

Fig.3 Seminar agenda extending from 08:00 AM and 04:00 PM.

of the lecture, the project results were demonstrated from underlying principles to real-world applications.

Describing the incident in Tham-Luang cave rescue as an inspiring research question, the presenter mentioned the motivation of the extreme environment – inspired Aerial-Terrestrial-Aquatic Robots from the world renowned incident. The underwater drive test of the robot was demonstrated on the video clip. The Mapping and Teleoperation part was mainly based on the Simultaneous Localization and Mapping or SLAM concept of using the first aerial robot to simultaneously map the studied environment as situation awareness for the second robot to perform a search and rescue operation. A collapsed building on a disaster-hit site was the proposed environment. The interest of the audience to the content was on a multifunction robot that was performing a dangerous and tedious job denied by human workers. Rust on old iron bridges in Japan was central to the application of robots of this kind. The second presentation was live-streamed from the Mechanical Engineering and Temasak Lab of National University of Singapore. The rationale of swarm operations for UAVs was the difficulty in urban/ forest environment operation of poor GPS

reception where autonomy was needed for their self-localization and autonomous navigation. System overview was first described to cover hardware design and software architecture. Hardware details were exposed for expert discussion, experience and knowledge sharing with the audience. The software structure was also addressed, leading to further offline discussion at the end of the lecture. State estimation providing challenges for visual odometry with an unstable illumination condition was discussed as the process yielded indoor scenes with less texture. Mapping and planning were adopted for UAV environment perception. After a Model Predictive Local Motion Planning with boundary State Constrained Primitive (BSCPs), a safe trajectory could be computed in 1/100 second on TX2. The system supported Open-street map that was imported into a simulator as the test map. The Unity3D® was used to simulate varying types of drones to achieve maximum number of 6 drones operating at the same time. Experimental results for instancing the flight test of a square path were covered. The result of flight test in corridor was showed with a video footage in the presentation.

The third lecture advanced aerial robot topic was delivered first in the evening of the seminar day from the Department of Biomedical Engineering of the City University of Hong Kong by the presenter who was an associate professor at the Robotics and Intelligent Systems Laboratory. The inspiring idea of the presentation was human inspiration to fly dated back the day the Wright brothers' era and beyond. A fly was an example of natural flying machines with no unrivalled aerodynamics feats. The Reynolds Number was introduced to the audience to show scaling effects on flight efficiency. Most of the audience

was first informed by the reduced flight time and energetic efficiency with smaller machines. Flapping-wing aerodynamics was the most interesting part of this presentation. It was less explored but most anticipated in Thailand than any other robotic kinds. The bio-inspired flying robot which was the world's smallest flying robot in 2013 and subject to the ongoing collaboration of Harvard University and Massachusetts Institute of Technology was demonstrated in a video clip. The presenter's own robot called Harvard Robobee© showed flying against wind disturbances at 80 cm./s. was much inspiring to the audience. Its planar components were elaborated for an audience's better understanding on the Harvard Robobee© flight capabilities. The delayed stall introduced at the beginning of the talk was further discussed at benefits of which flapping wings and Samara or auto-rotating plant seeds took advantage of. A Samara - inspired robot with 13.8 gram mass, two motors and propellers was elaborated, claiming passive attitude stability at the Laboratory.

The second presenter was back to deliver the fourth presentation from his Laboratory in National University of Singapore. A number of publications and research byproducts were obtained from the project Multi Target and Multi Sensor Detection in Aerial Autonomous Vehicle. The first concept that the presenter explained was multi-camera, multi-target detection, localization and tracking in 3D with image enhancement and moving camera compensation.

Then, trajectory-based target identification and association was showed with a video clip displaying tracked trajectory of flight paths. More interestingly, the small flying object classification

and identification of drone versus bird was derived from trajectory based detection and characterization that classified small, fast-moving drones from other small objects such as birds. The result from a combination of extended Kalman filter, Kernelized Correlation filter, Particle filter, and Discrimination filter was demonstrated to track drones with Reinforce Learning. Finally, the approach using multi-camera, multi-target tracking systems with trajectory-based target matching and re-identification was achieved using target identification, intra- and inter-camera target matching, and multiple target and identification.

