



■ ENGINEERING

## UNIVERSITY COLLABORATION NETWORK DRONE SURVEY SUMMARY REPORT

# NEEDS FOR DRONE EDUCATION IN FINLAND

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## **Abstract**

In this survey summary report, we have highlighted the key outcomes of the survey conducted by the UCN-DRONE project (Project Number) funded by the Finnish Ministry of Education and Culture. The survey was conducted online in March 2022 and we received 177 respondents from several regions of Finnish territories.

The consortium of Ten Universities and Universities of Applied Sciences

9/1/2023

# **UCN-DRONE Survey Results Report**

## *Survey Conducted in Finland*

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### **Prepared for:**

Finnish Ministry of Education and Culture and for all the respondents  
who participated in the Survey

Coordinator of the Project Consortium: Oulu University of Applied Sciences

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## EXECUTIVE SUMMARY

The consortium of ten Finnish universities and the University of Applied Sciences has been actively working intending to identify national and international development targets in the field of UAS. The University Collaboration Network (UCNDrone) project, funded by the Ministry of Finnish Education and Culture, collaborates with three universities, Oulu, Helsinki, Turku, and seven universities of Applied Sciences, Centria, Metropolia, Savona, XAMK, Tampere, Turku, and Oulu. UCNDrone is a national project to create a network of Finnish high educational institutions focusing on education, research, development, and innovation (RDI) related to UAS technologies and applications.

During this project, the consortium executed a national survey that included several stakeholders of the society working with UAS. The survey target groups were companies and organizations that manufacture and provide services and system solutions, public sector authorities working on UAS regulations, innovation and business development support organizations, teachers, students and faculty members of universities, and the general public.

The survey questions were distributed to several drone networks in Finland, partner universities' students and staff, social media groups, and other Finnish universities dealing with drones. Finally, the UCNDrone Network invited the aforementioned target groups to share their ideas about the future of drone-related education in Finland by responding to the national survey on unmanned aircraft system education needs.

We received 177 respondents all over Finland, where most of the respondents were from the greater Helsinki region (Uusimaa -44), North Savo (25), North Ostrobothnia (24), Tampere region (19), and central Ostrobothnia (14). A set of online questionnaires using the Webropol tool has been used to conduct the survey. The aim of the questionnaire was to reveal the urgent training needs related to Finland's rapidly developing drone sector. The respondents' answers have been targeted to be used by the Finnish Ministry of Education, Science, and Culture and UCNDrone partners in planning and implementing up-to-date drone-related training offered by Finnish Universities and the University of Applied Sciences.

This survey summary report would help government authorities, universities, and planners in several ways. A few key outcomes (but not limited to) would be to understand how important it is to educate future professionals in drone technology, what would be the most important expertise in drone legislation and standardization, and drone mission purposes.

## SURVEY OBJECTIVES

The key objective of this survey is to identify the demanding and immediate training and education needs related to the rapidly growing unmanned aircraft systems sectors in Finland.

Some specific objectives are as follows:

- To have an idea of the level of primary drone activities and operations in Finnish regions or the provinces
- To get familiar with the current proportion of the drone community, such as service providers, consumers, drone pilots, technology developers, researchers, educationists, hobbyists, etc., in terms of age, region, and usage frequency.
- To understand better which areas of expertise needed in the future drone technology development, legislation and standardization, and the drone mission purposes domains.

# TARGET GROUPS FOR THE SURVEY

We had targeted to get responses from the following target groups:

- Companies and organizations developing manufacturing and maintaining/services and providing UAS technologies (UAS operational and technological infrastructure) (In Finnish: *teknologian kehittäjä*)
- Companies and organizations developing and maintaining UAS-based applications for dedicated system solutions (In Finnish: *sovelluskehittäjä*)
- Companies utilizing UAS technology for services to companies (In Finnish: *palvelutarjoaja*)
- External Companies and public sector actors requiring services for their own business based on UAS service solutions (In Finnish: *palvelun tilaaja*)
- Public sector authorities defining and controlling UAS regulation in society (In Finnish: *julkinen valvonta and lainsäädäntö*)
- Innovation and business development support organizations for UAS solutions and business models
- Students at High Schools and Universities
- General Public
- Student organizations and Graduate Schools



## METHODOLOGY

The survey planning phase included the selection of the survey instrument and the definition of the survey questions. It was decided to collect the data through an online survey.

Survey instrument was chosen to be online survey tool named as webropol. Tool is easy to use, it collects the data online and some evaluation can be done based on the collected data. The survey tool has support for multiple languages the and survey can be shared easily for the different target groups.

