NECTEC
a member of NSTDA

Annual Report

2021

National Electronics and Computer Technology Center

Annual Report 2021

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Content

Message
from Chairman of the Executive Board National Electronics and Computer Technology Center

The National Electronics and Computer Technology Center (NECTEC) was established on September 16, 1986 following the Cabinet's resolution. The center was transformed into a national specialized center under the National Science and Technology Development Agency (NSTDA) in accordance with the enactment of the Science and Technology Development Act 1991.

NECTEC has been operated under a model of an autonomous organization for its agility with main responsibilities of undertaking, supporting and promoting the research and development of electronics and computer technologies to accelerate research results for real utilization. The center deploys the structure of a specialized executive committee, which consists of experts from government agencies and the private sector, to provide advices, offer opinions and reflect economic and social needs of the country to executives and researchers at NECTEC to drive the center's research and development to go in line with the country's development for all sectors.

For more than 35 years since its establishment, NECTEC has grown in terms of the organization's size and the number of researchers and supporting personnel. To date, the center maintains its commitment in completing all its missions together with accumulating knowledge, expertise and experiences to develop research works delivered to the country. Its research outcomes, including those successfully done through technology transfer approach and via collaboration with government agencies, educational institutions, and the private sector, created impacts and achieved the measurement index under NSTDA's policy.

NECTEC accomplished in transferring high-potential technology research works into commercialization, resulting in the establishment of three spin-off companies and the other two public organizations. The center got involved in many national projects including a project to drive the country's development using research, technology and innovation under the BCG Economy Model. It's also a secretary to drive the National AI Strategy and took part in the establishment of the Sustainable Manufacturing Center (SMC) to enhance Thailand's competitiveness to serve the new Industry 4.0.

During the COVID-19 pandemic, NECTEC utilized its technology research works to help healthcare professionals decrease the risks of COVID-19 infection while improving working efficiency to Thailand's healthcare system. The research works included robot for transporting medical equipment to operating rooms of COVID-19 patients; the development of Database of International Vaccination Certification (INTERVAC); and the development of face verification system to facilitate the Thai Red Cross Society on the vaccination registration process for the underprivileged, the fugitives, and stateless ethnic groups.

As the national research and development center, NECTEC has taken a role as a key foundation for the country's advanced electronics and information technology development. The center's ultimate goal throughout the past three decades and in the future principally focuses on developing and delivering the country's electronics and computer technology infrastructure in the form of "DE Facto Platform" for a wide-range utilization. The center's other missions consist of the dissemination of research works to target audiences and real users; the establishment of ecosystems to maintain long-term performance; readiness preparation for future technology researches in line with the world's circumstances such as the entering of the digital era, artificial intelligence era, the Fourth industrial revolution, and the responses to climate and pandemic crisis; as well as the participation in developing the national policy frameworks for the country's development. These are NECTEC's challenges in terms of knowledge utilization and management strategy development when it comes to operating the next phase of NECTEC. I sincerely hope that this annual report will be a medium to present NECTEC's achievement and pride in its hard-work during the past fiscal year. I would like to thank the management team, researchers, supporting personnel, allied agencies from the government sector, educational institutions, the private sector and non-profit organizations in supporting NECTEC and helping drive the center in progress to create research works that will benefit the society and the nation.

Taweesak Koanantakool
Chairman of the Executive Committee
National Electronics and Computer Technology Center

Message
from NECTEC's Executive Director

The National Electronics and Computer Technology Center (NECTEC) is a specialized center for research, development and engineering design focusing on building a foundation for the country's advanced electronics and information technology development.

The center restructured the role of its research and innovation group to be in line with a new working strategy that emphasizes on building up the country's competency on technology development to be at the forefront, strengthening research and development in the field of expertise; and being a good partner in a journey to a knowledge-based society that uses science and technology to respond the needs of the country's development. The focus also includes the driving of a new BCG (Bio-Circular-Green) Economy Model under the National Science and Technology Development Agency (NSTDA)'s strategic framework as one of Thailand's national agenda. All missions would be done under a determined target that is consistent with NSTDA's missions.

NECTEC carried out its activities in accordance with NECTEC's 4th Strategic Plan which concentrates on technology research and development in eight key areas including Big Data; Artificial Intelligence; Advanced Sensors; Precision Farming; Smart Industry; Smart City; Innovation for Education; and Digital Wellness. The center has restructured its working process to support these key operations and redesigned its research labs to match the target technologies.

The center has also utilized the newly set-up Sustainable Manufacturing Center (SMC) located at the Eastern Economic Corridor of Innovation (EECi) as a base to help enhance Thai industry. With well-equipped infrastructure and tools, SMC supports technology development and transfer while strengthening knowledge and expertise to local entrepreneurs and those who are interested in adapting to the changes in the manufacturing industry.

In the data utilization aspect, NECTEC got involved in supporting the Open Government Data Platform for public benefits. The center partnered with King Mongkut's University of Technology Thonburi to establish the Center of Technology Transfer (CoTT) for Smart Warehouse. It also promoted the use of spectroscopy technology through the development of "OnSpec", the Surface-Enhanced Raman Spectroscopy (SERS) chip and encouraged the utilization of a face verification system for outlander registration for the Thai Red Cross Society. The "KidBright" board was delivered to be used in teaching and learning systems in a new digital era whereas the "Navanurak" platform was developed to collect cultural and biodiversity data of Thailand.

In 2021, NECTEC worked with the Office of the National Digital Economy and Society Commission to amend the draft of the National Artificial Intelligence Master Plan for Thailand Development (2021 – 2027) in a 7-year period. To be proposed to the Cabinet, the plan set a vision to make Thailand a leading country in the development and the deployment of artificial intelligence technology to elevate Thai people's quality of life by 2027. The action plan will be executed through its key strategies in human resource development, technology development, economic growth enhancement, and social and environmental impact creation.

All NECTEC's researches that have been constantly delivered to the country are reflecting the center's commitment in working and driving R&D projects for real use. The center aims to create a foundation for systematic development so that we can proudly say that "We can ourselves create technology and innovation in response to the country's real needs based upon practical use and sustainability."

Dr. Chai Wutiwiwatchai
Executive Director
National Electronics and Computer Technology Center

Executive Summary

The National Electronics and Computer Technology Center (NECTEC) has carried out its activities in accordance with the National Science and Technology Development Agency (NSTDA)'s science, technology and innovation missions. The center emphasizes on enhancing the country's competency on technology development and strengthening technology research in the field of expertise. It's also intended to be a good partner in a journey to develop a knowledge-based society and build up the national science and technology infrastructure in response to the needs of the country's research and development

NECTEC got involved in many national projects including the development of the National Artificial Intelligence Master Plan for Thailand Development (2021 – 2027) and the project to drive the emerging BCG Economy Model for sustainable development. The new BCG Economy Model, which focuses on the country's economic development in three dimensions; bio-economy, circular economy and green economy, can be used as a guideline to help shape the country's objectives in line with the national strategies.

Meanwhile, NECTEC is committed to developing innovators and innovation by using advanced technology as a key mechanism to create partnership with all sectors. The center's collaborative approach helps generate positive economic impacts, create investment values, build up higher income, and encourage the development of practical technologies for wide use, which in return, promotes a good recognition to NECTEC as a whole.

During the past fiscal year, major actions have been executed including the development of the national integration plan; the development of the government's policy on science, technology and innovation infrastructure to create social and economic impacts; the adjustment of working procedure to cope up with the COVID-19 epidemic; and the driving of a new working process in line with the BCG Economy Model and for economic revitalization.

NECTEC set its direction to conduct research and development on advanced electronics and information technology in eight targeted areas including Big Data Analysis; Precision Farming, Smart Factory; Smart City; Smart Sensors; Artificial Intelligent Services; Innovation for Education; and Digital Wellness.

In the fiscal year 2021, collaborations among research groups and the integration of technology itself have been created, resulting in the blending of research data in many projects and the development of ecosystems that can expand technology usability to real users. The precision farming technology of HandySense, for example, was connected to Farm to School, an agricultural information system for school lunch. While a variety of electronic technologies and related systems have been combined to build up a new technology platform, the Aqua-IoT, to enhance the efficiency of aquatic animal production. Additionally, the technology of HandySense was linked with Kidbright AI board to allow farmers to control their smart farm activities remotely via the board.
Other technology integration projects also included the extension of Mutherm Robot to Mutherm for agriculture; AI platform to analyze and characterize oil stains using spectroscopy technique; SME registration system for government procurement; the provision of MECAs service, the Cloud Container Service Platform, for Kidbright team; and the development of data transmission module to allow TANITA digital scales to send body composition results to the cloud for further processing.

NECTEC's key performance in 2021 was visibly illustrated through the delivery of qualitative research prototypes for real utilization. The center achieved 123 technology transfer contracts and generated more than Bt147 million contract value from the collaboration with a total of 13 awards received. Its accomplishment also included a total of 142 academic articles, 85 invention patent filings, and real utilization of its intellectual property.

Currently, NECTEC employs a total of 578 human resources, of which 64 per cent are research and development personnel, 35 per cent are supporting personnel, and the remaining are executives. All are the key driving forces in supporting and strengthening NECTEC's operations to achieve the goals.

Master Pice

76

Technology Transfer Contracts

123

Contract value

147 **Bt/million**

Awards

13

Organization Overview

The National Electronics and Computer Technology Center (NECTEC) was established on September 16, 1986 following the Cabinet's resolution. In 1991, the center was transformed into a national specialized center in accordance with the enactment of the Science and Technology Development Act 1991. Currently, the center is operated under the Ministry of Higher Education, Science, Research and Innovation.

Vision

To be the foundation for advanced electronics and information technology development in Thailand

Mission

- To build a technology foundation for the country.
- To foster the development of the technology ecosystem together with strategic alliances.
- To get ready for the development of frontier technology.

Organizational Structure

Chai Wutiwiwatchai, Ph.d.
Executive Director

Alisa Kongthon, Ph.d.
Deputy Executive Director
Research & Development
Support

Kalaya Udomvitid, Ph.d.
Deputy Executive Director
Organization Management

Panita Pongpaibool, Ph.d.
Deputy Executive Director
Research & Development
Intelligent Systems and Network

Sarun Sumriddetchkajorn, Ph.d.
Deputy Executive Director
Research & Development AI
and Advanced
Electronic Sensing

Executive Board

Mr. Thaweesak Koanantakool	Chairman
Mr. Narong Sirilertworakul	Vice-Chairman
Mr. Manoo Ordeedolchest	Committee
Mr. Sommai Lakananuruk	Committee
Mr. Suwit Wibulpoprasert	Committee
Mr. Surapol Opasatien	Committee
Mrs. Kanit Muangkrachang	Committee
Mr. Nuttapon Nimmanphatcharin	Committee
Mr. Trirat Viriyasirikul	Committee
Mr. Tanaratt Ngamvalairatt	Committee
Mr. Wanchat Suwankitti	Committee
Mr. Chai Wutiwiwatchai	Committee and Secretary
Miss Kalaya Udomvitid	Committee and Assistant Secretary

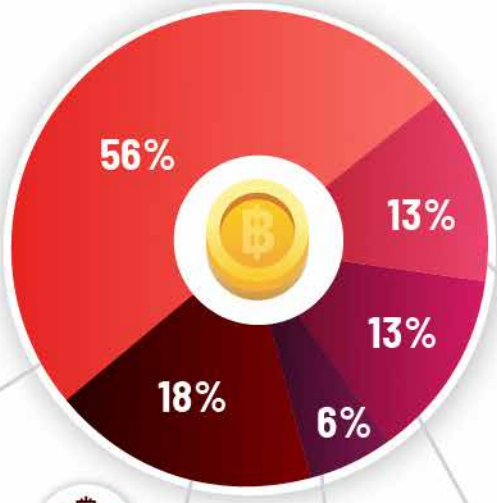
Budget

NECTEC received a total Bt1,377.09 million annual budget in the fiscal year 2021. Its expenditure was divided into three groups; main equipment budget; personnel budget; and operating budget. The Bt457.63 million was allocated to the operating budget of which Bt460.33 million actual expenses were used as details are followed:

Operating budget
457.63
million

Actual expenses
460.33
million

Operating Budget



Artificial Intelligence and Advanced SensorsResearch and Development
million 126.04

Intelligent Systems and Networks Research and Development
33.30 million

Sustainable Manufacturing Center Research and Development
31.66 million

Research and Development Support
14.52 million

Management
million 45.86

Personnel

578 persons

Job Titles

Senior Executives

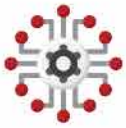
5

Management Executives

20

Supporting Research and Development

107



Research and Development Personnel

373

General Supporting Personnel

73

Educational Level

Ph.D.

