

The Future of Urban Life in Thailand

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Service Robots and the Life of Bangkokians in Post-COVID 19 Era



The Development of Smart Cities in Thailand's Eastern Economic Corridor



Smart Streetlight Control System on the NB-IoT, LoRa and 5G Technology Platforms in Thailand



Urban Agriculture for Urban Food Security

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A hand-drawn mind map titled "OUR BUSINESS" at the top left. The central theme branches out into several key business concepts, each represented by a cluster of related icons and text:

- TEAM:** Includes an icon of a box labeled "VSL", a bar chart, and the word "SUCCESS" written in a large, stylized font.
- QUALITY STRATEGY / VISION:** These terms point towards a central "SUCCESS" word, which is also pointed to by "INNOVATION" and "RESEARCH".
- MARKETING:** Features a lightbulb icon, a bar chart, and a large dollar sign icon. Below it, a circular flow diagram shows "money" going to "recycling" and then to "money recycling".
- MARKETING (bottom):** A separate box labeled "Marketing" with an arrow pointing to a building icon.
- internet:** Includes a car icon and a pie chart labeled "25% time".
- CLOUD:** Features a cloud icon, a laptop, a server, and a smartphone.
- Other elements:** A sun icon, a pie chart, a lightbulb, a recycling symbol, a house, and various other abstract shapes and lines are scattered throughout the map.

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- CLOUD:** Represented by a cloud icon, a laptop, and a server rack.
- WWW:** Shown with a sun icon and a network diagram of people connected by lines.
- Other elements:** The map is decorated with various icons including a lightbulb, a pie chart, a bar chart, a line graph, a cloud, a sun, a car, a house, a recycling symbol, and a dollar sign.

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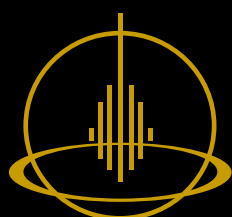
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Our urban environments are changing faster than ever before. Technological advancements, increasing economic uncertainties, lifestyle changes, climate change and environmental problems all play their part. Often due to a lack of planned expansion and coherent urban strategy, some cities have failed to reach their potential. Unplanned or poorly regulated, unfettered development carry dire consequences for quality of life, economic efficiency as well as hampering future city development plans.

The United Nations' Sustainable Development Goals (SDGs) require many countries, including Thailand, to plan and formulate strategies for urban development and design to ensure sustainability in all dimensions. These dimensions include safety and security for city dwellers, accessibility, a liveable environment, expansion of green spaces and full democratic participation of citizens in decision-making for urban development and planning.

Chulalongkorn University carries a responsibility to contribute towards best-in-class approaches to planning for sustainable urban development change management. Urban planning and design must go hand in hand to enable Thailand's cities to fulfil their true potential. An urban development plan has multiple objectives: it must offer concrete and practical concepts and approaches that give clear strategic direction, address spatial problems, balance the needs of multiple stakeholders and manage natural resources efficiently and appropriately. A well-designed urban development plan can improve economic competitiveness while maintaining the uniqueness and identity of the community. Cross-disciplinary research is therefore essential to a clear understanding of urban planning needs and opportunities. Finally, city development involves multiple agencies including local communities, public and private sector actors, user groups and civil society organizations. Building a meaningful, trust-based cooperation and partnership among stakeholders is essential to ensure sustainable urban development.

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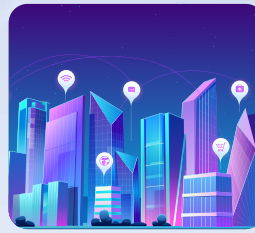
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Service Robots and the Life of Bangkokians in Post-COVID 19 Era

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Introduction

The spread of Coronavirus 2019 (COVID-19) has radically impacted on our lifestyles, which we now refer to as the so-called “New Normal”. These changes in our way of life have been driven by the imperative to comply with public health measures including wearing of protective masks, social distancing, frequent handwashing and reducing unnecessary contact and face-to-face meetings, particularly in large groups. The new limitations have in turn driven an acceleration in technological development to mitigate impacts on our lifestyle and allow life and business to continue to function as normal. In particular, during the COVID-19 pandemic the world has witnessed a rapid advancement in robotics. Service robot technology is expected to play a crucial role, due to its potential ability to automate multiple functions that would put human operators at risk in urban communities (e.g. robot maids, companions and delivery services). This constitutes a social shift that will probably be irreversible even after the threat of COVID-19 has receded.