2.1.4 Seminar Attendees

The attendees were from public, private and academic sectors already established the strong knowledge network with DTI. The 2020 seminar was restricted to only 40 attendees to comply with the social distancing rules strictly enforced by the Thai government. Educational background was compiled to crosscheck the fit-for-all contents of the seminar. Half of the attendees hold Master's degree, making the seminar the forum of highly educated network. Of 9 Ph.D. attendees, more than half of the number were from computer science background. Attendees with Bachelor were engaged with unmanned technology either professionally or educationally.

The age of the attendees was also an indicator of a degree of engagement with the knowledge and technology in the forum. The attendees aged from 30 – 50 years old accumulated more than half of the participants. This number reflected two fold i.e., on the interest the networked sectors had

showed on the forum and a strong relation between DTI and its partners. The attendees above 50 years old was one-fourths of the participation, indicating such a success of the forum contents. At 10 years before retirement, Thai people at this age are at the topmost of their performance and most successful on their career. Most importantly, one of the participants was more than 60 years old and found to be closely networked with one of the presenters.

2.2 Questionnaires

At the end of the seminar, the attendees were facilitated with either the online response or paper-based questionnaires. The questionnaires were designed with the first section aimed to collect personal data of the attendees. The second section was for the awareness creation to the attendees on the 4 topics. Each topic was measured on: 1) the significance of the topic in research and development, 2) the advancement of the topic in Thailand, 3) the application and benefit of the topic in the attendee's work, and 4) the opportunity of the topic research and development in Thailand. Five-rating scores from 1 to 5 were expected from the attendees to show the Least to the most aware content the attendees responded to the questions of each topic.

Due to the Covid-19 pandemic, the virtual seminar was adopted to comply with government instructions. The presenters physically resided in Osaka of Japan, Singapore, and Hong Kong were provided with the communications infrastructure to deliver their lectures to the audience in the convention of Bangkok. This technological adoption was needed to guarantee to the audience that the presentation worked smoothly and

with no difficulties to the point that contents planned to deliver by the presenters were not comprehended by the audiences. The third section was targeted on attendees' satisfaction with three aspects of the seminar that included; 1) multi-media, communications, equipment and documents, 2) seminar contents and time allocation, and 3) with the online seminar itself. Similar to the purpose of the second section, five rating scores from 1 to 5 were expected from the attendee to rate the Least satisfied to the Most satisfied for the measured aspects.

2.3 Proposed Quantitative Analysis

The seminar was divided into 4 sections from three lecturers where section 2 referred to topic T_2 or presentation 2 and section 4 referred to topic T_4 or presentation 4 were delivered by the same lecturer in Table 1. The questionnaires were composed of 4 questions upon similar purposes for each lecture session. Assume that $a_{i,1}$ is the value that the attendee i rates upon gaining awareness aimed by the seminar to Q_1 , whereby 1 means the Least aware and 5 means the Most aware. The rating values range from 1 to 5. In addition $a_{i,2}$, $a_{i,3}$ and $a_{i,4}$, are the rating of the attendee i to question Q_2 , Q_3 , and Q_4 respectively. The number of seminar attendees is n . Let $A_{i,1}$ be awareness anticipation calculated from the attendee rating and be it less than or equal to 1. Thus, the awareness anticipation from an attendee i can be calculated from equation (1) below.

$$A_{i,1} = \frac{a_{i,1}}{5} \quad (1)$$

Therefore, the total awareness anticipation of n attendees can be calculated from equation (2).

$$\sum_{i=1}^n A_{i,1} = \frac{a_{1,1}}{5} + \frac{a_{2,1}}{5} + \frac{a_{3,1}}{5} + \dots + \frac{a_{n,1}}{5} \quad (2)$$

The awareness anticipation from the presentation of each of the 3 lecturers having total 4 lectures was rated with the similar 4 questions in the questionnaire. If P_1 , P_2 and P_3 are presenter1, presenter2 and presenter3, respectively, the percentage of anticipation from presenter1 derived from Q_1 or $P_{Q_1}P_1$ can be calculated from equation (3).