The project consortium started working on the survey questions in spring 2021, using the expertise of the project consortium as a basis to make the questions as comprehensive as possible. The aim was to make the survey as short as possible to inspire the respondents to complete the survey but at the same time comprehensive enough to identify future needs in the field of drone research and education in Finland. The questionnaire included predetermined response options, but also open-ended options, allowing the respondent to decide how to answer. The survey was tested with a limited group of users before publication.

The survey was national and aimed to reach out to people who work with or are involved in drones. More specifically, the target groups of the survey were national companies and organizations that manufacture and provide services and system solutions, public sector authorities working on UAS regulations, innovation and business development support organizations, teachers, students, and faculty members of universities, and the general public.

The survey was conducted as an open online survey from the end of December 2021 to the end of March 2022. Each research organization shared the invitation to the survey in their organization for researchers, teachers, and students, as well as networks and social media. The aim was to activate the people to participate in the survey.

The survey was created by the Oulu University of Applied Sciences and the data collected from the survey was managed by them. Data was shared with the consortium for data analysis.

# SURVEY RESPONDENTS

Heat map of the regions with respect to the responses is shown below

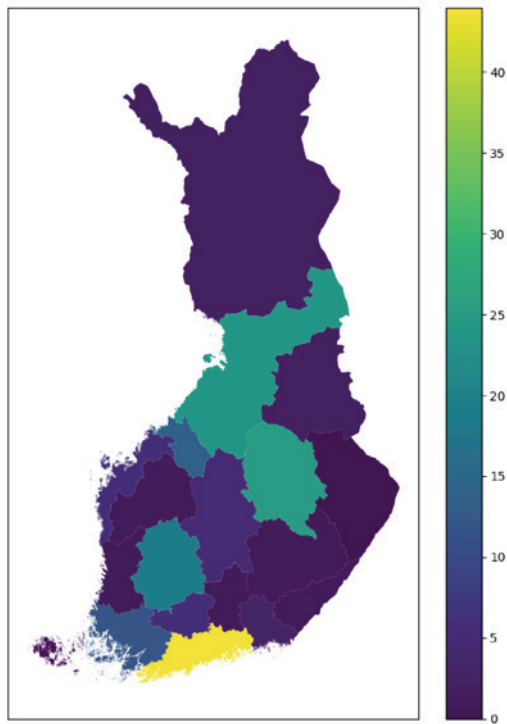


Fig. 1. Heat Maps.

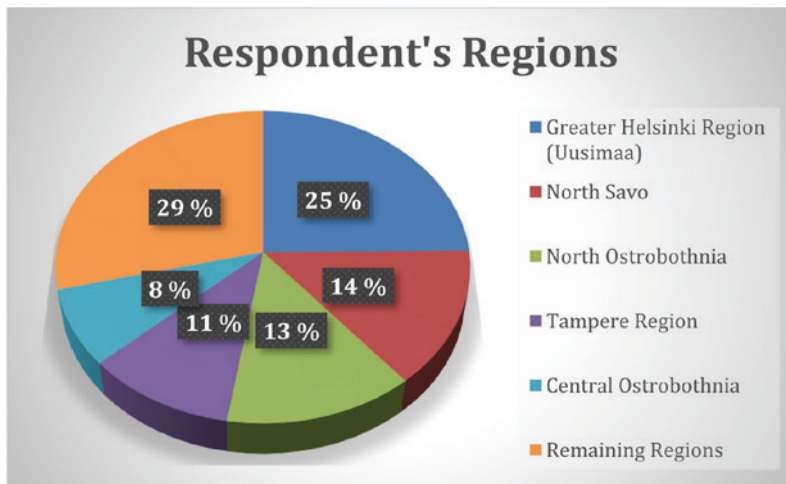


Fig. 2. Major Respondents from the Finnish Regions.

## COLLECTED DATA

Variables	Distribution (N=176)
<b>Age</b>	
Below 20	1
20-39	44
40-59	50
60 years or older	5
<b>Role</b>	
Gov. Authority	7
Commercial Trainers	10
Designers	10
Service Providers	13
Researchers	10
Users	46
Other	4
<b>Respondents Region</b>	
Keski Pohjanmaa	8
Pirkanmaa	11
Pohjois-Pohjanmaa	14
Pohjois-Savo	14
Uusimaa	25
Varsinais-Suomi	7
Others	21
<b>Experience with Drones</b>	
No experience	32
Less than 3 years	29
3-5 years	16
More than 5 years	23
<b>Frequency of Use/year</b>	
Less than 5 activities	21
6-12 activities	15
More than 12 activities	32
Nonusers	32

Data was downloaded from Webropol in Excel and cleaned. During the clean processes, missing datapoints were identified, frequency distributions were examined, necessary recategorization, such as respondents' region and importance of education in application areas was performed.