Conclusion

Service robots are similar to industrial robots, but rather than simply manage complex and repetitive mechanical tasks e.g. in manufacturing, are designed to serve humans directly. Service robots too can perform repetitive or tiring tasks instead of humans, and can work in high-risk situations. They are cost-effective and can be designed to be highly adaptable to change. Service robots also possess the abilities of cobots that can work with people effectively. They are precise and sensitive when applying force, and are able to perceive and map their working location and environment. Service robots are designed to look friendly to humans and be easy to use and controls; they are also autonomous and have the ability to learn and adapt to their work environment and to their human ‘client’.

The current enduring pandemic, together with an ageing society are together reducing the workforce, creating an opportunity for AI-enabled service robots to fill many roles hitherto conducted by humans and to undertake increasingly complex tasks and roles. Service robots are intriguing, and are here to stay.

The Development of Smart Cities in Thailand's Eastern Economic Corridor

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Introduction

Cities around the world have reinvented themselves as 'Smart Cities' by employing Information and Communication Technology (ICTs) to integrate multiple functions of city management. As well as driving efficiency and enhancing quality of life, Smart Cities also aim to contribute to achieving targets under the Sustainable Development Goals (SDGs), and plan their interventions with a high level of public participation. In Thailand, cities such as Bangkok and large provincial centres have also taken early steps towards transforming into Smart Cities. The spotlight is currently on the development of smart cities in the Eastern Economic Corridor (EEC) area as emphasised by the National Strategy 2018-2037, which is predicted to have a positive impact on Thailand's economic and social development as well as the quality of urban life.

Conclusions and recommendations

Under the Masterplan for the Eastern Economic Corridor (EEC), the planning and design of infrastructure and public utilities in cities within the EEC will be developed following smart city principles: technology, innovation and sustainability. The vision is to create liveable urban areas where the economy, society and environment are all fostered and nurtured together, following criteria set out in the Smart City Handbook by the Digital Economy Promotion Agency (DEPA). The National Smart City Committee has awarded the Smart City Thailand logo to all 7 areas within the EEC, which will unlock special privileges from the Board of Investment (BOI).

Smart Streetlight Control System on the NB-IoT, LoRa and 5G Technology Platforms in Thailand

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Introduction

Global energy consumption is rising continuously and many countries have turned to renewable energy, both to meet demand and also to reduce dependency on fossil fuels. Growing environmental awareness and the need to conserve natural resources has also helped drive the shift to renewable energy. Global statistics indicate that public street lighting accounts for more than 19% of global energy usage. In Thailand, figure is lower at approximately 2%. Many countries have adopted information technology to control and manage street lighting more effectively. Good energy management can help reduce energy consumption and reduce costs.

Conclusion

Smart streetlight control using LoRa, NB-IoT, and 5G internet connectivity increases control system efficiency, transforming legacy systems to more stable systems, saving cost, covering a wider area, and responding quickly in real-time. This development is part of a system to increase efficient control of public streetlights via a cloud-based user interface (UI), including intelligent real-time dimming and turning on/off periods. The results of this development will contribute to future smart city development, enhancing quality of life in urban areas while saving energy costs and protecting the environment.

Urban Agriculture for Urban Food Security

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Introduction

Our global agricultural system is increasingly suffering from the impacts of climate change, directly affecting global food and nutritional security (IPCC, 2007). Disasters such as floods or outbreaks of infectious diseases also exacerbate food security risks, especially in densely populated areas and urban areas. The United Nations predicts that approximately 50% of the global land area will become urbanized by 2050 (United Nations, 2018); clearly this will leave a smaller land area available for food production, while food demand continues to grow with population. If cities continue to rely on external resources, they become increasingly vulnerable to external factors such as food shortages.

Urban agriculture is not only about growing food. It also plays an important role in improving the urban environment and quality of life, as well as increasing its adaptability to climate change, as noted in the 2009 International Conference on Urban Challenges and Poverty Reduction in African, Caribbean and Pacific Countries (UN-Habitat, 2009). Urban agriculture helps reduce food miles, increases urban green space, decreases surface temperatures (urban heat islands) as well as contributing to the aesthetic value of the city landscape.