$$P_{Q_1}P_1 = \frac{100}{n} \sum_{i=1}^n A_{i,1} \quad (3)$$

Using equation (3), total awareness anticipation from presenter1 to Q_1 - Q_4 or $tot.P_{Q_{1-4}}P_1$ can be calculated as equation (4).

$$tot.P_{Q_{1-4}}P_1 = \frac{1}{4} \left(\frac{100}{n} \sum_{i=1}^n A_{i,1} + \frac{100}{n} \sum_{i=1}^n A_{i,2} + \frac{100}{n} \sum_{i=1}^n A_{i,3} + \frac{100}{n} \sum_{i=1}^n A_{i,4} \right) \quad (4)$$

The average awareness anticipation from the seminar presentation or

$ave.P_{Q_{1-4}}P_{1-4}$ is obtained by the overall total percentage of all presenters divided by the number of presenters as in equation (5).

$$ave.P_{Q_{1-4}}P_{1-4} = \frac{1}{4} (tot.P_{Q_{1-4}}P_1 + tot.P_{Q_{1-4}}P_2 + tot.P_{Q_{1-4}}P_3 + tot.P_{Q_{1-4}}P_4) \quad (5)$$

To determine the level of attendees' awareness anticipation of the seminar, grades are applied to the $ave.P_{Q_{1-4}}P_{1-4}$ as follows:

1. If $ave.P_{Q_{1-4}}P_{1-4} < 20$, the attendees gain *Least knowledge awareness* as anticipated by the seminar;
2. If $20 \leq ave.P_{Q_{1-4}}P_{1-4} < 40$, the attendees gain *Less knowledge awareness* as anticipated by the seminar;
3. If $40 \leq ave.P_{Q_{1-4}}P_{1-4} < 60$, the attendees gain *Moderate knowledge awareness* as anticipated by the seminar;
4. If $60 \leq ave.P_{Q_{1-4}}P_{1-4} < 80$, the attendees gain *Much knowledge awareness* as anticipated by the seminar; and
5. If $80 \leq ave.P_{Q_{1-4}}P_{1-4} = 80$, the attendees gain *Most knowledge awareness* as anticipated by the seminar.

3. Methodology

3.1 Quantitative Implementation

The implemented methodology was illustrated in Figure 4. The knowledge network has been established and extended annually since the origin of DTI more than 10 years ago. The forum such as this one has been a mechanism for DTI to keep its stakeholders closely and inform the knowledge and technology deemed important to the defense technology and industry, of course reflected in the objectives. The Covid-19 pandemic was crucial to the adaptation of the seminar to be held in a virtual environment in which the experienced and expert presenters residing in virus hard-hit countries interacted with the audience in Thailand in a manner that complied with the government rules and regulations. The seminar venue was provided for the domestic attendees in order to keep the Institute in close

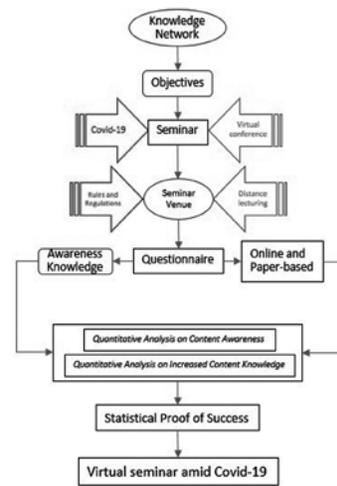


Fig.4 The methodology of quantitative analysis for statistical proof.

contact with the stakeholders while the distance lecturing was to ensure the presenters and the attendees seamless back and forth communications. From this section on, the article was dedicated to the assessment part of the seminar of whether it was conducted to achieve the targeted objectives.