# RESULTS

The results are broken out by category and listed by question.

## Question 1: Importance of Education in Disciplines

Education is considered as important especially in the disciplines of Human-Computer-Interaction, computer vision, flight control and operational safety (86% of respondents think education is somewhat or very important), and Operational data analytics, information systems, geoinformatics and navigation (85% of respondents think education is somewhat or very important) as seen in Fig 3 below. On average, 75% of respondents believe in the importance of education (somewhat important and very important) versus only 8% of the respondents believe that education is somewhat not important or not at all important, regarding all the disciplines listed below.

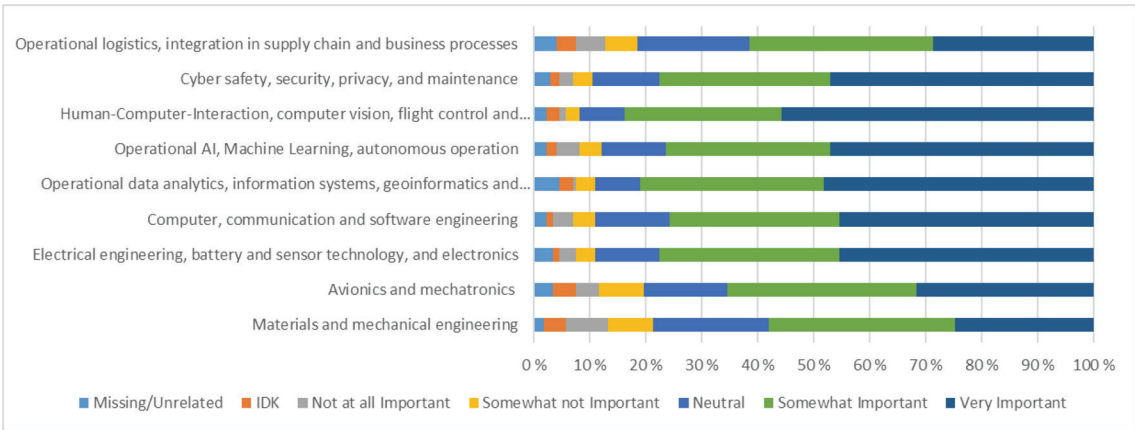


Fig. 3. Importance of Education in Disciplines.

## Question 2: Importance of Education in Legalization and Standardization

According to Fig. 4, acceptable means of compliance and instructions and recommendations are perceived as most important in educating future professionals about Legislation and Standardization. 76% of respondents believe that legislation and standardization are somewhat or very important parts of education versus only 6% of respondents believe that is somewhat not important or not at all important. International Standards get the lowest rating among others in terms of importance in education, 67% of respondents think it is somewhat or very important in educating future professionals.

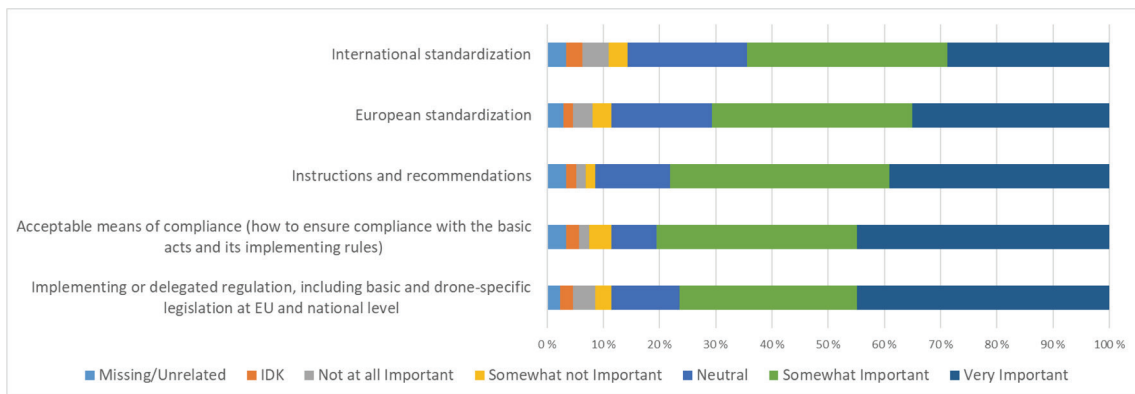


Fig. 4. Importance of Education in Legalization and Standardization.