As a result, 21st-century agriculture is undergoing an emerging paradigm shift to focus on food security and food safety. Agriculture is shifting towards organic farming or controlled environment indoor farming (Wijitkosum, 2018a). Precision agriculture, building-integrated agriculture, roof-top agriculture, and vertical agriculture are all attracting increasing interest. Agriculture is also increasingly focused on mitigating impacts of food production practices on climate, ecosystems and the environment.

Conclusions

Urban agriculture is increasingly contributing to urban food demand, supplying fresh local produce to city dwellers and communities while also contributes to many environmental improvements such as food waste management, reducing food miles, and reducing the use of chemicals in food production and preservation. However, developing urban agriculture, both horizontal and building-integrated agriculture, is a complex process and has to take into account various factors including spatial, environmental and social dimensions. Urban agriculture requires effective planning of land utilization and resource management. Ultimately, if urban farming is able to expand in scale, this modality will contribute to the city's food security, resilience and sustainability.

The Future of Urban Life in Thailand

Distinguished Scholar Assoc. Prof. Nopanant Tapananont, Ph.D., a city planning expert, shares his views and concepts in developing the future of urban life and city planning in Thailand for sustainable development.

Development of urban planning in Thailand

“...Urban communities play a crucial role in the country’s economic and social development. They are the hubs of industries and commerce and center of government, education, and public health administration...”

Thailand has had urban settlements for a long time. Many moats built around cities have been discovered in all regions of the country. These urban communities have long been developed. They started as single independent towns, merged to form a group of towns or states, which themselves became integrated to become kingdoms. For example, the Kingdom of Ayutthaya encompasses many smaller towns and states, including Sukhothai in the north, Lop Buri and Suphan Buri in the centre, and Nakhon Si Thammarat in the south, with Ayutthaya as the Kingdom’s capital city before it was succeeded by Thon Buri and later by Rattanakosin.

Historical and archaeological evidence suggests that urban communities in Thailand developed continuously from agricultural settlements with fertile lands that were relatively safe from natural disasters, especially floods. Communities later learned to build moats as a defence against invaders. The development of administration and government systems for urban communities, states, and kingdoms came later and grew in sophistication. They continued with their traditional beliefs and, at the same time, embraced new religions, especially Buddhism from India. Influences from the West came later, and helped modernize the country and its image.

Today, urban communities are the hubs of industry and commerce, as well as centers for government, education, and public health administration. Our cities are therefore the key drivers of the country's economic and social development- a major shift from the country's dependence on agriculture as a driver of GDP. Population growth as well as limited land availability, and the availability of higher-paid employment opportunities from a fast-growing industrial and business sector, have hastened a continuing exodus from rural areas since the 1980s, and a resulting rapid growth in urban populations.

National strategies for urban development and community orders of Thailand according to the UN Sustainable Development Goals