From the lower part of Figure 4, the questionnaire was provided for the invited applicants to fill out either online or paper-based to collect the attendees' rating on the content awareness and increased content knowledge from the seminar. A simple but effective statistical analysis was applied, to be detailed in section C Proposed Quantitative Analysis, to address how the virtual forum responded to the objectives of the long established network. The 4 level grading system was adopted to determine the level of attendees' awareness anticipation of the seminar into the Least, Less, Moderate, Much and Most knowledge awareness scales. The average calculation was used to obtain the content awareness and increase of the introduced technologies.

3.2 Qualitative data

Responses to the questionnaire were summarized in Table 1 for to the content awareness questions and in Table 2 for the increased knowledge questions. It was visually interpreted that all topics attained exclusively Much and Most rating scales. Equal number was seen at 13 Much and Most ratings for the question 2 of the presentation 1. Where there was low at the number of rating such as 9 Most ratings for the question 4 of the presentation 1, there was high at the number of 25 Much ratings of this criterion. The highest rating from 25 attendees was at Much category for Q4 of Topic 1 for presentation 1. Accordingly, the network agreed that the ATA-robot research had opportunity in Thailand. However, the advancement of flapping and bio-inspired robots had seen less developed in the country with 6 attendees rating the Least aware content, thus, requiring policy, encouragement and financial boost from relevant agencies.

3.3 Quantitative information and interpretation

After applying the ratings in Table 1 to the equations in section *C Proposed Quantitative Analysis*, the statistically computed results were detailed in Table 2. As expected, the statistical results of $P_{Q_2}P_{1-4}$ that were related to the advancement of the topics in Thailand dropped to less than 80% with that of Presentation 3 slightly above 80%. The flapping winged robot technology did have a great opportunity for research and development in Thailand. Where benefit in workplace was not highly realized such as the topic of the presentation 3, a forum for technological promotion and education was required from a policy level of the Institute.

However, the $tot.P_{Q_{1-4}}P_{1-4}$ values were well above 80%, making the average for all presentations or $ave.P_{Q_{1-4}}P_{1-4}$ at 85%. When this final statistical outcome was determined for the level of attendees' awareness anticipation of the seminar, the grade of gaining Most knowledge awareness as anticipated by the seminar was achieved. As a result, the final score of 85% proved the virtual seminar among Covid-19 statistically successful and matched the objective of the knowledge network.

Table 1 Summary of responses to the questions

Questions	Rating				
	Most	Much	Moderate	Less	Least
*P1_Q1: Significance in R&D	23	17	0	0	0
P1_Q2: Advancement in Thailand	13	13	11	2	1
P1_Q3: Application and benefit in work	18	19	0	3	3
P1_Q4: R&D Opportunity in Thailand	9	25	4	0	1
P2_Q1: Significance in R&D	18	21	1	0	0
P2_Q2: Advancement in Thailand	13	14	11	2	0
P2_Q3: Application and benefit in work	16	19	4	1	0
P2_Q4: R&D Opportunity in Thailand	15	18	7	0	0
P3_Q1: Significance in R&D	22	18	0	0	0
P3_Q2: Advancement in Thailand	17	12	6	2	3
P3_Q3: Application and benefit in work	13	20	4	3	0
P3_Q4: R&D Opportunity in Thailand	15	18	3	4	0
P4_Q1: Significance in R&D	22	18	0	0	0
P4_Q2: Advancement in Thailand	17	12	3	2	6
P4_Q3: Application and benefit in work	13	20	4	3	0
P4_Q4: R&D Opportunity in Thailand	15	18	3	4	0

* P1_Q1 is abbreviated for question 1 of presentation 1, and so on.

Table 2. Results of statistical content awareness.

Awareness contents	Statistical results				
	P_{Q_1}	P_{Q_2}	P_{Q_3}	P_{Q_4}	$tot.P_{Q_1-P}$
P_1	91.5	77.5	86	81.5	84.125
P_2	88.5	79	85	84	84.125
P_3	89.5	80.5	96.5	87	88.375
P_4	91	79	81.5	82	83.375
$ave.P_{Q_1-P_1-4}$					85.000

P_1 , P_2 , P_3 , and P_4 are presentation1, presentation2, presentation3, and presentation4, respectively.