### Question 3: Importance of Education in application area

Note: 0= I don't know, 1=not at all important, 2=somewhat unimportant, 3=neither unimportant nor important, 4=somewhat important, 5=very important

The application areas considering Drone education as most important are R&D (79% of respondents believe education is very or somewhat important), Logistics (72% of respondents believe education is very or somewhat important) and Safety and Security (71% of respondents believe education is very or somewhat important) as it is seen from Table 6.1. On average, marketing and advertisement application is considered the least important area for education. 43% of respondents believe it is very or somewhat important whereas 23% of the respondents believe it is not at all important or somewhat not important.

Table 1. Importance of Education in application area.

#### Marketing and Advertisement:

Categories	0	1	2	3	4	6
Advertising	6	30	29	57	25	22
Aerial Photography & Film / Video Footage	1	4	8	39	70	48
Broadcasting	8	9	7	51	56	35
Sky Painting & Sky Writing	13	29	36	57	18	10

#### Logistics

Categories	0	1	2	3	4	5
Identification	8	9	9	26	60	55
Localization	8	4	3	28	59	65

#### Safety and Security

	0	1	2	3	4	5
Fire fighting	7	7	7	36	54	57
Monitoring	6	6	8	26	60	57
Observation	5	3	6	23	66	59
Patrolling	6	5	5	28	62	56
Relief Flight	9	5	2	24	46	77
Pest control	15	9	8	42	61	27
Search & Rescue	3	4	1	15	40	99
Security	5	3	3	22	41	86
Spotting	12	9	10	43	58	31

## Industry

	0	1	2	3	4	5
Actuating	26	4	5	50	54	24
Inspection	7	6	1	31	63	60
Measuring	2	2	2	16	67	72
Sensing	27	7	5	49	52	27
Testing / Evaluating	12	4	3	39	56	45
Validation	28	8	10	44	42	27

## Agriculture

	0	1	2	3	4	5
Deterring	10	20	21	60	38	17
Mapping	5	2	4	19	62	72
Spraying	14	9	11	51	53	24
Seeding	16	7	11	52	51	26
Surveillance	8	7	6	37	56	49
Surveying	4	2	4	26	68	60

In agriculture, drones are able to capture very accurate field information. The results of the survey show 72% is very important for mapping and 60% for surveying the farm because of the big size of farms in Finland. In ten years, the average farm area has grown from 41 to 51 hectares. (Luke, 2021). At the same time, using drones for spraying and seeding is somewhat less important for Finland farms about 52%. It means the location gives a competitive advantage to developing and adapting drones in Finland.

## Logistics

	0	1	2	3	4	5
Tracking	14	5	8	48	45	41
Transport – Goods	5	8	14	30	63	43
Transport – Persons	10	23	18	43	41	27

## Research & Development

	0	1	2	3	4	5
Research, Development and Innovations	2	4	5	20	48	83
Exploration	5	4	4	24	65	64