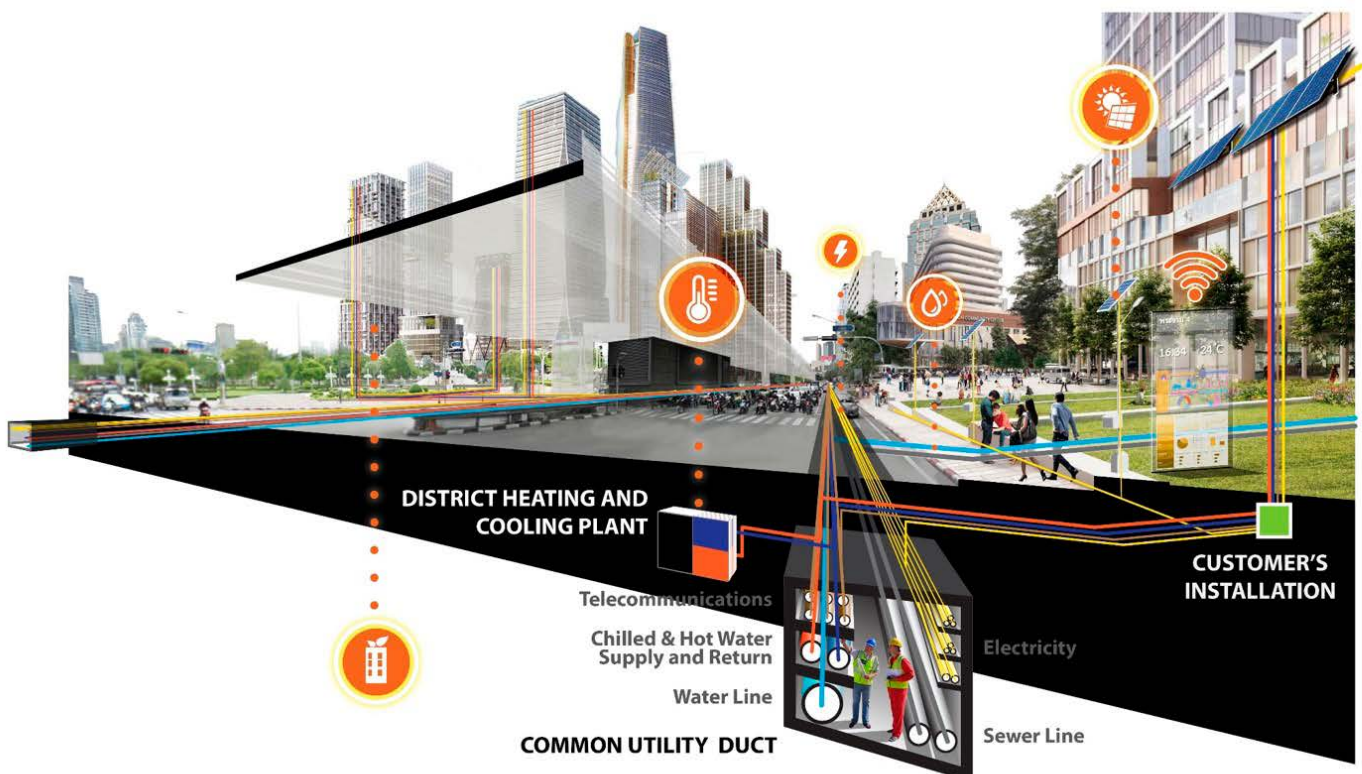
"...The Constitution of the Kingdom of Thailand B.E. 2560 (2017) requires that the government devise national strategies for sustainable development according to the principles of good governance and to be used as a framework and guideline for future plans to achieve the target..."

Thailand is changing fast. The Constitution of the Kingdom of Thailand B.E. 2560 (2017) requires that the government devise national strategies for

sustainable development according to the principles of good governance and to be used as a framework and guideline for future plans to achieve the target. Accordingly, the 20-Year National Strategy (2017-2036) aims at improving the quality of life in an environmentally-friendly manner. The national strategy plan states that liveable urban environments should be fostered, along with the appropriate policies, plans, and regulations according to the potential of the area and following the principle of environmental conservation.

The details for implementing the national strategies are elaborated in The Twelfth National Economic and Social Development Plan (2017-2021), including the development of regional areas, urban and commercial areas to decentralize development and distribute more economic opportunity to all provinces outside Bangkok. The central business district of the province will be made more liveable for all residents. The main economic base will be developed, restored, and expanded in an environmentally-friendly manner, and quality of life for local communities will be improved. New economic areas will be promoted to increase their competitiveness and secure long-term sustainable development.

To satisfy the Constitution of the Kingdom of Thailand B.E. 2560 (2017), the government has





passed several new bills, the first of which was the National Strategies Preparation Act B.E. 2560 (2017). Additionally, the National Economic and Social Development Act B.E. 2561 (2018) was enacted to supersede the National Economic and Social Development Act B.E.2521 (1978), and the Town Planning Act B.E. 2562 (2019) to replace the Town Planning Act B.E. 2518 (1975). The Department of Public Works and Town and Country Planning has been assigned to prepare national and regional policy plans under the supervision of the Board of National Town Planning Policies and prepare provincial policy plans under the supervision of the Board of Town Planning. These policy plans will serve as frameworks for town and country planning and as blueprints for long-term development and restoration projects. The policies are to be implemented by the Department of Public Works and Town and Country Planning or local administrative organizations under the oversight of the Board of Town Planning or Provincial Board of Town Planning. The Eastern Special Development Zone Act B.E. 2561

(2018) has also been passed to develop the region, towns, and economic zones located in the provinces of Chachoengsao, Chon Buri and Rayong.

The importance of innovation in development and town planning for sustainable development and the future of urban life in Thailand

“...Town planning and urban development may place less emphasis on the quantity, but shift the focus on the quality instead in order to upgrade the quality of life and standard of the environment in the future...”