3.4 Scope of satisfaction assessment

3.4.1 The Likert Scale

5 point Likert scale consists of 5 answer options which will contain two extreme poles and a neutral option connected with intermediate answer options. A commonly used 5 point Likert scale example to measure satisfaction is: Very satisfied, Satisfied, Neither satisfied nor dissatisfied, Dissatisfied, and Very dissatisfied [10]. A principle basic to Likert scale measurement methodology is that scores yielded by a Likert scale are composite (summated) scores derived from an individual's responses to the multiple items on the scale [11].

3.4.2 The contents are as follows:

1. Attendees knowledge before and after the seminar
2. Seminar attendees' satisfaction towards the seminar in terms of location, suitability of equipment, satisfaction with the speakers, appropriateness of content, duration and platform for virtual events

An on-line questionnaire, comprised of 5-point Likert scaled items ranging from 1

(strongly dissatisfied) to 5 (strongly satisfied) and open-ended questions, was used as research instrument. The population was all 40 attendees attending to the seminar by the time the survey questionnaire was administered. The average score estimation was prepared as a five sub-scales measuring attendees' satisfaction as follows:

- 1.00 – 1.80 means strongly dissatisfied
- 1.81 – 2.60 means dissatisfied
- 2.61 – 3.40 means neutral
- 3.41 – 4.20 means satisfied
- 4.21 – 5.00 means strongly satisfied

The attendees' overall satisfaction of knowledge before and after attending the seminar averaged mean score is 3.77 which illustrated that they tended to be satisfied with the seminar (see Table 3 and figure 5 below).

The attendees' overall satisfaction of the virtual seminar averaged mean score is 4.49 which illustrated that they tended to be strongly satisfied with the seminar (see Table 4 and figure 6 below).

4. Results and discussion

The seminar of Knowledge Network Forum 2020 "Multisensor Detection and Aerial Robot" was held amid the Covid-19 pandemic to create a forum that enabled knowledge and experience sharing among the DTI stakeholder network. The seminar was to make sure that the essential content awareness of the forum was attained via the reliable communications infrastructure when the presenters were distancing lecturing from the pandemic-affected countries. The 2020 seminar was restricted to only 40 attendees to comply with the social distancing rules strictly enforced by the Thai

Table 3. Attendees knowledge before and after attending the seminar

Assessment Items	Satisfaction (n=40)			
	\bar{X}	SD	Scale	Interpretation
1. (ATA-Robots) knowledge before attending the seminar	3.25	1.15	3	Neutral
2. (ATA-Robots) knowledge after attending the seminar	4.28	0.60	5	Strongly satisfied
3. (Advancing Aerial Robots) knowledge before attending the seminar	3.30	1.20	3	Neutral
4. (Advancing Aerial Robots) knowledge after attending the seminar	4.20	0.65	4	Satisfied
5. (Swarm operation) knowledge before attending the seminar	3.35	1.19	3	Neutral
6. (Swarm operation) knowledge after attending the seminar	4.20	0.61	4	Satisfied
7. (Multi detection) knowledge before attending the seminar	3.38	1.08	4	Satisfied
8. (Multi detection) knowledge after attending the seminar	4.23	0.61	5	Strongly satisfied
Attendees knowledge before and after attending the seminar	3.77	0.89	4	Satisfied

Table 4 Seminar attendees' satisfaction

Assessment Items	Satisfaction (n=40)			
	\bar{X}	SD	Scale	Interpretation
1. Location	4.60	0.50	5	Strongly satisfied
2. Suitability of equipment	4.35	0.74	5	Strongly satisfied
3. Satisfaction with the speakers	4.57	0.59	5	Strongly satisfied
4. Appropriateness of content and duration	4.20	0.65	5	Strongly satisfied
5. Platform for virtual events	4.48	0.62	5	Strongly satisfied
6. (Swarm operation) knowledge after attending the seminar	4.44	0.49	5	Strongly satisfied
Overall satisfaction	4.49	0.59	5	Strongly satisfied