147

Bachelor-degree

188

Master-degree

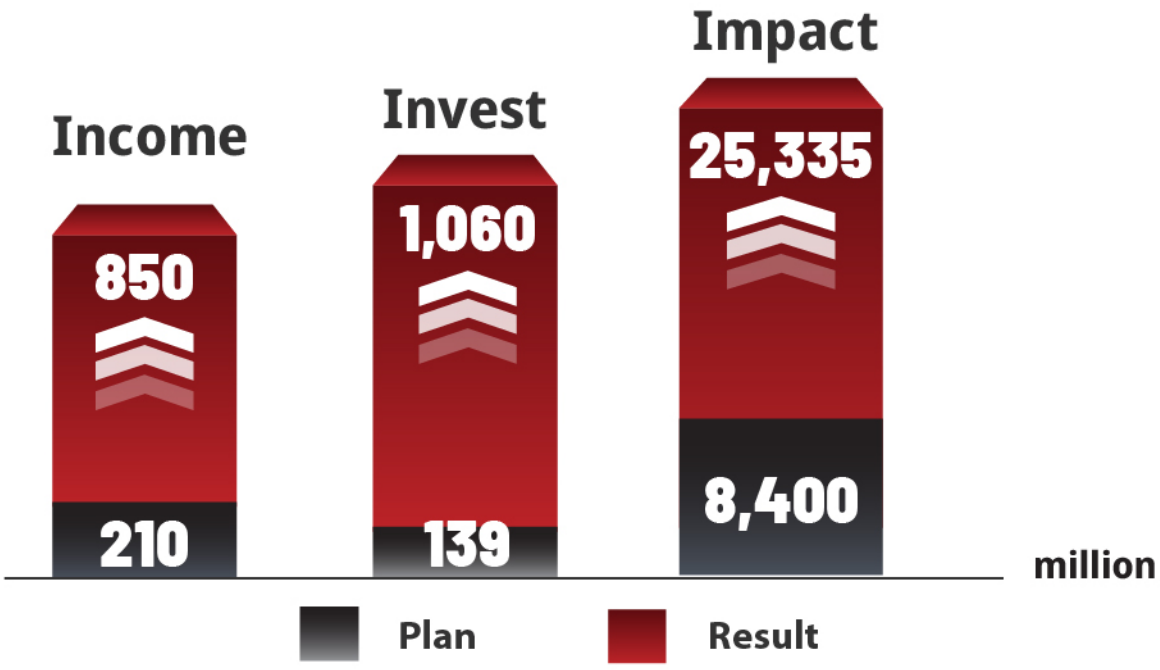
230

Diploma-level

13

Performance and Key Activities

In the fiscal year 2021, NECTEC delivered significant research results and achieved its goal in creating economic and social impacts, totaling worth at Bt26.54 billion.



Top 5 Highest Investment Value

Consultancy service and Strength Analysis of Aluminum-based Bus Body Structure

450 million

Thai People Map and Analytics Platform (TPMAP)

102 million

Agri-Map Online

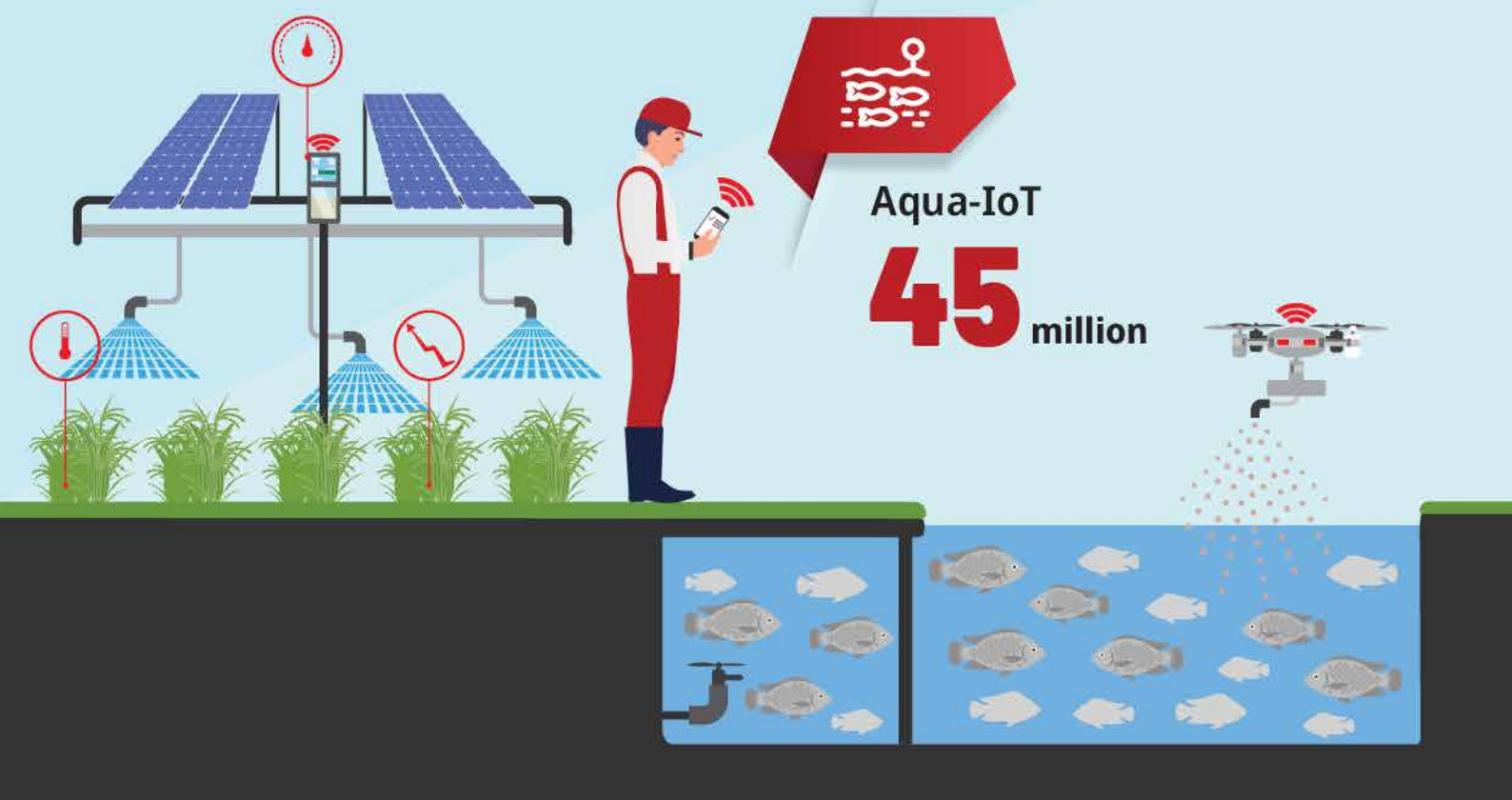
102 million

Electronic Monitoring and Evaluation System of National Strategy and Country Reform (eMENSCR)

48 million

Aqua-IoT

45 million



Top 5 Highest Income

SME Registration System for Government Procurement

12 million

Population Census System

10 million

Electronic Products Testing System

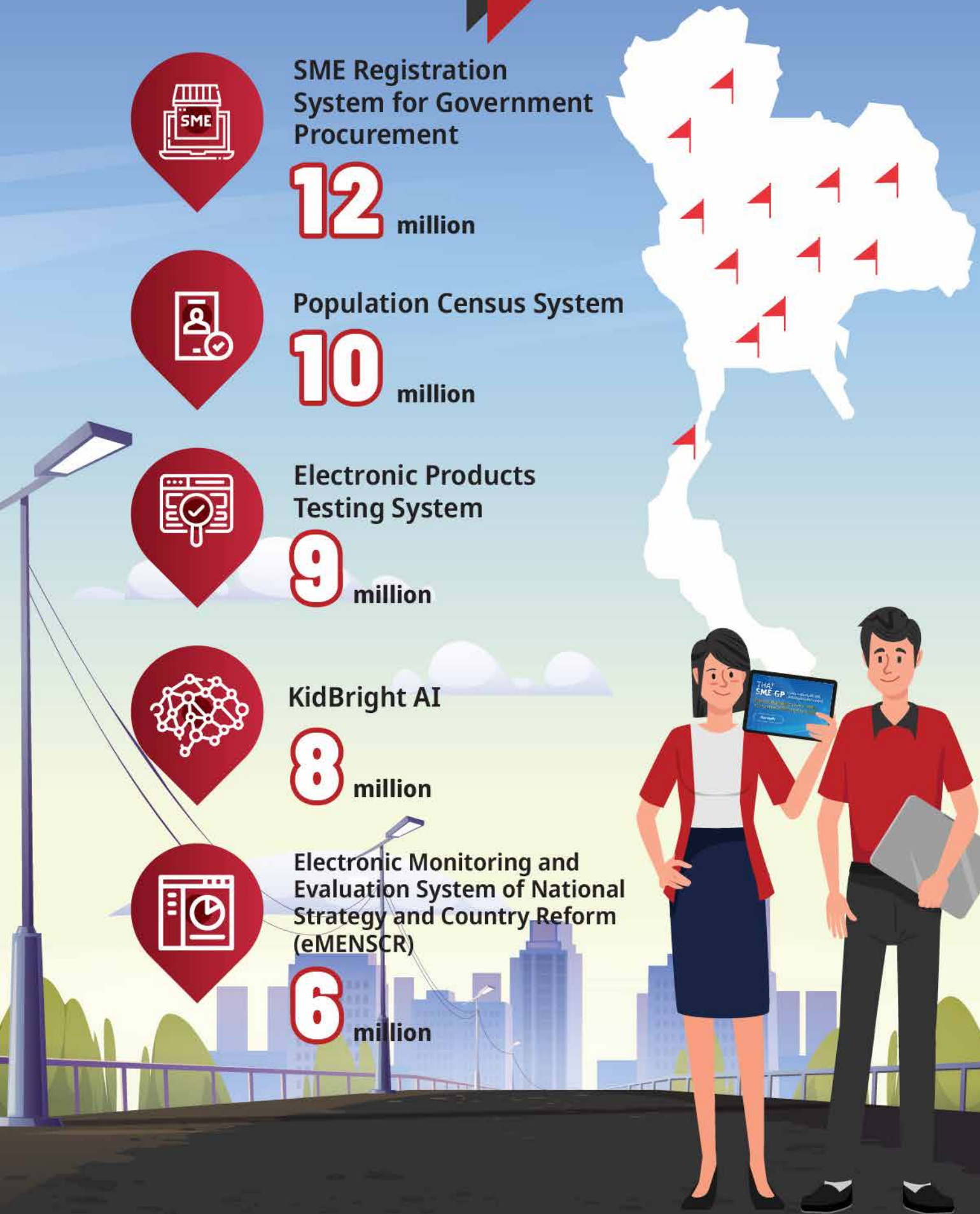
9 million

KidBright AI

8 million

Electronic Monitoring and Evaluation System of National Strategy and Country Reform (eMENSCR)

6 million



Top 5 Impact Value

Electronic Monitoring and Evaluation System of National Strategy and Country Reform (eMENSCR)

13,622 million

Dam Safety Remote Monitoring System (DS-RMS)

3,567 million

Thai School Lunch

3,474 million

Thai Journals Online 2.0 (ThaiJo 2.0)

641 million

TanRabad

641 million

Key Activities

NECTEC completed its key activities in the fiscal year 2021 through the implementation of operational strategy using advanced technology and its expertise to support the country's development in accordance with the national strategies. A range of technology platforms have been developed using big data as a tool to address the country's problems while the development of ecosystems was stimulated.