Sustainable development is founded upon establishing an equilibrium between economic growth, social equality, and conservation of natural resources and environment. For so long, urban communities in Thailand have been suffering from increasing population pressure and overcrowding. Labor migration from other provinces to provincial urban centres has led to multiple problems such as



housing shortages, overpopulated communities, traffic congestion, a strain on public utilities and infrastructure, along with degradation of quality of life and an unhealthy environment.

In the medium term, Thailand's population is expected to remain steady or decline slightly. Decentralization to encourage development in outer provinces will reduce rural-urban migration; however, a slowdown in growth in urban development is also expected. Town planning and urban development may place less emphasis on quantity, but instead shift its focus to quality in order to enhance quality of life and conserve the environment.

However, town planning and urban development need to align with economic, social, and environmental trends and pressures. Factors that should be considered include the trend towards creating special 'innovation zones', policies and programmes to drive a creative economy through SMEs and startups, the emergence of the aging society, the growing individualism of the new generation, accelerating climate change

impacts, pervasive pollution of our air, water and soils, along with outbreaks of new emerging diseases. In the meantime, smart city development based on IT and communication systems to store and process data will improve the speed and efficiency of urban administration.

Problems in the concept of town planning innovation and solutions

"...National strategies, the national economic and social development plan, including action plans of central, provincial and local government agencies and state enterprises do not in general adequately integrate spatial development to ensure effective and optimal implementation..."

Town planning and urban development in Thailand are characterized by top-down rather than bottom-up administration, with little engagement and input from local-level agencies or communities. Emphasis has been placed upon enforcing the law

to regulate private development rather than follow government guidelines. Also, town planning has frequently failed to effectively transfer national-level policies, especially at regional and provincial scales. There has been little effort on urban restoration, which should have led to more creative town planning and enhanced quality of urban life.

Another problem is the lack of coherence among various policy initiatives such as the National Economic and Social Development Plan and the Spatial Development Plan. This adversely affects the sectoral plan characterized by issue-based development. Also, there is a shortage of area-based integration. In other words, policy initiatives are not integrated and have failed to utilize spatial development as a tool to improve policy coherence and boost their combined impact and effectiveness.

Solutions to these problems need to be grounded in an establishing an understanding with and among relevant agencies to ensure the necessary inter-agency consultative processes required to achieve integration. In particular, meaningful public participation must be embraced throughout and placed at the core of planning processes, in order to ensure effectiveness and meet the needs of local communities and other stakeholders.

Urban development planning and urban planning in the future in the midst of climate change, disasters, and pandemics

“...The incalculable impacts of climate change are only just beginning, and our future security and survival will depend upon how effectively these impacts are factored into our long-term national social and economic development plans as well as at every level of planning...”

By definition, town planning and urban development must provide the infrastructure to meet future needs as well as the ability to adapt to short and long-term stressors such as social change, natural disasters or man-made emergencies. Long term trends such as urban migration and our aging society must be taken into account. It will be especially important to recognize that climate change is driving an increasing intensity as well as frequency of natural disasters

such as floods, drought and storms, all of which are expected to be much more devastating than past trends would predict. Changes also need to be made across the board, both at urban planning level and at sectoral level to reduce greenhouse gas emissions and mitigate our contribution to climate change.

As noted, history is less helpful than it used to be in predicting the future, as the emergence of new infectious diseases such as Covid-19 has demonstrated all too tragically. Lessons need to be learned from the current pandemic, in order to mitigate impacts and improve our resilience to future emerging diseases. Radical changes are called for in town planning and urban development, for example, to reduce population density and increase personal distancing. New limits to population carrying capacity must be established, for example for mass transit systems, public transport and large events, and more empty space and green areas need to be incorporated in urban plans.

With this in mind, Thailand needs to extend its planning horizon and allow for unexpected changes. Today, the country operates under a 20-year master plan. However, most other planning processes such as the National Economic and Social Development Plan, the government action plan, and state enterprise plan, operate on a 5-year planning horizon, with more detailed annual plans at governmental and state enterprise level. It will be especially important that changes in planning philosophy are integrated and fully implemented at all these different planning levels.

Public participation in urban development

“...Participation in the planning of our urban spaces is very close to people’s way of life. It concerns their living spaces, how they commute, and is fundamental to economic and social development in our cities...”

Town planning and urban development are implemented by agencies such as the Department of Town & Country Planning and local administrative organizations such as municipalities, provincial administrative organizations, subdistrict administrative organization, and special administrative organizations (e.g. Bangkok Metropolitan Area and Pattaya City).