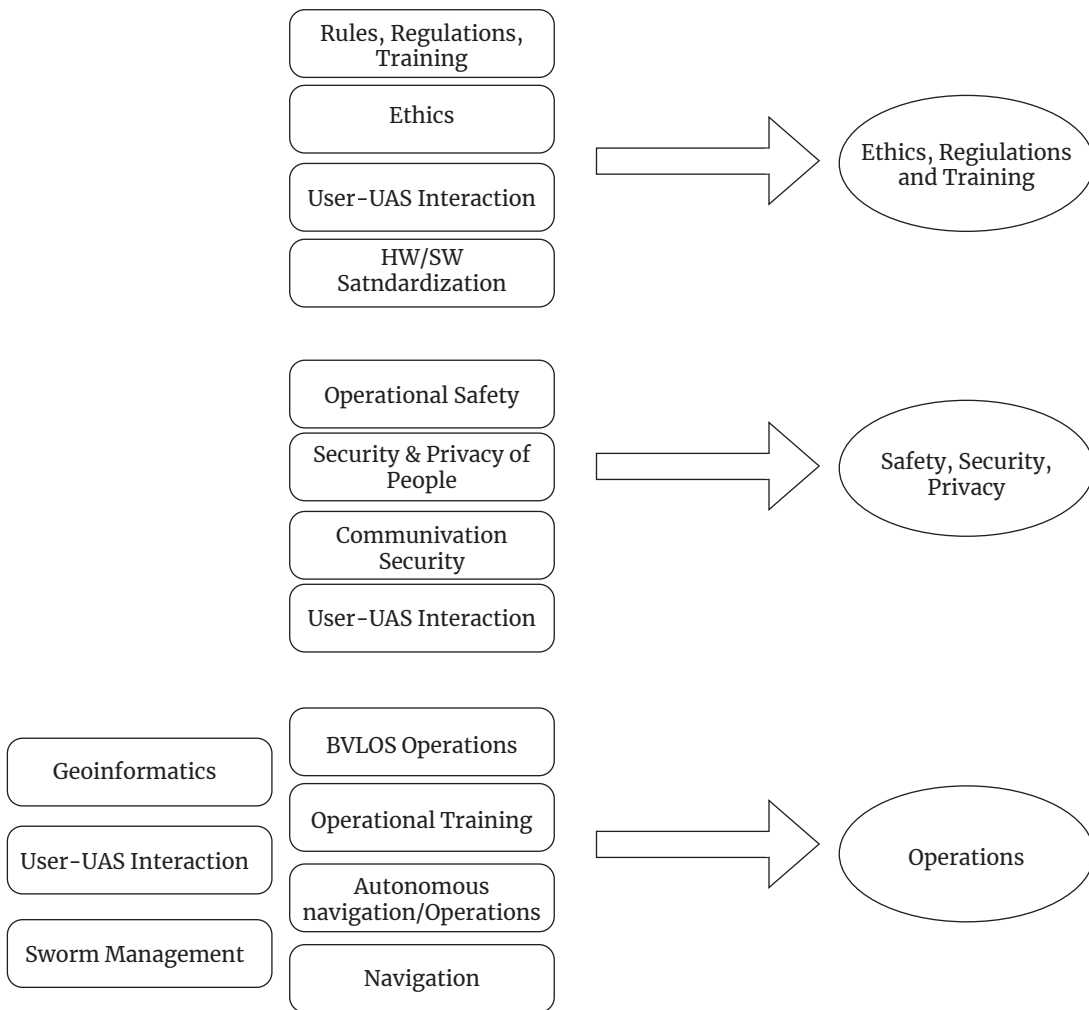
## Recreational

	0	1	2	3	4	5
Aerobatics, Special Effects & Sport	6	21	33	59	29	20

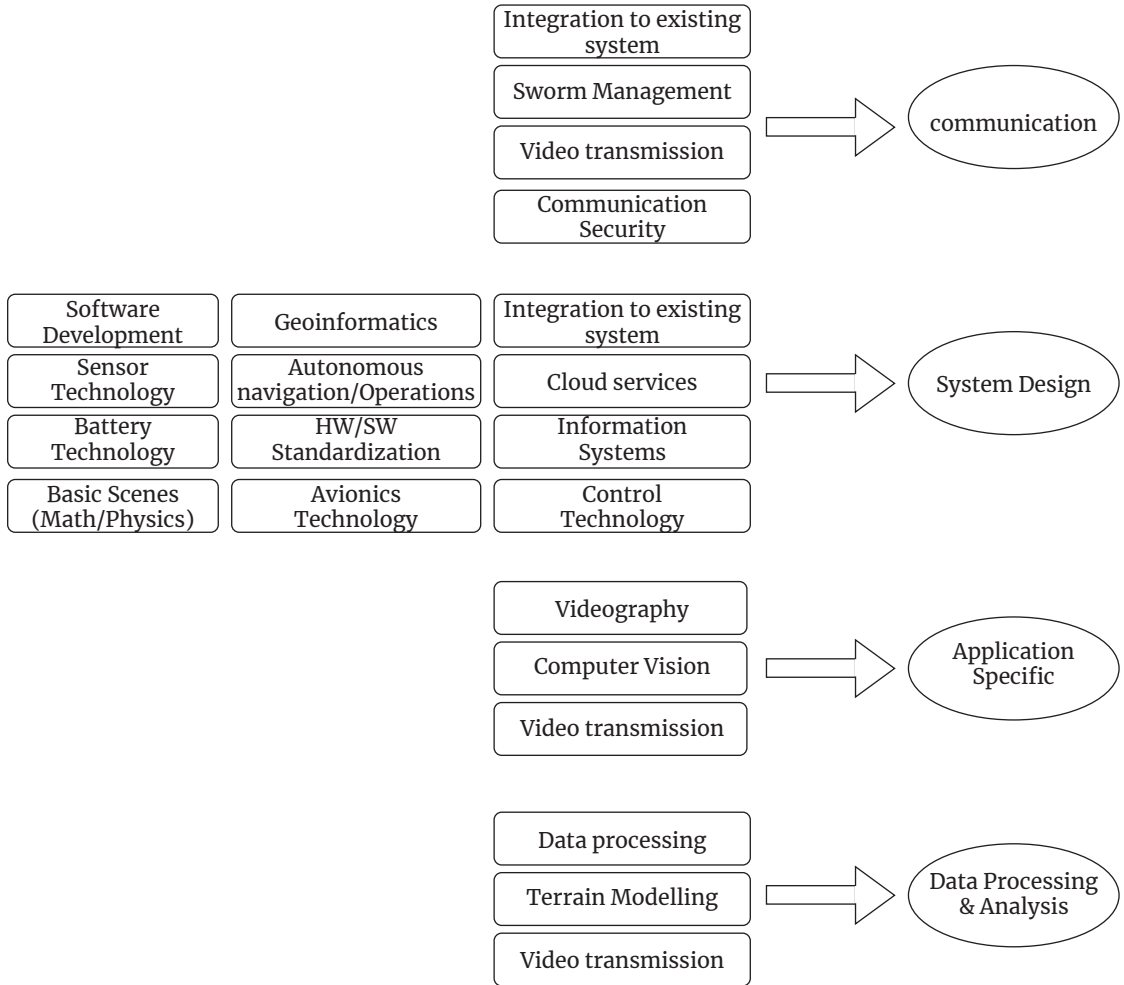


### Question 4. Education Competencies Required.

Respondents were asked to identify the education competencies that will be needed in Finland through an open-ended question. Their responses were coded inductively, and the resulting themes are shown in Fig. 5 and Fig. 6.



**Fig. 5.** Education competencies required in the areas of ethics, regulations, and training, safety, security and privacy, and operations.



**Fig 6.** Education competencies require in the areas of communication, system design, applications and data processing and analysis.

## CONCLUSION

In this survey report, we were able to visualize the current scenario for the needs of drone education and research in Finland. Some of the key conclusions are:

- On average, 75% of respondents believe in the importance of education is somewhat important and very important.
- 76% of respondents believe that legislation and standardization are somewhat or very important parts of education.
- The results of the survey show 72% is very important for mapping and 60% for surveying the farm because of the big size of farms in Finland.

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# APPENDIX A – SURVEY TEXT

Appendix A contains the complete list of questions.

## Introduction

This survey is organised by Finnish UCNDrone university network. The aim of this questionnaire is to reveal the urgent training needs related to the rapidly developing drone sector. The questionnaire results will be used by Ministry of Education, Science and Culture of Finland and UCNDrone partners to plan and implement up-to-date drone related training to be offered by Finnish universities and universities of applied sciences and other stakeholders.