Development of Information Ecosystem

NECTEC encouraged the development of an information ecosystem for government agencies by:

1. Enlarging the number of local TPMAP users through government officials in every province.:: Delivery of TPMAP Logbook
2. Promoting University to Tumbon (U2T), a project under the Ministry of Higher Education, Science, Research and Innovation, via local universities.:: Delivery of U2T Platform towards Community Big Data
3. Driving the Government Data Catalog Project by encouraging the disclosure and the exchange of government data on the same standards.

Development of Sharing Ecosystem for Smart Agriculture

NECTEC encouraged the emergence of a sharing ecosystem for smart agriculture by:

1. Driving the development of open-source smart farm standards.
2. Encouraging the integration of farmer registration systems and developing open agricultural data linking with the Open Government Data.
3. Promoting the use of AI Machine Learning for productivity forecast among sugar factories through the Office of the Cane and Sugar Board.

Elevating Thailand Towards Industry 4.0

1. Driving the devel opment of Thai Industry Index to serve the arrival of Industry 4.0.
2. Motivating the Department of Alternative Energy Development and Efficiency (DEDE) to announce a policy enforcing manufacturing plants to report their annual productivity outcomes and the energy consumption and conservation using IDA Platform.

Announcing SERS as Thailand's Screening Method for Tuberculosis

NECTEC worked with the Ministry of Public Health to utilize NECTEC's Surface-Enhanced Raman Spectroscopy (SERS) chip as a screening method for Tuberculosis in Thailand, serving the ministry's vision "Thailand – Tuberculosis Free 2021 – 2023."

Integration of Water Pollution Management Platform

NECTEC developed an integrated platform to trace the sources of oil, oil stains and tar balls along the coastal areas of Thailand. The platform is a collaboration between research teams and research groups at NECTEC.

Development of Thailand's AI Ecosystem

NECTEC utilized AI for Thai, the Thai AI Service Platform, to encourage research and development on AI and Machine Learning to serve real needs of users in industrial and service sectors in Thailand.

1. COVID-19 vaccine registration system for the underprivileged.
2. Redundancy Checking System for Fund's project proposals.
3. Chatbot system.

System Extension for City Management, Disaster Surveillance and Environment

1. Developing Dam Safety Remote Monitoring System (DS-RMS) and water management platform to link with safety information of the country's main dams for wider uses. International partnership will be developed to drive the adoption of the platform in the ASEAN region.
2. Expanding Traffy Fondue for use by all local governments and the people at all levels including the underprivileged. The application can be used to report people at risk of contracting COVID-19 entering the area and for asking for help and complaining.

Promoting Science Instructional Media Ecosystem

1. Developing Dam Safety Remote Monitoring System (DS-RMS) and water management platform to link with safety information of the country's main dams for wider uses. International partnership will be developed to drive the adoption of the platform in the ASEAN region.
2. Expanding Traffy Fondue for use by all local governments and the people at all levels including the underprivileged. The application can be used to report people at risk of contracting COVID-19 entering the area and for asking for help and complaining.

Integration of Data Platform for Holistic Child Health Information

KidDiary Data Platform was developed together with the integration of holistic child health information on Thai School Lunch to enhance the efficiency in screening and monitoring the health of each individual child.

Startup

NECTEC has a mission to drive its high-potential technology research works into commercialization and encourage the establishment of spin-off and deep-tech startups through a collaborative mechanism among partners. The goal is to create an ecosystem for continual and sustainable use of technology and innovation.

BIGGO

BRAINIFIT
Benefit your brain

BIG GO Co., Ltd. utilized NECTEC's Open Data Service Platform known as the Open-D to develop a system to support big data analysis while **BrainiFit Co., Ltd.** adopted NECTEC's Neurofeedback Cognitive Training System to enhance the efficiency of cognitive training for brain patients.

Researches
For Real Utilization

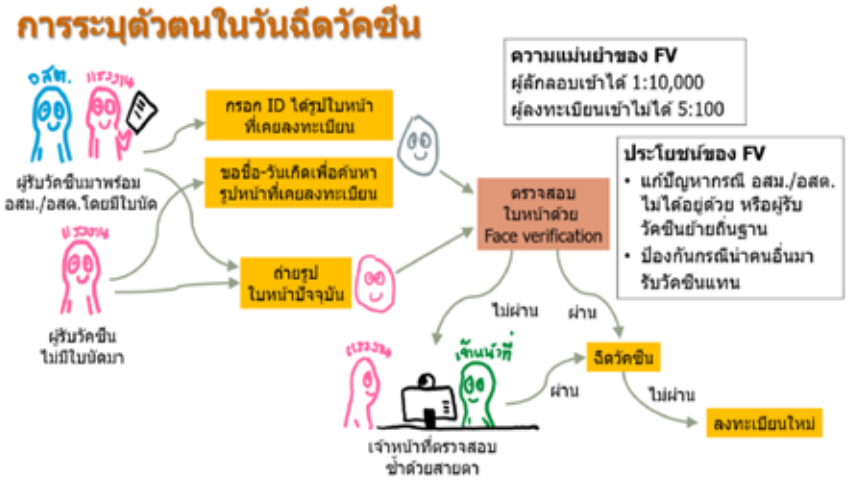
Researches to Reduce COVID-19 Pandemic

For innovators and technologists, technologies have been applied to use as a tool to help medical professionals lessen the risks of COVID-19 infection in addition to the social distancing measure and immunity boosting while reducing the workload burdens and facilitating their operations.

Vaccine Registration System for Vulnerable Groups

The vulnerable groups including the underprivileged, foreign workers and marginal groups with problems of identity verification were able to register to get the COVID-19 vaccine of COVAX the Thai Red Cross Society was donated from Norway at 5 million doses through NECTEC's face verification system.

The system was developed under Data Governance Regulations and it was used as a vaccine registration system for the vulnerable groups in the area of Suan Phueng District, Ratchaburi Province. The system is a collaborative project among NECTEC under NSTDA, Thai Red Cross Society, Chulalongkorn University and Prince of Songkla University to help the country reduce the spread of COVID-19 infection, lessen the severity of illness and death, and boost up immunity among people in the country.



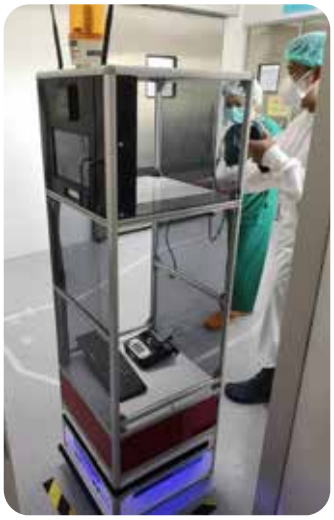
Wireless Stethoscope

Wireless stethoscope is a collaborative project between NECTEC and Ramathibodi Hospital to decrease the risks of disease infection and troubles when it comes to use with the PPE suit. Currently, the device is in the process of component design and testing in the laboratory.

The development of the wireless stethoscope will come out in two versions. The first version is expected to complete in a shorter time by extending NECTEC's previous research of Assistive Learning System (ALS) that was developed for use with general stethoscope heads for this development.

The second version is totally a new development incorporating Tx-Rx Bluetooth technology to allow the doctors to select the body sounds they want to listen directly from the transmitter. This version can smoothly integrate with the Telemedicine system.

Robot for Transporting Medical Equipment to Operating Rooms of COVID-19 Patients



The project is a collaboration between NECTEC and Thammasat University Hospital to install a robot to transport medical equipment to operating rooms within the hospital. The robot came to replace the hospital's officers by reducing the risks of contracting the COVID-19 disease.

NECTEC's Smart Machine and Mixed Realty (SMR) Research Team and Industrial IoT and Automation Research Group (IIARG) customized the Automated Guided Vehicle (AGV) to use for this mission by decreasing the robot's speed to ensure safety during its duty. As soon as the test was completed, the robot was installed at Thammasat University Hospital to rapidly solve the problem.

Eye Tele-Analyzer

Eye Tele-Analyzer is a collaborative project between NECTEC and Metta International Eye Center (Wat Rai Khing Hospital) under research funding from Thailand Center of Excellence for Life Sciences (TCELS). The technology was developed to address the shortage of ophthalmologists in remote areas and enhance the efficiency of eye examination especially for the Cataracts and Glaucoma.

With this technology, the ophthalmologists can control the Eye Tele-Analyzer remotely through high-speed Internet and see the patient's eye status on a computer screen. During the COVID-19 epidemic, the Eye Tele-Analyzer was used to ensure social distancing between the ophthalmologist and the patient, reducing the chance of disease infection.

Currently, the Eye Tele-Analyzer is installed at Metta International Eye Center (Wat Rai Khing Hospital) to examine patients with conjunctivitis (pink eye), one of the symptoms from COVID-19 infection.

INTERVAC: Database of International Vaccination Certification

INTERVAC is a database system to record Thai traveler's information while issuing and verifying the vaccination certificates. The system comprises of three parts:

- Data Recording -- The vaccination data will be imported from MOPH Immunization Center (MOPH IC) and the officials are allowed to input additional data into the system.
- Certificates Issuing – The system supports the issuing of paper-based certificates (Yellow book) and electronic certificates.
- Certificates Verification – Certificates can be verified through QR Code using visual certification and cryptographic verification on the website, computers and mobile devices.

The system was initially piloted at the Division of Communicable Diseases of the Department of Disease Control and Bamrasnaradura Infectious Diseases Institute and it received good responses. Using this system, the Department of Disease Control could increase its efficiency in issuing a certificate of COVID-19 vaccination to travelers leaving Thailand.

INTERVAC was in use at over 100 certification centers across the country (including all provinces) and supported the issuing of vaccination certificates to approximately 10 million travelers per year.

FoodPrint Recipe: Calculating Nutritional Value; Recommending Recipes for Immunity Boosting

The Bureau of Nutrition under the Department of Health, the Ministry of Public Health utilized NECTEC's FoodPrint program to help calculate nutritional value and recommend recipes for immunity boosting to COVID-19 patients. The bureau developed a manual for food and nutrition management disseminated to field hospitals, community waiting centers and other service units to help them arrange proper menus for the infected and the patients. The program was piloted at the Health Center No. 6, Chonburi province before expanding to other field hospitals.

Driving Country's Development with Data

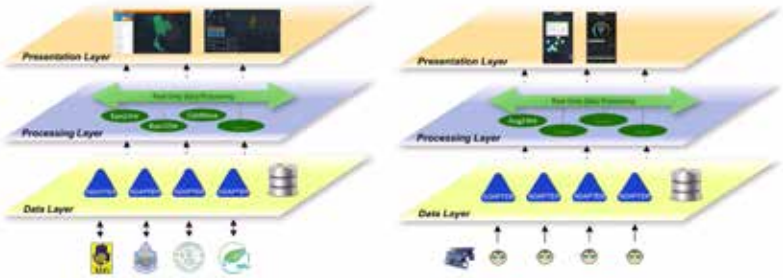
Information is playing an important role to drive the country's economic policy and digital society development for all sectors. Once data and technology are integrated, the technology of Big Data is used as a tool to increase the efficiency of the country's development. During the fiscal year 2021, NECTEC has energized the national development using data-driven approach through projects and key activities as follows:

BigStream: Real-time Data Platform

BigStream is a platform for developing applications under a data management framework. It simplifies the system design and development at the data management layer of its architecture and supports the management of data derived from IoTs for research and industrial purposes. The platform shortens the developing time by 20-30 per cent and reduces the cost of using licensed software at more than 80 per cent.

BigStream comes with agility and security and it can integrate with government data efficiently. Entrepreneurs can utilize the platform for further product development.