The Town Planning Act B.E. 2562 (2019) allows the public to participate in public hearing meetings and to file pleas to review land use regulations before the comprehensive plan comes into enforcement. Participation in the development of urban life is very close to people's way of life. It concerns their living spaces, how they commute, and forms the basis for all economic and social activity, including work, study, shopping, and recreation. Apart from participating in town planning at the appropriate level and through the appropriate channels, the public should not violate land use regulations under the overall city plan. In addition, the public has an important role in monitoring and reporting non-compliance and violation of planning regulations, thereby contributing to their effective implementation and enforcement.

Educational institutes and improvement of the quality of future urban life

"...We need more high-calibre graduates who understand the latest advances in town planning, and innovative urban designers and scholars who can future-proof our planning processes and create liveable, safe and vibrant urban spaces..."

Thailand's educational institutes already offer programs at Bachelor, Master and Ph.D. levels in spatial development at regional and urban levels, as well as programs in urban community design. Such programmes contribute to producing a next generation of graduates who understand the town planning profession, creative urban designers, and researchers and scholars who can transform and future-proof our urban spaces.



Chulalongkorn University places strong emphasis on the quality of research and academic services. Located in Bangkok, the university plays a vital role in researching and providing academic services relevant to key challenges in urban development. The Center of Excellence in Urban Strategies (CE. US.) has been established along with research clusters for sustainable urban development. Research focuses

primarily on developing an extensive database for sustainable urban development in Thailand. The premises of Chulalongkorn University and its vicinity on Rama IV Road, from Hua Lam Phong to Khlong Toei Intersections serve as a living laboratory, while plans are already in place to expand to implement successful urban development strategies to other key urban centers in Thailand in the near future.



Distinguished Scholar Assoc. Prof. Nopanant Tapananont, Ph.D. graduated with a Bachelor of Architecture (Architecture) from Chulalongkorn University, a Master of Science (Human Settlements Development) from the Asian Institute of Technology, and Doctor of Philosophy of Engineering in Urban Engineering from the University of Tokyo. He is a former lecturer at the Department of Urban and Regional Planning, Faculty of Architecture, Chulalongkorn University.



Time for Modern Agriculture to Change and Apply New Agricultural Technology of Thailand

Thailand is an agricultural country with a total area of approximately 321 million rai (513,000 km²). Farmlands account for up to 43 percent (138 million rai), of which only 34 million (24.6 percent) is irrigated. Agriculture sector revenues account for 10 percent of the country's GDP, including fisheries, animal husbandry, and forestry as well as field crops and orchards, which make up 68 percent of the agricultural area.

Thailand's agriculture sector has evolved through four distinct eras. The first (called Agriculture 1.0) was a traditional family or community-centred agrarian system, focusing on producing and selling single crops with a small cash surplus. Most farmers produced rice as their main crop, together with a few other crops mainly for home consumption. Traditional agriculture is typified by small plot sizes, a heavy reliance on manual labor, and a heavy dependence on weather. Traditional farmers are usually disempowered, with no collective bargaining power against buyers, and frequently suffer from water shortages, crop failures and low produce prices.

Agriculture 2.0 refers to the gradual integration of basic mechanization into farming systems. Light machinery was introduced to reduce the burden on field workers and increase their efficiency. The light machinery era was also characterized by the introduction of irrigation, chemical inputs and lower-cost mechanized harvesting methods. Alongside this trend came the advent of organic farming, though many farmers still maintained their traditional ways of rice farming.

Later came Agriculture 3.0, characterized by the use of heavy machines and an emphasis on industrial, export-driven farming. Farm machinery required high investment and large operational scales (larger fields), but greatly boosted productivity. Mechanization was also driven by labour shortages caused by an exodus from rural to urban centres, where expansion in the industrial and service sectors offered higher-paid employment. The high investment and operational scale reduced the competitiveness of small farmers, and corporate farms have prospered due to their higher efficiency and access to resources and markets.

In mid-2016, the Thai Government launched a new project to propel the agricultural sector towards a better future. The initiative calls for a transformation from traditional agricultural systems to a smarter, technology-enabled system referred to as Thailand 4.0, and seeks to resolve the complexity and inefficiency of today's agricultural price support schemes. Also dubbed as the '*Smart Farming*' era, Agriculture 4.0 focuses on expanding the '*value-based economy*' that harnesses innovation in crop production, product management, processing

and marketing. The system is characterized by a high level of technological integration and collaboration: farmers may undertake collaborative research with educational institutes in order to increase their competitiveness e.g. through value-added products, innovative farm management tools or processing or packaging technologies.