Please share your thoughts what kind of expertise is needed for Finland to become a forerunner in developing and utilizing the drone technology.

We would like to encourage all the stakeholders that would like to share their thoughts on the matters above to respond this survey.

Responding to the survey may take about 10 minutes.

### About UCNDrone

- A project by the Ministry of Education, Science and Culture of Finland
- Total budget: 823 116 EUR
- Duration: two years, 2021–2023
- Partners: A national collaboration of three universities, Oulu, Helsinki, Turku, and seven Universities of Applied Sciences, Centria, Metropolia, Savonia, XAMK, Tampere, Turku and Oulu
- <http://www.uas-finland.eu/>
- For more information about joining the network, please contact Vadim Kramar, [vadim.kramar@oamk.fi](mailto:vadim.kramar@oamk.fi), +358443250770

## Johdanto

Kyselyn järjestää suomalainen UCNDrone-korkeakouluverkosto. Tämän kyselyn tavoitteena on selvittää nopeasti kehittyvän drone-sektorin kii-reelliset koulutustarpeet. Opetus-, tiede- ja kulttuuriministeriö ja UCNDrone-kumppanit käyttävät kyselyn tuloksia suomalaisten yliopistojen ja ammattikorkeakoulujen sekä muiden sidosryhmien tarjoamien ajantasaisten droneihin liittyvien koulutusten suunnittelussa ja toteuttamisessa.

Kerro mielipiteesi, millaista osaamista Suomessa tarvitaan tullaksemme edelläkävijöiksi drone-teknologian kehittämisessä ja hyödyntämisessä.

Haluamme rohkaista kaikkia sidosryhmiä jakamaan ajatuksensa yllä olevista asioista vastaamalla tähän kyselyyn.

Kyselyyn vastaaminen kestää noin 10 minuuttia.

If you prefer responding in English, please change the language from a drop-down list at the right upper corner of this page.