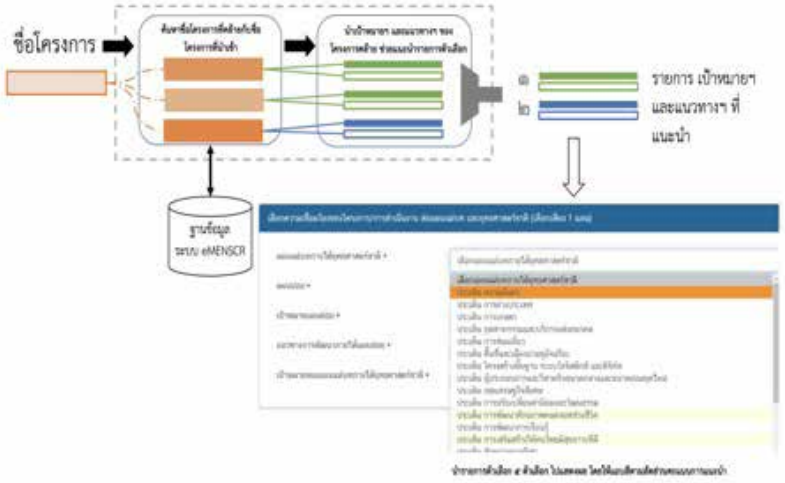
General Application Development



Options Recommendation System for eMENSCR

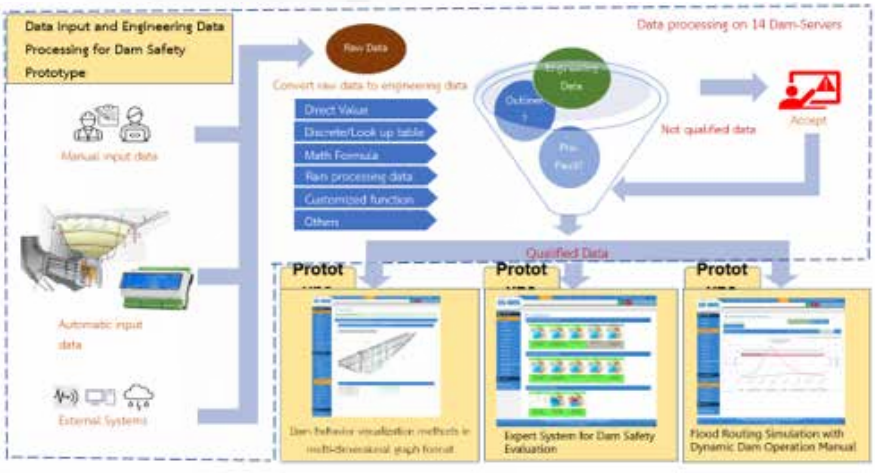
The Options Recommendation System was developed to search for project names which are similar to those imported from the Electronic Monitoring and Evaluation System of National Strategy and Country Reform (eMENSCR) while suggesting a list of five options to show with color bars highlighted according to the suggestion scores.

The system will recommend an options list with a maximum average maturity at 0.405, which is approximately 2.4 times higher than the result of the direct base method, which has an average maturity of 0.118. With this technique, the correct recommended option is ranked about 2.5 on average out of the 5 recommendations. According to the test, users using this system can choose the options much more efficiently than the system with no suggestion at 36.1 per cent, while shortening time spent on selecting options at 58.2 per cent.



Data Import and Processing System for Dam Safety

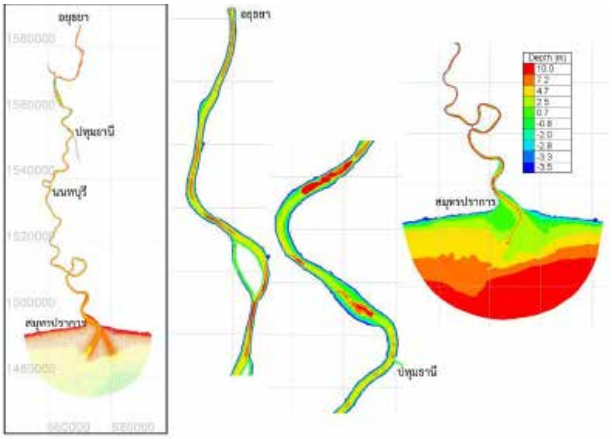
The data import and processing system for dam safety was developed to monitor the status of the Electricity Generating Authority of Thailand's large-sized dams for further maintenance. The prototype comes with its accuracy, having the error rate between the auto meters less than 0.1 per cent. Thanks to its ease-of-use features, the system helps increase working efficiency, shorten time taken for data import from 2 days to within 15 minutes following the Remote Terminal Unit (RTU) setting, and importantly, reduce the number of field operators to take care of the dam from 10 to 1. It can also process data received from different types of measuring devices via RTU.



Raknam

Raknam is a prediction and scenario-based simulation system for saltwater Intrusion. Focusing on area-based management, the prototype consists of three main modules.

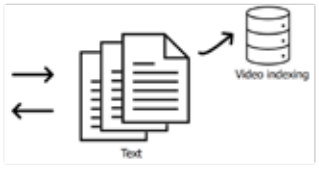
- Monitor Module is to track the relevant data and store it for displaying on the web page.
- Forecast Module is used to forecast water quality and it will automatically start its daily operation once a day for five hours. Equipped with 64 CPUs, the system can make a forecast 7 days in advance.
- Scenario Module is a dedicated module for experts to simulate the scenarios for further forecast by using flow rates and salinity values to help make decisions for water management.

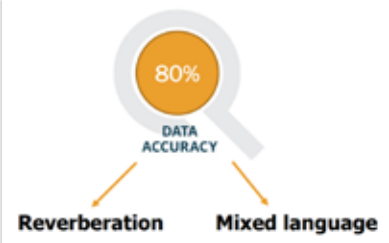


Partii: Thai Speech Recognition System for Video Transcription

The system uses artificial intelligence to enhance its capabilities in converting speech into text. The system is applied to use for automatic video transcription, creating subtitles and making video indexes. Covering more than 200,000 lexical words of Thai and English combined. Partii offers 80 per cent recognition accuracy regardless of speaking domains, speakers, or speaking styles. The system offers processing speed at 1.01 times faster than the audio signal with its average output performance at 0.21 sec.

Partii helps lessen production costs, facilitate subtitle making process, and reduce workloads of related staff. Thai Public Broadcasting Service (Thai PBS) has licensed the technology to enhance its video transcription.

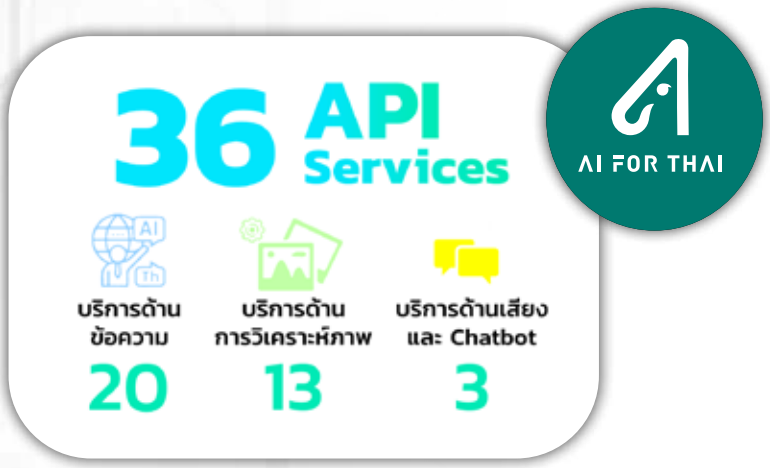




Driving AI FOR THAI to National AI Platform

As a part of the National Artificial Intelligence Master Plan to drive the country's development on AI technology, the Ministry of Higher Education, Science, Research and Innovation in cooperation with the Ministry of Digital Economy and Society gave a support to NECTEC in developing the Government Data Center and Cloud Service (GDCC) to help improve the performance of AI FOR THAI platform to process faster and provide sustainable services and eventually become the National AI Platform of the country.

AI FOR THAI is NECTEC's Thai AI service platform developed under the "Thai AI" concept. The platform offers AI APIs services in three core technologies; image and vision; conversation; and language. Of the total existing 36 APIs services, 13 are image and vision APIs, 20 are language APIs and the remaining three are conversation APIs. So far, 5,458 developers have been using the platform's services with more than 20.6 million APIs downloads.



Artificial Intelligence for Performance Audit

Artificial Intelligence for Performance Audit (AI for PA) is Thailand's significant collaborative project among the Office of the Auditor General of Thailand, the Digital Government Development Agency (Public Organization) (DGA) and NECTEC in developing a prototype of AI platform to help the state audit office analyze and search for a large number of audited documents stored for more than 20 years for further auditing process. The development covers the digitizing of paper-based documents and structuring data into a machine-readable format before transferring the new data set onto the AI platform. The project is a part of the Office of the Auditor General of Thailand's digital transformation plan to use AI to modernize the governmental system.

Launch of Data Platform Technology for Open Data

The launch of Data Platform Technology for Open Data is a part of NECTEC's research direction on Open Data development. The platform incorporates NECTEC's own-developed data management system, the CKAN Open-D, that allows the government agencies to create a data catalog for the provision of open data services. This project encourages information sharing for use by government agencies and the private sector and it's a part to drive the emergence of the country's national AI platform.

RooTan

RooTan is a mobile application developed added-on from the previous TanRabad software suite to provide health knowledge and updated information about dengue-related issues to raise awareness of dengue fever among Thai people. NECTEC's Data-Driven Simulation and Systems Research Team (DSS) cooperated with the Department of Disease Control developing RooTan as a tool to communicate health risks covering dengue diseases spread and other health-related issues such as updates on PM 2.5 concentrate and a heat index relative to incidence of heat stroke and others.

Digital Agriculture Research

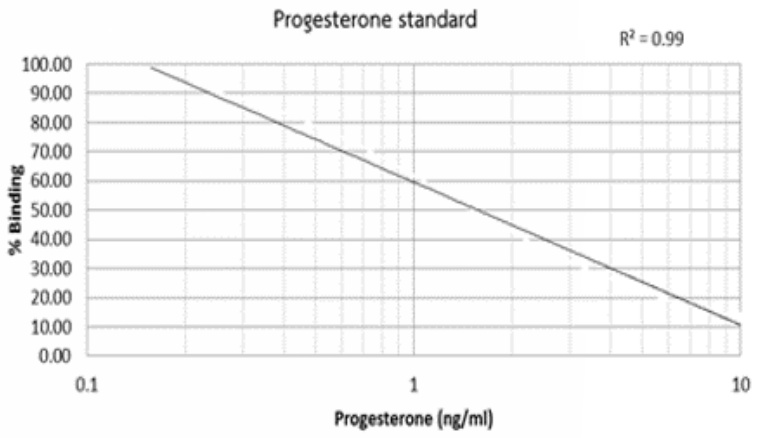
Agri-Map Online

Agri-Map Online is the agricultural mapping system for online proactive agricultural land management. The system enhances an efficient use of the lands to match not only the market's agricultural demands but also the efficacy of the lands according to the government's policy and it helps plan for future production of agricultural products efficiently.

Agri-Map

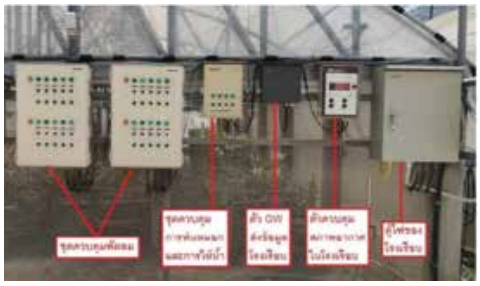
Early P-Check for Dairy Cows

The early pregnancy test kit for dairy cows measures the amount of progesterone in cow's milk to indicate the pregnancy and the status of the cow's ovaries. The pregnancy testing will be done on 20 days and 24 days after artificial insemination to predict the cow's pregnancy status. Early P-Check offers 82 per cent predictive accuracy in laboratory tests compared to the results from ultrasound tests.



Measuring and Analyzing System for Humidity Sensors in Orchid Greenhouse

The system estimates the relative humidity in the orchid greenhouse in areas where no sensors are installed. Using information received from nearby sensors, the system helps decision-making, allowing farmers to better control the orchid growth. It offers five per cent accuracy under general conditions with the highest predictive error at an average of 18 per cent during mist sprayings. The error rate will return to below 10 per cent within 25 minutes on average, and less than 1 per cent within 3 hours 13 minutes. Deterioration of the humidity sensors can also be detected.