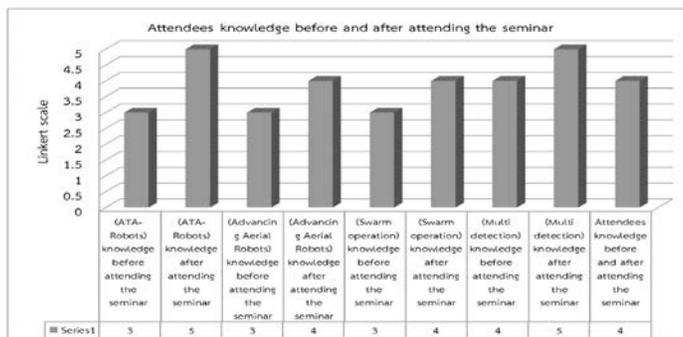


Fig.5 Histogram of attendees knowledge before and after attending the seminar.

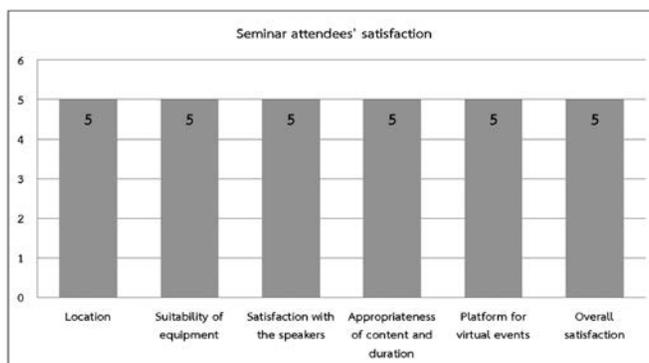


Fig.6 Histogram of Seminar attendees' satisfaction.

government. The methodology of quantitative analysis for statistical proof of the forum success was proposed with the questionnaire designed to measure the Least to the Most content awareness the attendee response to the questions of the topics. The visual interpretation from all topics summarized in the tables managed to attain only Much and Most rating categories. The highest rating from 25 attendees was at Much category for Q4 of Topic 1 for presentation 1. Since the average content awareness in statistical value was at 85%, the grade of gaining Most knowledge awareness as anticipated by the seminar was achieved. The Likert-scale scores reported and interpreted; furthermore, the attendees' overall satisfaction of knowledge before and after attending the seminar and the virtual seminar averaged mean scores are 3.77 and 4.49 which illustrated that they tended to be satisfied and strongly satisfied with the seminar respectively.

As a result, the final score of 85% proved the virtual seminar among Covid-19 statistically successful and matched the objective of the knowledge network.

5. Conclusions

This research paper addresses the virtual seminar forum held amid the Covid-19 pandemic. However, the virus situation in Thailand was significantly mostly contained and the forum was widely embraced by DTI's stakeholders. The rationale of the seminar was to create a forum that enabled knowledge and experience sharing by the invited speakers distantly lecturing advanced defense knowledge and technology to the audience. The Zoom video conference played a central role of communication infrastructure using a 10 GB speed internet. The

seminar was divided into four different topics but all covering unmanned robots which were of interest of the 40 attendees. Thus came the objective of this research of assessing the content awareness from the distance lecture. The seminar was measured via the questionnaires designed to contain 4 questions upon similar purposes for each lecture session. The rating values range from 1 the Least to 5 the Most gained awareness. The average awareness of all presenters was used to grade the attendees' awareness anticipation of the seminar. The summarized data showed that the attendees rated mainly Much and Most categories with the highest rating from 25 attendees at Much category for "Opportunity of ATA-robot R&D in Thailand" of the ATA-robot Topic. And in conclusions, the attendees' overall satisfaction of knowledge upon the 4 topics by assessing the knowledge before and after attending the seminar averaged mean score is 3.77 which illustrated that they tended to be satisfied with the seminar; moreover, the attendees' overall satisfaction of the virtual seminar averaged mean score is 4.49 which illustrated that they tended to be strongly satisfied with the seminar. In addition, the final score of 85% proved the virtual seminar among Covid-19 statistically successful and matched the objectives of the knowledge network.

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