### Tietoja UCNDronesta

- Opetus-, tiede- ja kulttuuriministeriön hanke
- Budjetti yhteensä: 823 116 euroa
- Hankkeen kesto: kaksi vuotta, 2021–2023
- Yhteistyökumppanit: kolme yliopistoa, Oulun, Helsingin ja Turun, sekä seitsemän ammattikorkeakoulua, Centria, Metropolia, Savonia, XAMK, Tampere, Turku ja Oulu
- <http://www.uas-finland.eu/>
- Lisätietoja UCNDrone-verkostoon liittymisestä: Vadim Kramar, [vadim.kramar@oamk.fi](mailto:vadim.kramar@oamk.fi), +358443250770

**Format of questions – 6 options****Kysymysten muoto**

Very important  
Somewhat important  
Neutral  
Rather not important  
Not important at all  
I do not know

Hyvin tärkeä  
Jokseenkin tärkeä  
Neutraali  
Jokseenkin ei tärkeää  
Ei ollenkaan tärkeää  
En tiedä

**Region of primary drone activities/  
operations (drop-down list)****Drone-toimintojen/operaatioiden alue**

Åland Islands  
Central Finland  
Central Ostrobothnia  
Kainuu  
Kanta-Häme  
Kymenlaakso  
Lapland  
North Karelia  
North Ostrobothnia  
North Savo  
Ostrobothnia  
Pirkanmaa  
Päijät-Häme  
Satakunta  
South Karelia  
South Savo  
South Ostrobothnia  
Southwest Finland  
Uusimaa

Ahvenanmaa  
Etelä-Karjala  
Etelä-Pohjanmaa  
Etelä-Savo  
Kainuu  
Kanta-Häme  
Keski-Pohjanmaa  
Keski-Suomi  
Kymenlaakso  
Lappi  
Pirkanmaa  
Pohjanmaa  
Pohjois-Karjala  
Pohjois-Pohjanmaa  
Pohjois-Savo  
Satakunta  
Päijät-Häme  
Uusimaa  
Varsinais-Suomi

**Specify your primary role with rele-  
vance to drone activities/operations:  
(radio button, only one option)****Mikä kuvaa parhaiten rooliasi drone-  
toimijana:**

Drone service provider  
Drone service consumer  
Drone pilot  
Drone technology developer  
Drone researcher or special expert  
Government Authority  
Educator  
Student  
General public  
Some other background, please specify

Drone-palveluntarjoaja  
Drone-palvelun käyttäjä  
Drone-lentäjä  
Drone-teknologian kehittäjä  
Drone-tutkija tai -erikoisasantuntija  
Viranomainen  
Kouluttaja  
Opiskelija  
Julkisyhteisö  
Muu tausta, tarkenna

**Your age (radio button)****Ikäsi**

Under 20  
20 – 39  
40 – 59  
60 years or older

Alle 20  
20-39  
40-59  
60 vuotta tai vanhempi

**How many years of experience you have with drones? (radio button)**

No experience  
Less 3 years  
3 to 5 years  
Over 5 years

**Kuinka monen vuoden kokemus sinulla on droneista?**

Ei kokemusta  
Alle 3 vuotta  
3-5 vuotta  
Yli 5 vuotta

**If any, what is the scale of your drone related activities/operations? Here, activity or operation means that you, e.g., piloted a drone, used data collected with drone, or have some other use of drone technology or results of its applications. (Open only, if more than no experience) (radio button)**

Less than 5 activity/operation per year  
6 – 12 activity/operation per year  
Over 12 activity/operation per year

**Jos on kokemusta, mikä on droneihin liittyvien toimintojesi tai operaatioittesi laajuus? Tässä toiminta tai operaatio tarkoittaa, että olet toiminut drone-lentäjänä, käyttänyt dronella kerättyä dataa, tai sinulla on muuta käyttöä drone-teknologialle tai sen tuloksille.**

Alle 5 toimintaa/operaatiota vuodessa  
6 – 12 toimintaa/operaatiota vuodessa  
Yli 12 toimintaa/operaatiota vuodessa

**How important it is to educate the future professionals in the following areas of expertise regarding drone technology? (6 options)**

Materials and mechanical engineering  
Avionics and mechatronics  
Electrical engineering, battery and sensor technology, and electronics  
Computer, communication and software engineering  
Operational data analytics, information systems, geoinformatics and navigation  
Operational AI, Machine Learning, autonomous operation  
Human-Computer-Interaction, computer vision, flight control and operational safety  
Cyber safety, security, privacy, and maintenance  
Operational logistics, integration in supply chain and business processes

Something else? Please specify (text field 100?)