Bacterial Growth Tracker for Shrimp Farming

The system helps monitor bacterial growth in shrimp farms using IoT technology to collect data in real-time with alerts noticed via Line application. The system can detect even a small amount of Vibrio parahaemolyticus, the marine bacterium that causes foodborne illness, at 16 hours faster than using bacterial cultures on growth medium method. This makes it possible for the farm owners to solve the problem before the bacteria spreads.

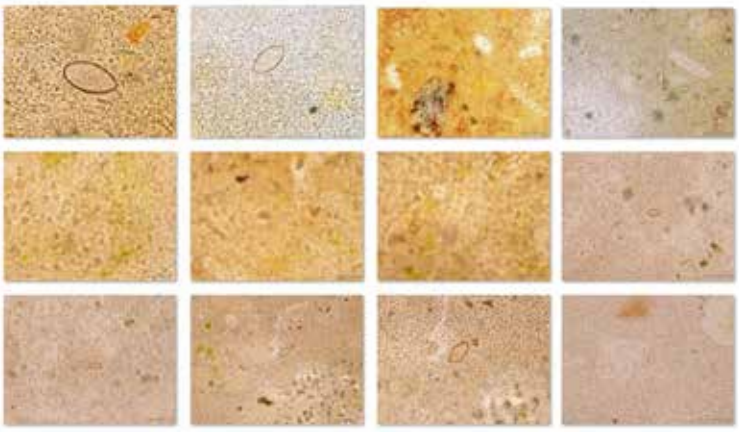
The technology was licensed to Vinai Engineering Industry (1997) Co., Ltd. for further production and commercialization. So far, five Bacterial Growth Trackers have been installed for use in four Microbial Centers in Trat, Chanthaburi, Rayong, and Chachoengsao province, and at the Faculty of Marine Technology, Burapha University.

Big Data Analysis for Medical Health

AI-based Liver Fluke Screening System

The Department of Disease Control, the Ministry of Public Health partnered with NECTEC, Khon Kaen University, and Suranaree University of Technology to develop an AI system to screen and diagnose worm diseases as well as identify the worms from images of helminth eggs. The project is an integration of knowledge, expertise and collaboration of the four institutions to expedite an innovation related to the screening of liver fluke and other worms from the images by AI technology.

The technology comes to help medical professionals to enhance the efficiency of worm diseases surveillance. With AI, the system can detect 90 per cent of helminth eggs with 80 per cent accuracy on egg identification. The system is available to use on the web site and via Line application.



TanRabad

TanRabad is a tool for comprehensive surveillance of dengue outbreak situations among public health officers. It provides real-time and interactive visualization for epidemics of infectious diseases in multi-dimensions, enabling timely communication and efficient situation analysis for proactive outbreak prevention and control. The tool generated economic and social impacts during the year 2018-2020 at the amount of Bt2.94 billion.

KidSize: Automatic Weight and Height Scaling System

The automatic weight and height scaling system uses sensors to measure the correct standing posture, including head, back and feet to obtain accurate height and weight information. The system is connected to the KidDiary Platform, NECTEC's children health database system, to send the children's weight and height data to the platform while evaluating each individual child's nutrition status with results sent to schools, hospitals and the parents.

Food Management System for Thai School Lunch

It's an online food management system for food entrepreneurs involved in the school's lunch preparation. The system facilitates the entrepreneurs to arrange quality lunches for the students according to the nutritional standards with efficient cost management. The system can link with Thai School Lunch and Thai School Lunch for BMA, the automatic lunch recommendation system for Thai schools which are now in use among government schools nationwide.

REMI Chatbot

The Robot for Expecting Mother's Information (REMI) is a chatbot system for health monitoring and assessment for pregnant women developed on the Line platform. The system allows pregnant women to record health information and ask for advice via the chatbot system. It also calculates calories and provides nutrition recommendations as well as answers the health problems to the mothers throughout their pregnancy.

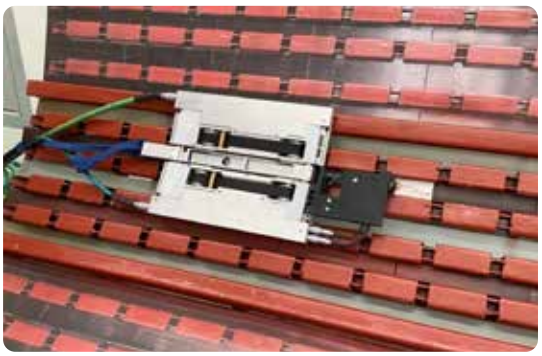
Intelligent System Research

Generator Inspection Vehicle V.2

The Generator Inspection Vehicle (GIV) Version 2 is a small-sized robot that can inspect the inside of the generator without removing the rotor and stator. The robot is able to access a narrow space between the rotor and the stator, transmit the image signal and examine the tightness of the wedges.

GIV Version 2 incorporates more enhanced capabilities than its predecessor. The version 2 comes with 1.390-kilogram weight compared to the 1.605 kilograms of weight in the first version. It also offers the maximum moving speed at 3.54 meters per minute, much faster than the first generation which could move at the speed of 1.9 meters per minute. The robot improves its capability in analyzing wedge signals with more accuracy at the rate of 73 to 74 per cent compared to 72 per cent in the first version.

Thanks to its compact size with more enhanced features, the robot offers high-efficient inspection tasks, allowing the power plants to shorten their inspecting time and lessen damages from the generation's downtime, resulting in the efficiency for long-term maintenance.



Portable Water Leak Sound Analysis Device

The device helps identify the probable location of the water leak point from the sound signal at the water meter. The method is to use a smartphone to analyze the water leak sound replacing the ground microphone used in the first version. The latest development is easier for use and maintenance and comes with 90 per cent precision compared to the analysis by the Metropolitan Electricity Authority (MEA)'s experts so the water loss rate can be reduced significantly.

3.5-kW Switched Reluctance Motor for Small Electric Vehicle

The Switched Reluctance Motor (SR Motor) is a new type of motor technology coming with a simple structure with no permanent magnets. The motor is easier to manufacture, resistant to high temperature, and supports a wide range of speeds to offer a small electric vehicle like motorcycles a high performance.

The motor can accelerate from 0 to 30 kilometers per hour within 5.1 seconds and has a top speed at 82 kilometers per hour. The driving performance is at the maximum 98-kilometer distance. The motor incorporates high performance and stability, safety, and energy saving. The prototypes were delivered to the Provincial Electricity Authority (PEA) for use in its 60 electric motorcycles.

Toyota Altis Modified Electric Vehicle

The modification uses a method to generate a proper signal to allow the ECU and CVT gear set to control the automatic gear changes as usual. The new modified EV can run at the speed of 90 kilometers per hour for 30 minutes and passed the motor power testing criteria for registering as the modified electric vehicle. The modification method can be applied to use with all types of vehicles.

Modified Electric Motorcycle for General Use

The modified electric motorcycle was developed to offer high performance, high efficiency and energy saving. The vehicle includes power system, battery system, battery management system, charging system, mechanical parts and safety system that are integrated and controlled under motor circuit connection of interlocking. The driving distance per charge of the Li-ion system is 98 kilometers, farther than the general requirement that is determined at 80 kilometers. It also offers higher performance than other prototypes used as a comparison. The motorcycle has been tested and reached electrical standards in terms of electrical safety. The prototype was delivered to the Provincial Electricity Authority.

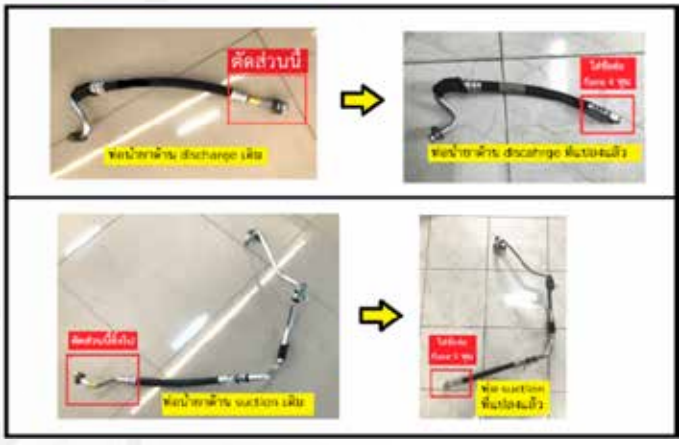
Electric Powertrain for Electric Boat

The motor of an electric-powered boat is designed to use a 250-kW powertrain driver powered by 625 kWh lithium-ion batteries. A boat requires the driving power from electric motors at 500 kW.

Air Conditioning System for Modified Electric Vehicle

The development is to modify the local-developed compressor of the general air conditioning system to be used in the electric vehicle for energy saving. The modified compressor can control the temperature in the vehicle by detecting the outside temperature and adjusting a proper temperature for efficient energy consumption.

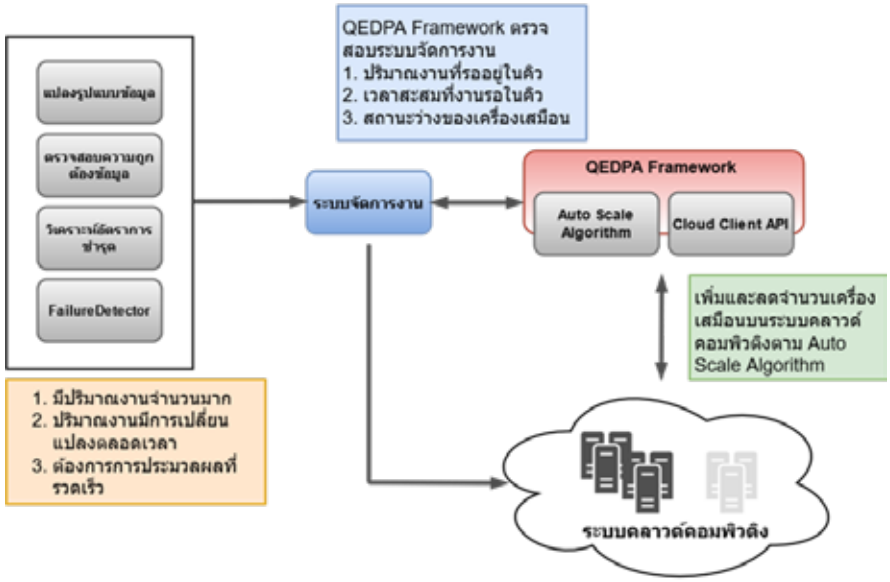
This method simplifies the modification process, allowing the implementation of air conditioner to be done from the outside with no need to change or install temperature sensors or additional equipment within the cabin. The Electricity Generating Authority of Thailand has adopted this method for real utilization.



Fault Detection and Analysis System on Cloud Computing

The system enhances fault detection and analysis on the Cloud Computing platform with more accuracy. Built upon QoS-based Elastic Data Processing and Analyzing (QEDPA) Framework, the system processes massive data using Auto Scaling on cloud computing for managing the computational resources to suit the workloads.

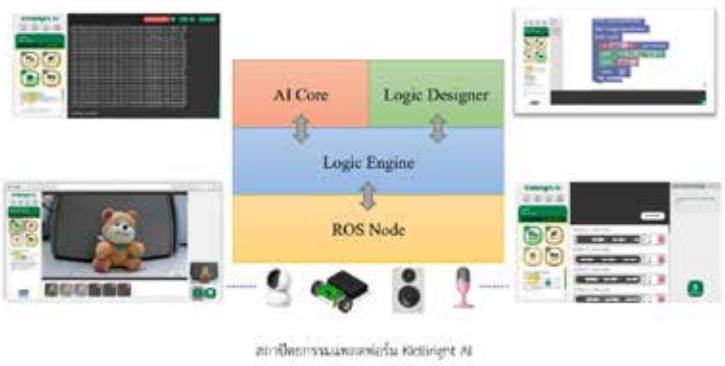
The system also utilizes Knowledge-Based Systems (KBS) to increase the precision of fault analysis, improving the processing time with computational resources used cost-effectively.



KidBright AI Platform

KidBright AI is an artificial intelligence learning media platform to help learners understand the process of developing artificial intelligence systems through the creation of Blockly Programming. The platform supports input and output connection with a wide range of sensors via the Robot Operation System (ROS). Learners can develop artificial intelligence models in the form of visual and audio data on Nano Pi or Raspberry Pi hardware and via web browsers.