The strategy is important if Thailand is to shift from producing and exporting raw unprocessed agricultural commodities such as rice, cassava flour and rubber latex which have low value-added. Downstream processing into intermediate or finished products adds value and enhances national competitiveness. Agriculture 4.0 is implemented as part of the broader Thailand 4.0 economic initiative, which focuses on the following business sectors:

- 1) Food, agriculture, and biotechnology
- 2) Public health, health, and medical technology
- 3) Smart equipment, robots, and electronically controlled systems
- 4) Digital, internet connection and control, artificial intelligence (AI), and embedded systems
- 5) Creative industry, culture, and high-end services.

In the meantime, the Ministry of Agriculture and Cooperatives has set a long-term plan that includes the following 10 missions to implement the practices of Agriculture 4.0:

- 1) Facilitate farmers' access to knowledge
- 2) Keep existing regulations up to date
- 3) Solve debt problems for farmers
- 4) Boost agricultural production to ensure domestic food self-sufficiency
- 5) Create and develop modern innovations
- 6) Promote large livestock farms and emphasize healthy food
- 7) Increase the value of agricultural produce

- 8) Adjust crop production systems to increase resilience to climate change
- 9) Boost research and development
- 10) Promote inter-Ministry collaboration to ensure broader, coherent development policies.

However, Thailand's agricultural sector faces several fundamental challenges that constrain its growth and economic competitiveness. First, despite the large agricultural area, there is a scarcity of effective irrigation systems. Second, many small farmers are leaving the land amid increasing levels of poverty and indebtedness. Children from farming families, having seen their parents struggle to survive, have turned to urban employment in the industrial and service sectors. The high average age of Thai farmers (around 52) attests to a continuing structural change associated with the decline of the farming lifestyle.

Without intervention to improve the competitiveness of farming as an occupation, the number of Thai farmers is expected to fall to below 10 percent within a few decades, to levels similar to those in Europe, Japan, and the United States.

The recently emerging and unprecedented impacts of rapid economic change, frequent natural disasters and the COVID-19 pandemic only add to the suffering of Thailand's farmers, who have always faced systemic poverty, inequity and political discrimination. Some of the most important problems are as follows:

- 1) Production costs and access to resources: Many farmers do not own land, and must rent the land they farm. Continuing consolidation of land ownership often forces small farmers from the land or obliges them to work as wage labour for larger farming enterprises or industrial factories.



- 2) Health problems: Heavy and uncontrolled use of pesticides on virtually all crops across the country directly affects the health of farmers and consumers alike, as well as the environment. Although the Government has imposed a ban on some of the most toxic active ingredients, farmers merely seek alternative chemical products, which may often be more expensive than the banned ones, adding to production costs and continuing to impact on health and the environment.
- 3) Marketing problems: Marketing of agricultural produce is dominated by middlemen while the majority of the risk is borne by farmers. The latter have no negotiating power and no say in pricing, resulting in unfair and fluctuating prices; the inherent power inequity means that farmers are generally price-takers. Moreover, production costs have constantly increased year by year, while prices have not kept pace. Despite the establishment of grower groups to avoid exploitation by middlemen, such groups still struggle to negotiate effectively and counter pressure exerted by powerful buyers. Therefore, it will be important for the Government to act to address power inequities and ensure farmers receive a fair price.
- 4) Farming land: Changes in land use and agricultural structure are linked to the policies and support schemes implemented by successive governments. When this Government's policy promotes larger farms, requiring heavy investment and technology to compete, large-scale corporate agribusiness enterprises will capture the sector, while small farmers are marginalized and- lacking

expertise, capital and collaborative skills to negotiate collectively- are progressively excluded from market access.

- 5) Energy policy and oil shortage: The energy policy and recent oil shortages have disrupted agricultural production, with some farming areas converting from food crops to energy crops as feedstocks for biofuel plants. Sugar cane and cassava in particular are grown now mainly as feedstocks.

Agriculture is vital for Thailand's future. Amidst the transition toward the digital era or Thailand 4.0, megatrends and innovations in frontier technologies such as biotech, nanotech, space tech, robotics, and digital solutions will increasingly disrupt the sector. It is time for Thailand and its agriculture sector to recognize the implications and act immediately to keep pace with our fast-changing world. To ensure the sector survives and thrives, the government needs to act now, beyond the overarching ideas and direction set out under Agriculture 4.0.