**From your perspective, what would be the most important expertise related to the drone technology development? (From the pre-prepared list, we collect the technology development categories and responder can reply under each application area) Text area 500?**

**Kuinka tärkeää on kouluttaa tulevia ammattilaisia seuraavilla droneteknologian osaamisalueilla?**

Materiaalit ja koneenrakennus  
Avioniikka ja mekatroniikka  
Sähkötekniikka, akku- ja anturitekniikka sekä elektroniikka  
Tietokone-, viestintä- ja ohjelmistosuunnittelu  
Käyttötiedon analytiikka, tietojärjestelmät, geo-informatiikka ja navigointi  
Operatiivinen tekoäly, koneoppiminen, autonominen toiminta  
Ihmisen ja tietokoneen vuorovaikutus, tietokonenäkö, lennonohjaus ja käyttöturvallisuus  
Kyberturvallisuus, tietoturva, yksityisyys ja ylläpito  
Operatiivinen logistiikka, integrointi toimitusketjuun ja liiketoimintaprosesseihin  
Jotain muuta? Määritä

**Mikä olisi sinun näkökulmastasi tärkein drone-teknologian kehitykseen liittyvä osaaminen tällä hetkellä?**

**How important it is to educate the future professionals in the following areas of expertise regarding drone-relevant legislation and standardisation? (6 options)**

Implementing or delegated regulation, including basic and drone-specific within the EU Framework and National Implementations

Acceptable means of compliance (how to establish compliance with the Basic Regulation and its Implementing Rules)

Guidance and recommendations  
European Standardisation  
International Standardisation  
Something else? Please specify (text field 100?)

**Kuinka tärkeää on kouluttaa tulevia ammattilaisia seuraavilla droneihin liittyvän lainsäädännön ja standardoinnin osaamisalueilla?**

Täytäntöönpano- tai delegoitu sääntely, sisältäen perus- ja drone-spesifiset säädökset EU:n ja kansallisella tasolla

Hyväksyttävät keinot noudattaa säännöksiä (miten varmistetaan perussäädösten ja sen täytäntöönpanosääntöjen noudattaminen)

Ohjeita ja suosituksia  
Eurooppalainen standardointi  
Kansainvälinen standardointi  
Jotain muuta? Määritä

**From your perspective, what would be the most important expertise related to the drone-relevant legislation and standardisation? (From the pre-prepared list, we collect the regulation areas and responder can reply under each application area) Text area 500?**

**Mikä olisi sinun näkökulmastasi tällä hetkellä tärkein drone lainsäädäntöön ja standardointiin liittyvä asiantuntemus?**

**How important it is to educate the future professionals in the following areas of expertise regarding drone mission purposes (Part 1) (6 options)**

**Kuinka tärkeää on kouluttaa tulevia ammattilaisia seuraavilla drone-tehtävien osaamisalueilla (Osa1)**

Advertising  
Aerobatics, Special Effects & Sport  
Aerial Photography & Film / Video Footage  
Broadcasting  
Deterring  
Exploration  
Fire fighting  
Identification  
Inspection  
Localisation  
Actuating  
Mapping  
Measuring  
Monitoring  
Observation  
Patrolling  
Relief Flight  
Pest control  
Search & Rescue  
Security

Mainonta  
Taitolento, erikoistehosteet ja urheilu  
Ilmakuvaus ja elokuva / videomateriaali  
Lähetys  
Eläinten hätistely  
Tutkimus  
Tulipalon sammuttaminen  
Tunnistaminen  
Tarkastus  
Paikallistaminen  
Toimilaitteena  
Kartoitus  
Mittaus  
Valvonta  
Havainnointi  
Vartiointi  
Pelastuslennot  
Tuholaisten torjunta  
Etsintä ja pelastus  
Turvallisuus



How important it is to educate the future professionals in the following areas of expertise regarding drone mission purposes (Continuation, Part 2) (6 options)

Sensing  
Sky Painting & Sky Writing  
Special Purpose  
Spotting  
Spraying  
Seeding  
Surveillance  
Surveying  
Testing / Evaluating  
Tracking  
Transport – Goods  
Transport – Persons  
Validation  
Research, Development and Innovations  
Something else? Please specify (text field 100?)

Kuinka tärkeää on kouluttaa tulevia ammattilaisia seuraavilla drone-tehtävien osaamisalueilla (Osa 2)

Aistinta  
Ilmamaalaus ja -kirjoitus  
Erityinen tarkoitus  
Tarkkailu  
Ruiskutus  
Kylväminen  
Valvonta  
Maanmittaus  
Testaus / arviointi  
Seuranta  
Kuljetus – tavarat  
Kuljetus – Henkilöt  
Validointi  
Tutkimus, kehitys ja innovaatiot  
Jotain muuta? Määritä

From your perspective, what would be the most important expertise related to the drone mission purposes? (From the pre-prepared list, we collect the application areas and responder can reply under each application area) Text area 500?

Mikä olisi sinun näkökulmastasi tällä hetkellä tärkein drone-tehtävään liittyvä osaaminen?

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