KidBright is an open source so Thai electronic companies and those who are interested can extend its use for further production and commercialization. This approach will promote the development of AI teaching and learning tools within the country, thus stimulating the emergence of an ecosystem in the education industry. Currently, the Institute for the Promotion of Teaching Science and Technology (IPST) is using KidBright AI to help train teachers and improve the teaching and learning system in Thai schools.

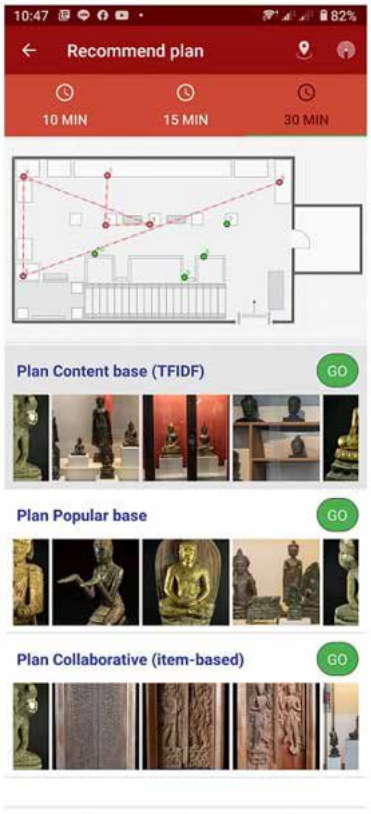


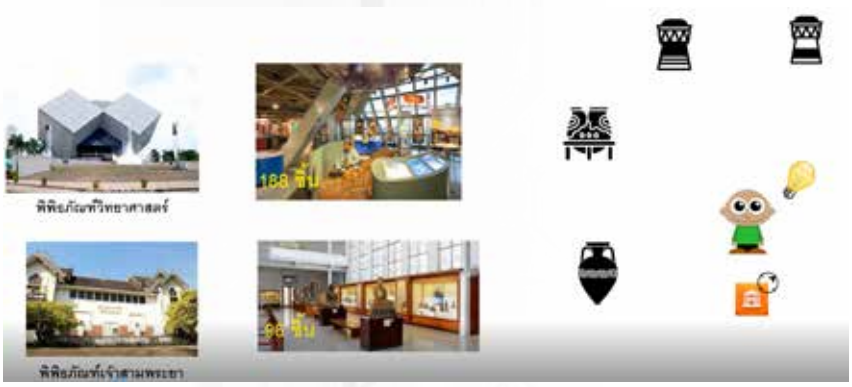
Route Guidance System for Exhibition

The system will guide the visitors to see the exhibition under a limit of time. A set of instructions in the form of APIs was developed to create a recommended route, allowing users to choose the preferred direction to go for exhibition through their mobile devices. The prototype used three techniques for route recommendation.

- Content-based technique: Guided by the content of the exhibited item itself.
- Statistic-Based technique: Using basic statistical calculations for the selection of exhibited items.
- Behavior-based technique: Using the similarity between the visitor and the displayed object for route suggestion.

The visitors' viewing statistics will be recorded while they use the application to get access to details of each exhibited item through QR code.



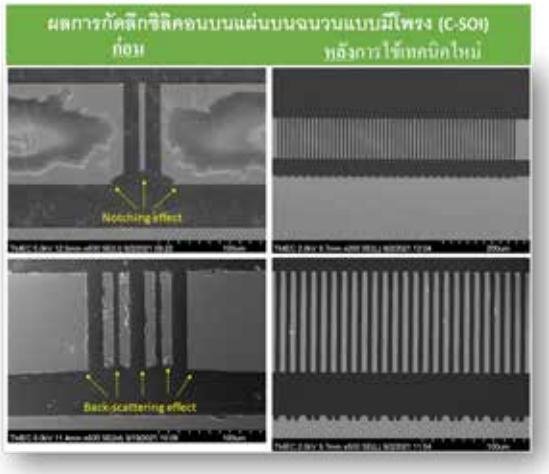


Driving Sensors Industry

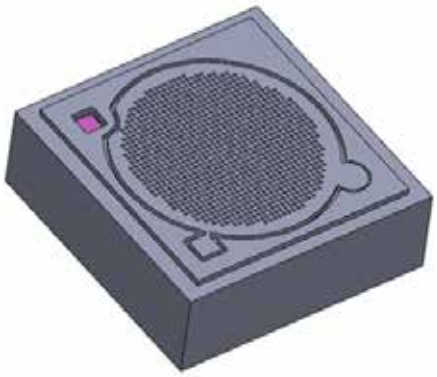
Deep Plasma Etching for Gyroscope MEMS Fabrication on Cavity Silicon-on-Insulator Substrates

The process is a new technique to address structural imperfections of Spring/Fingers after silicon deep etching process. The technique is to bury cavities in the Silicon-on-Insulator (SOI) wafer and etch the oxide thin film layer in the cavity of the C-SOI substrate to eliminate the accumulation of positive ions on the thin film surface that causes “Notching” and “Back Scattering.”

This technique can be applied to the silicon deep etching process using the standard Deep Reactive Ion Etching (DRIE) machine. Generally, the machine is low frequency and has no power source and pulsed function that is required for Advanced Silicon Etching (ASE) so it causes a limit on the development of silicon deep etching method on C-SOI wafers. The high-aspect-ratio DRIE using the Bosch process enables gyroscope MEMS fabrication to come with a high level of stability against interference.



Improvement of Plasma Etching Process of Silicon Dioxide for MEMS Microphone Produced to IR Sensors and Systems Pte. Ltd.

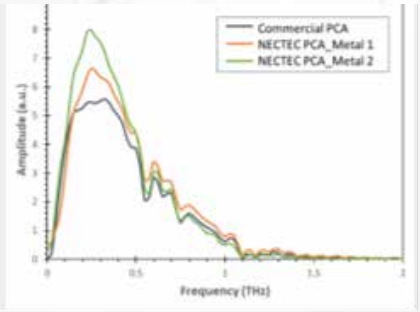


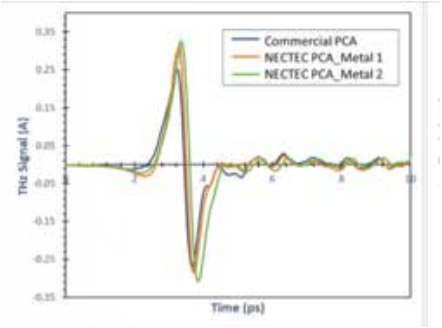
The improvement uses the Magnetic Field Enhanced Reactive Ion Etching (MERIE) technique to control the uniformity of SiO2, making the etch rate of SiO2 thin film be less than 5 per cent and the selectivity of SiO2 /Poly-Si reach a value of 5 as required by the employer.

The technique is in use in the manufacturing process to produce MEMS Microphone, a sensor that converts an audio signal into an electrical signal. Using this technique, the MEMS Microphone offers 0.55 um diaphragm thickness with C0 equaling to 1.93 pF while its pull-in voltage is at 14-18 V and ΔC is between 100 to 150 fF. The yield is also equal to 15 per cent.

Development of a THz Photoconductive Antenna (PCA) Emitter

The prototype of THz Photoconductive Antenna (PCA) Emitter uses E-beam irradiation technique to improve semiconductor materials to develop a PCA emitter that outperforms the existing PCA devices available in the market. The new technique supports mass production more efficiently than other commonly-used techniques and it will come to disrupt the production of commercial PCA devices in the country.





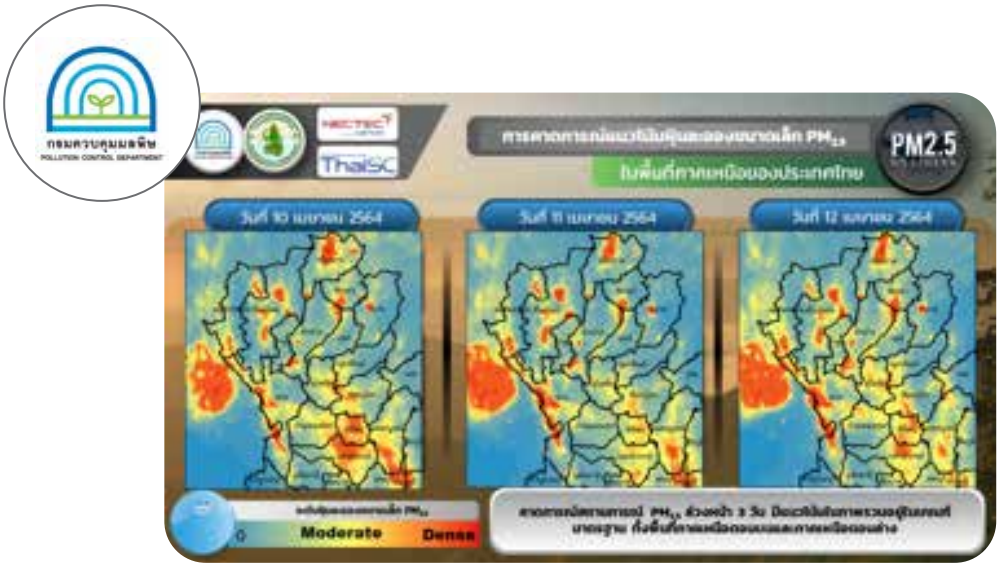
Driving Infrastructure for Country's Development

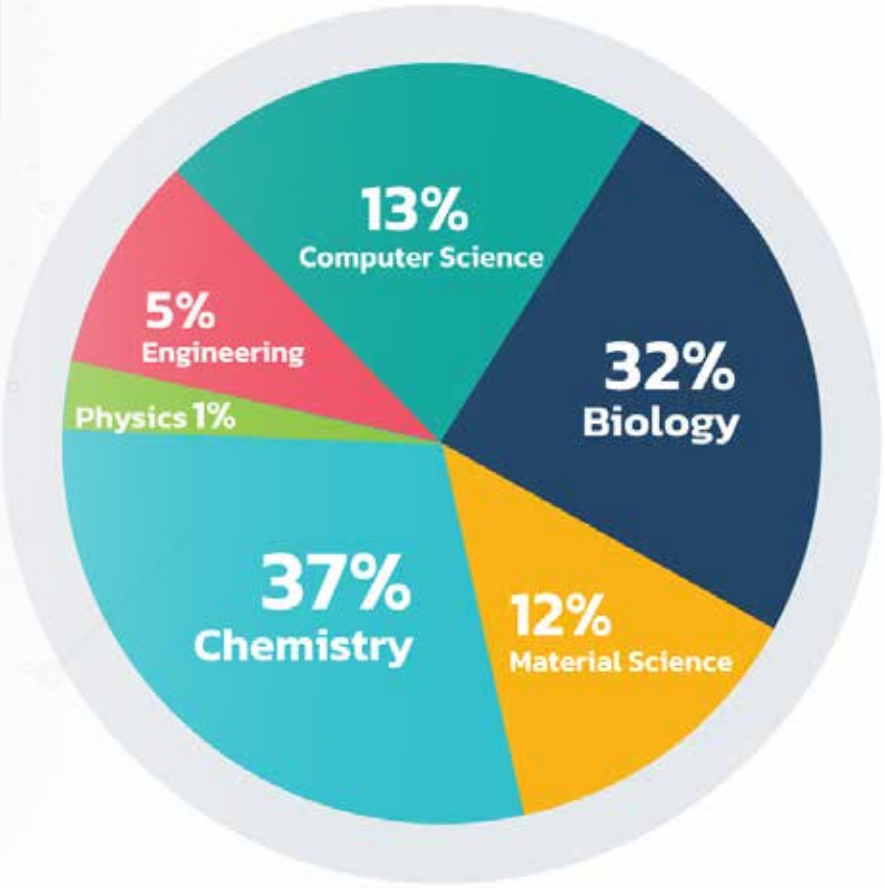
NSTDA Supercomputer Center (ThaiSC) (ThaiSC)

ThaiSC was established to provide cutting-edge high-performance computing (HPC) services to support the development of science, technology and innovation for solving the country's critical and urgent problems. The center helps develop human resources and promote advanced industries that require the use of computational science and artificial intelligence technology for their development. Currently, the center provides HPC services to more than 300 users with over 100 projects in operation.

In 2021, ThaiSC cooperated with the Pollution Control Department to utilize the center's supercomputer resources to develop a model of PM 2.5 pollution in Thailand. The HPC power shortened time on model development from 11.5 hours to within 45 minutes, allowing the department to quickly determine the air quality around the nation, make an accurate forecast three days in advance, and timely alert the public for further self-protection.

The center's supercomputing power was also used to facilitate genome-level genetics decoding process of the Coronavirus and disease investigations for the COVOD-19 pandemic control. The advanced computations increase the competency of local research and development and improve time-to-market on model development and testing at least five times faster. The supercomputer supports the use of large-sized audio data (Training data > 2 TB).





Secure Authentication System: A Prototype of 4-Factor Time Attendance

The prototype of 4-Factor Time Attendance uses a secure authentication system of face image, password, smartphone and location to be processed simultaneously for high-level secured verification. The authentication can be done through a mobile application on Android and iOS or via a kiosk. It's ease-of-use and allows users to record their time attendance from anywhere via a smartphone.

Automatic Storing and Recording System for Telecommunication Relay Service Platform

The system automatically stores and records all services provided through Thai Telecommunication Relay Service (TTRS) Platform. The platform offers the Total Conversation, an audiovisual conversation service, with multi-channel support for medical emergency reports via voice, video, text, and a Video Relay Service for the speech-impaired.

The system can automatically detect all kinds of services and record the conversations in the form of a service log stored on the Cloud for the examination of complaints, service evaluation and service improvement.

Partnership Development for Research Strengthening

Internal Collaboration

NECTEC created alliances with local and international organizations using a partnership framework as a mechanism to expand the scope of its technology research and development. The collaborations cover knowledge exchanges and the development of collaborative projects and activities. In the fiscal year 2021, the development of partnership with local and international agencies has resulted in a series of ongoing collaborative contracts to drive research works to achieve the maximum benefits.

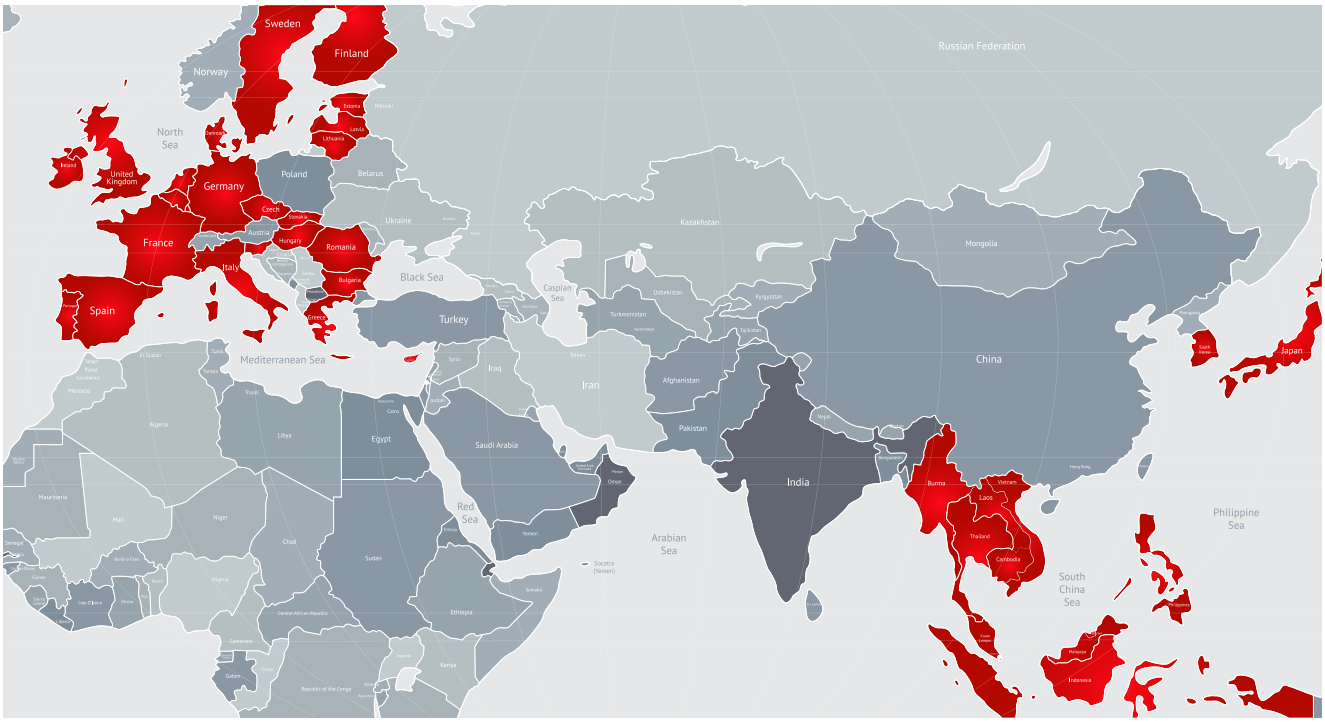
Partner Agency	Collaboration	Research Project
Department of Resources	Collaboration on the utilization of Big Data in the management of geopark tourism to support a sustainable economy.	Navanurak platformMineral Museum Pool
Pollution Control	Collaboration on air quality forecast using supercomputers to predict PM 2.5 dust through model development of WRF-chem.	NSTDA Supercomputer Department Center (ThaiSC)
Institute for the Promotion of Teaching Science and Technology	Academic collaboration via Online System (Zoom) on “Data Science@School with GLOBE” project to promote science in teaching and learning systems on the environment. Students are required to make real experiments and surveys on their local environment in accordance with GLOBE methodology for further research.	KidBright
Thammasat University Hospital	Joint Medical Innovation Research and Development Project on Digital Healthcare to elevate the hospital towards Smart Hospital.	UNAI
Chaipattana Foundation and Total Access Communication Public Company Limited (DTAC)	A pilot project to develop the Lingzhi Demonstration Farm at Fang district, Chiang Mai province using Precision Farming solution, IoT technology, integrated sensors and Cloud Service Mobile to improve farming on high agricultural areas.	HandySense: Precision and Smart Farming System
National Savings Fund	Integration of information technology and AI Chatbot to automate the fund’s Q&A system to promote financial planning for retirement.	Traffy Fondue Line Chatbot
Northeastern Rajabhat University Group: 11 Universities	Promoting 5 educational innovations in the northeastern region for the community’s sustainable development and in response to the BCG Economy Model for quality of life and well-being improvement.	KidBright, Thai Journals Online, Massive Open Online Courses, Navanurak Platform Museum Pool

Partner Agency	Collaboration	Research Project
Faculty of Science and Technology – Thammasat University and AI9 Co., Ltd.	Human resource development on Big Data, Artificial Intelligence, IoT and Cloud Technologies & Platforms.	AI Platfom

International Collaboration

NECTEC created collaborations with international alliance networks under its “International Visibility” policy to promote technology research and development and human resource development in the field of electronics and computer technology to be recognized internationally.

Due to the COVID-19 epidemic, the plans on partnership development including international trainee program, researcher exchange program and visiting researcher program have been postponed.



Academic Research Collaboration

NECTEC signed a Memorandum of Cooperative Agreement on academic research with seven international organizations under its alliance network.

International Organization	Research Field
National Institute of Information and Communications Technology (NICT), Japan	Information and Communications Technologies Utilizing, Network Technology, Low-power Wide-area Network (LPWAN) Technology, Visual IoT
University of Electro-Communications (UEC), Japan	Academic Cooperation , Student Internship Program
University of Luxembourg, Luxembourg	High-Performance Computing and Cloud Computing Platform
Riken Center for Computational Science, Japan	High-Performance Computing and Cloud Computing Platform
Beijing International Exchange Association (NSTDA-BIEA), China	Exchange research scientist, knowledge and information
Daheng New Epoch Technology, Inc., China	Terahertz Antenna and others
Industrial Technology Research Institute, ไต้หวัน	FleXARs: Large-area Flexible Polymers with Antifouling Robust Micro-structure

International Networking Participation

NECTEC puts a focus on establishing partnership networks with international organizations including research institutes, the private sector and educational institutions to create integrated knowledge innovations under international cooperation framework.

During the fiscal year 2021, major collaborative projects have been achieved as follows:

ASEAN region

- Under a cooperation framework of ASEAN Committee on Science, Technology and Innovation (COSTI), NECTEC partnered with more than 23 institutions from Brunei, Myanmar, the Philippines, Malaysia, Laos, Vietnam, Singapore, Indonesia and Japan organizing an online workshop “International Workshop on ICT for Landslide Hazard Assessment in the ASEAN Member States: Local Sensing and Remote Sensing.” More than 50 experts from the network countries participated.

  The attendees had chances to exchange their knowledge and utilized advanced technology to develop a mathematical model for developing the Landslide Warning System using Integrated Sensors. The workshop was a part of a joint research project on Real-time Monitoring Based on Wireless Sensor Networks for Landslide-prone Areas.

- In cooperation among countries under ASEAN Committee on Science, Technology and Innovation (COSTI), NECTEC cooperated with research institutions from Thailand, Cambodia, Brunei, Myanmar, the Philippines, Malaysia, Laos, Vietnam, Singapore and Indonesia publicizing two research works; the Landslide and Flash Flood Monitoring System; and TanPibut, the real-time natural event monitoring and surveillance in the ASEAN Innovation Roadmap & Bioeconomy Forum in Conjunction with GBS 2020.
- ASEAN High Performance Computing (HPC) Task Force (TF) under the ASEAN Committee on Science, Technology and Innovation (COSTI) cooperated with network alliances from 10 countries (Thailand, Cambodia, Brunei, Myanmar, the Philippines, Malaysia, Laos, Vietnam, Singapore, and Indonesia) organizing the 6th ASEAN HPCTF meeting to acknowledge the progress of ASEAN HPCTF operations and further development of the Shared ASEAN HPC Facility and EU-ASEAN HPC School. TF also collaborated with EU and Japanese partners arranging the EU-ASEAN High-Performance Computing Virtual School 2021 to offer selected participants from ASEAN Member States to learn about the fundamentals of HPC design and applications.
- Under e-ASIA Joint Research Program (e-ASIA JRP), NECTEC cooperated with Thailand, Japan, and Vietnam to conduct a joint research project on the Establishment of a Landslide Monitoring and Prediction System. NECTEC also worked with research institutes from Japan and Indonesia on the development of Microfluidic Nanowires coupled with Gold Nanoparticles for Dengue Viral Disease Diagnosis.
- NECTEC partnered with research institutes from Thailand, Japan, Brunei, Singapore, Myanmar, Laos, and Malaysia under the ICT Virtual Organization of ASEAN Institutes and NICT (ASEAN IVO) conducting a series of joint researches including the Event Analysis: applications of computer vision and AI for smart tourism industry; the mesh-topological and low-power wireless network platform for a smart watering system; and a project on Relay Station Network Based on Low-power Wide-area Network (LPWAN) Technologies for Disaster Management.
- NECTEC created a partnership with the National Institute of Information and Communications Technology (NICT), Japan to develop methods for detecting changes in satellite imagery and from 3D point cloud images for landslide risk areas.

  The center also hosted the 3rd NECTEC–NICT Joint Workshop to strengthen the long-standing partnership. The two organizations came out with a resolution to expand their collaboration on technology research in five areas; Network Technology, Frontier: Terahertz Technology, Smart Farming, AI Technology and 5G/6G.
- NECTEC collaborated with EOSL lab from the Industrial Technology Research Institute (ITRI), Taiwan, as well as Noto Marine Center from Kanazawa University, Japan conducting a research project on Fabrication of Large-area Antifouling Film by Using Roll-to-Roll NIL Process, a large-sized and flexible polymer with antifouling micro-structure for marine and medical applications.
- NECTEC cooperated with the Industrial Technology Research Institute (ITRI), Taiwan to develop the Microfluidic Lab on a Disc Platform for the detection of elephantiasis pathogens in foreign workers.
- NECTEC joined hands with the National Institute of Information and Communications Technology (NICT), Japan to conduct research and development on Fabrication of Si Waveguide Device for use in medical applications.

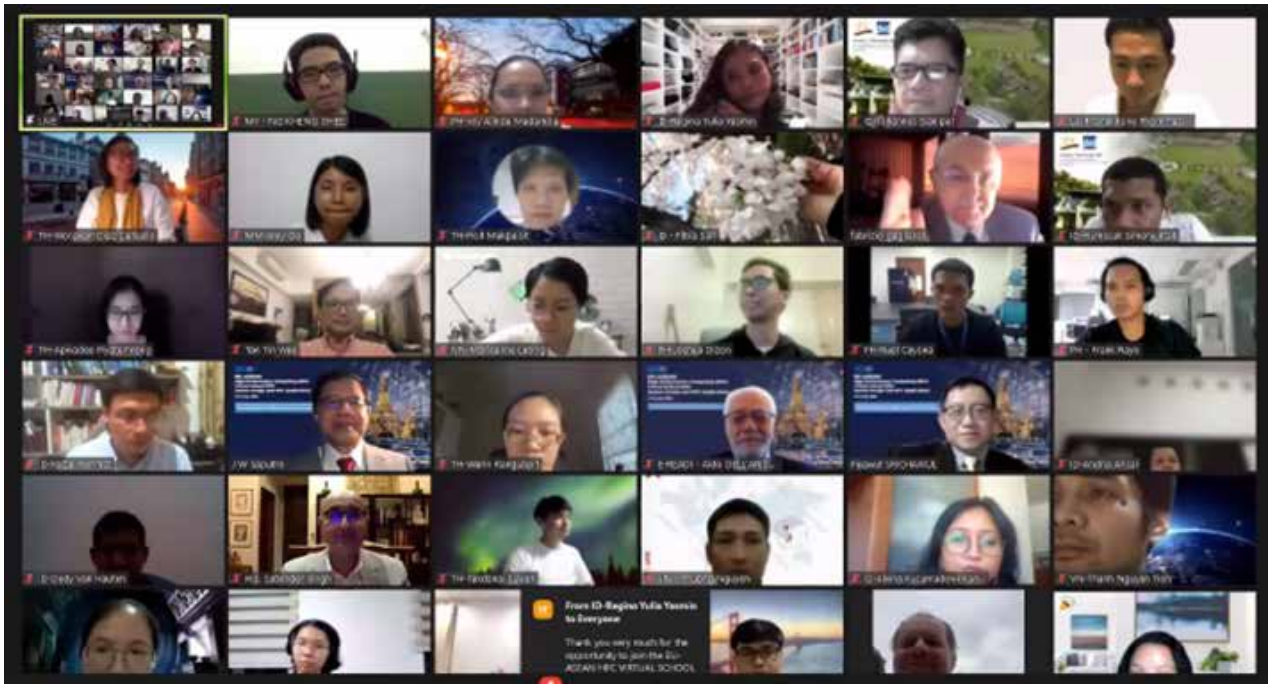
European Region and others

- ThaiSC joined in a collaboration program under the Enhanced Regional EU-ASEAN Dialogue Instrument (E-READI), an EU-funded development cooperation program to facilitate dialogue forums between the EU and ASEAN, through the operation of ASEAN High Performance Computing Task Force.

  In the fiscal year 2021, the EU-ASEAN High-Performance Computing (HPC) Virtual School 2021: System Design and HPC Applications was organized under a collaboration among the ASEAN countries (Thailand, Cambodia, Brunei, Myanmar, the Philippines, Malaysia, Laos, Vietnam, Singapore, and Indonesia) and the EU under a cooperation framework of the EU 27 countries; Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, United Kingdom, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovenia. Slovakia, Romania and Bulgaria. The participating countries in the HPC Summer School 2021 included Spain, Luxembourg, the Netherlands, Finland, and France.

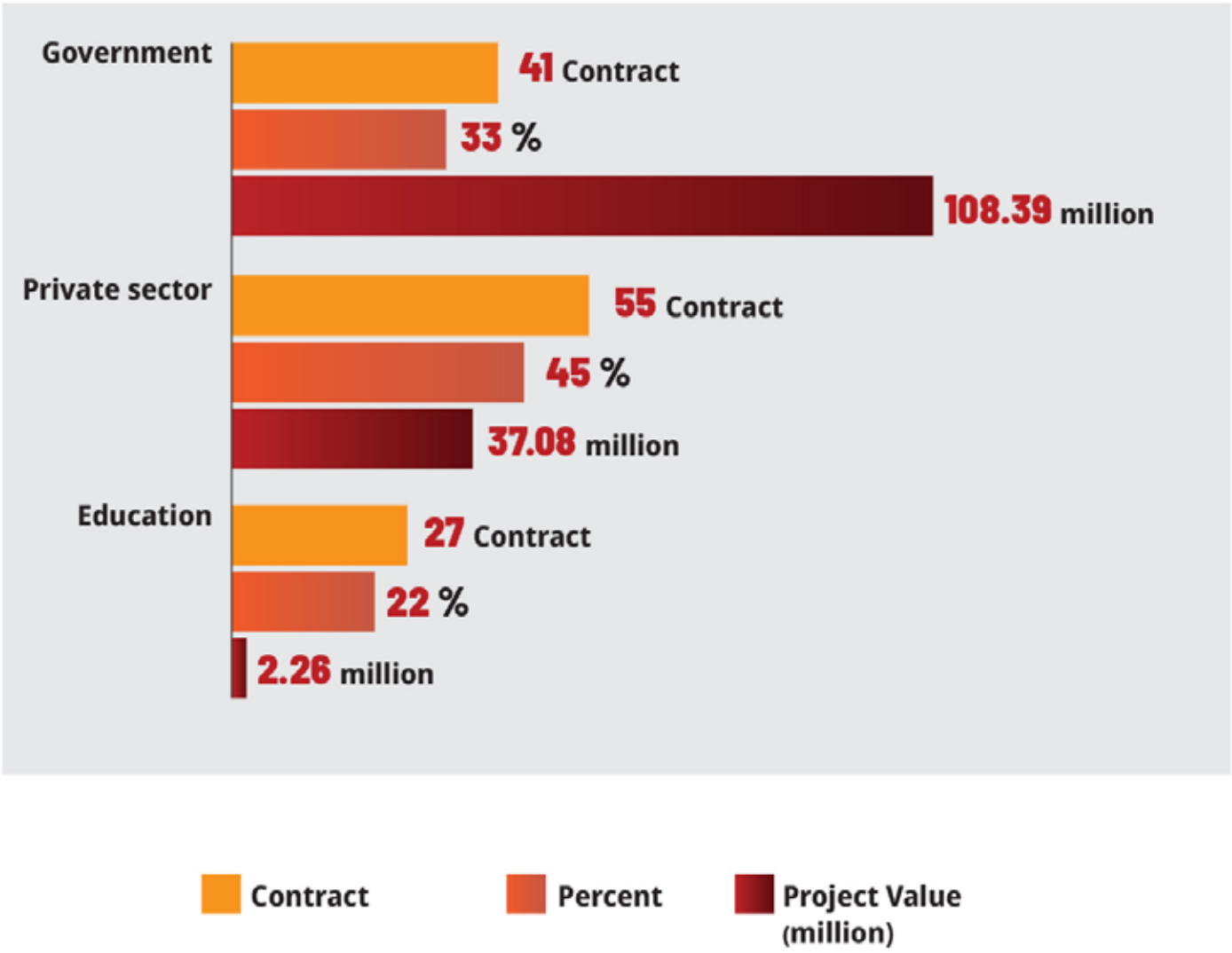
- Thai Microelectronics Center (TMEC) under NECTEC joined hands with leading research institutes in Germany and the Netherlands to conduct a research project on Fabrication of Large-area Antifouling Film by Using Roll-to-Roll NIL Process.

  The project is to develop a high-resolution laser patterning technique to create a micro-pattern with an aspect ratio of more than 5.0 on a silicon mold that is used as a template to develop a nickel mold. The micro-pattern on the polymer is created using the R2R-NIL process to offer surface antibacterial properties. The development came out with the silicon prototype, the nickel mold and the anti-bacterial film (FleXARs film) for further technology transfer.



Technology Transfer

Under a strategy of “Technology Transfer”, NECTEC has developed a mechanism to drive its research and development works for real utilization and commercialization in the form of a “contract” model. In 2021, NECTEC achieved 123 technology transfer contracts with a total value of Bt147.73 million, dividing into 41 contracts from government agencies representing 33 per cent (project value at Bt108.39 million), 55 contracts from the private sector accounting for 45 per cent (project value at Bt37.08 million), and 27 contracts from education sector accounting for 22 per cent (project value at Bt2.26 million).



Awards

6 International Awards

Dr. Putt Sakdhnagoll, a researcher from ThaiSC, received the Honorable Oral Presentation Award at the 24th International Annual Symposium on Computational Science and Engineering (ANSCSE) from "TARA: Year in Review"

Mr. Nachat Jatusripitak, an Internship with ThaiSC team, received an award at the 24th International Annual Symposium on Computational Science and Engineering (ANSCSE) from "Grid Spacing for Efficient Data Center CFD Simulation: A Preliminary Study."

Dr. Kamol Kaemarungsi was recognized as the World's Top 2 per cent Scientists by Stanford University in Networking & Telecommunication. He also received the Best Paper Award in the 9th International Electrical Engineering Congress (iEECON 2021) from the academic article titled "Effect of Obstacle Attenuation on Human Respiratory Detection using IR-UWB Sensor."

Dr. Atcha Kopwitthaya, the researcher and Team Leader from Photonics Technology Research Team at Spectroscopic and Sensing Devices Research Group (SSDRG), was honored to be "SPIE Women in Optics 2022" by the International Society for Optics and Photonics (SPIE). She was ranked as one of 25 researchers from around the world who has been recognized academically in the field.

Dr. Chanjira Sinthanayothin, Mr. Wisarut Bholsithi, and Ms. Nonlapas Wongwaen, the researcher team from Image Processing and Understanding Research Team (IPU), received the Best Presentation Award in Image Processing at the 13th International Conference on Digital Image Processing (ICDIP 2021) from "Morph Targets for 3D Facial Animation with Webcam Using Facemesh, Jeeliz-tranfer APIs and Three.js"

Energy Management and Conservation Working Group at NECTEC received the ASEAN Energy Efficiency and Conservation Best Practice Awards 2020 in Energy Efficient Building/Retrofitted Building. The Excellency Dang Hoan Ann, the Vice Minister of Trade and Industry of Vietnam presided over the online awards ceremony.

6 National Awards

Strategic Analytics Networks with Machine Learning and AI Research Team (SAI) from Data Science and Analytics Research Group (DSARG) won the first-prize award in the Public Sector and Government category.

“Thai People Map and Analytics Platform (TPMAP)” won the first runner-up award in Big Data Analytics from Thailand ICT Awards 2020.

Dr. Wutthinan Jeamsaksir and Mr. Wisarit Sriphomkhai received the National Research Council of Thailand’s Excellence Award 2021 in Medical Sciences from the “Innovation of Microfluidic System Device Application on the Bio-Engineering by Using Veterinary Medicine as a Study Model.”

Dr.Wasan Pattara-atikom won the National Innovation Awards’ first runner-up in Society and Environment from “Traffy Fondue”

Dr. Chainarong Amornbunchornvej, a researcher from Strategic Analytics Networks with Machine Learning and AI Research Team (SAI), Data Science and Analytics Research Group (DSARG) received the National Research Council of Thailand’s Excellence Thesis Award 2021 in Information Technology and Communication Arts category from “Inference of Leadership of Coordinated Activity in Time Series.”

Dr. Noppadon Nunthawong and Dr. Pitak Eiamchai, the researcher team from Spectroscopic and Sensing Devices Research Group (SSDRG), received the National Research Council of Thailand’s Honorary Award 2021 in Invention from “Chemistry Science and Pharmacy from Green Colloidal SERS.”

Academic Work

academic work

Patent

65

Technology Journal

78

Technology Journal Meeting Conference

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