Among the disruptive technologies and phenomena emerging from the digital space, a number are already transforming Thailand's agricultural sector. The following are expected to be particularly important in shaping Agriculture 4.0:

- 1) Geopositioning satellites for agriculture (mapping, monitoring, crop development, weather)
- 2) Zoning and geo-strategy
- 3) Water management and Internet of Things (IoT)
- 4) Seed and soil development
- 5) Services and smart farming vs. contract farming
- 6) Traceability (e.g. blockchain)



- 7) Commodity to process and branded food to innovate in health and beauty
- 8) R&D in agriculture and food, as part of regional and health technologies
- 9) Sustainability and land use

A Cornell University research study entitled *Study Mission: "Agriculture innovation and competitiveness"* has analyzed the prospects for of Thailand's agriculture sector, and stresses the need for innovation and sectoral transformation. This study notes the initiative of one company- CEO AGRIFOOD Co., Ltd., a leading manufacturer of rice bran oil. This company aspired to increase value-added for rice bran, which has traditionally been a low-cost byproduct of milling, used only as an ingredient in animal feed or fertilizers. Instead, CEO AGRIFOOD extracts oil from the rice bran, which has a variety of unique properties. Rice bran oil can be used for cooking or as an ingredient in cosmetics. More importantly, the antioxidant unique to rice bran is extracted from oryzanol and used medically to reduce blood cholesterol levels. The value of rice bran is thereby increased by over 500 times.

(Rice bran costs Baht 10/kg, while oryzanol extract imported from Japan costs Baht 5,000 baht/kg: data as of 2014). Such examples demonstrate the potential of increasing added value from extraction of fine chemicals from agricultural products and by-products. However, to unlock this potential, Thailand needs to invest in R&D and technology to identify, develop and commercialize such products for global markets. Therefore, research and other support from the Government will be a vital success factor.

The Government aspires to transform the country into a hub for modern farming and the 'Kitchen of the World', while most farmers still only view their products as raw commodities for export. Thai agriculture is in urgent need to increasing value added in the sector, using new knowledge, innovation and technologies. Tomorrow's farmers will need to embrace new skills and competencies and need to be trained. Young farmers should be fostered to sustain a quality farming career and quality of life so that they can develop new products from existing materials and apply new technology that drives Thai agriculture forward.

Reference

Limjaroenrat, P. (n.d.). *Study Mission: "Agriculture innovation and competitiveness"*, Cornell University. Retrieved May 21, 2020, from <https://www.krungsri.com/bank/th/plearn-plearn/business-agriculture-thai-to-global-market-part1.html>





Entrepreneurial University Development Program

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The world has changed from an industrial to a knowledge-based society. The role of universities as custodians of knowledge and learning is therefore ever more critical to enhancing every aspect of our lives as well as to driving international competitiveness. An '*Entrepreneurial University*' is a management concept arising from the desire of universities to be independent from government support and control, which has often proven a constraint to progress. The entrepreneurial university concept allows universities to generate income and contribute directly to economic growth and be more agile in focusing on addressing real-world problems in our society.

Today's new and fast-moving economic and social challenges highlight an increasingly important role for universities to integrate teaching and research to meet a constantly changing external environment. Responding to fill this need, entrepreneurial universities are creating new products and services, fostering innovations and innovation management skills, and facilitating technology transfer to industry and the public sector. These expected outcomes form the basis of a shift in the mission of universities towards a new and integrative paradigm.

Creating a successful entrepreneurial university requires a broad range of new skills and approaches; the following three factors are especially foundational: 1) Leaders and staff with entrepreneurial attitudes and skills; 2) Courses and curricula that nurture creativity and networking; 3) Tools, equipment and facilities

that foster and support innovation; 4) Close partnership with the business sector; and 5) Flexible and agile university governance and management to support social enterprise approaches and business models to facilitate generation of new revenue streams that contribute to the university's financial sustainability.

Despite this shift towards independent status, government support remains vital to a thriving, vibrant and entrepreneurial tertiary education sector. While privatization of Thailand's universities is progressing from an institutional perspective, organizational cultures within universities are entrenched and resistant to change. As a whole, the level of entrepreneurship of universities in Thailand remains at a "moderate" level, with major potential for further development of entrepreneurial capability.

Considering the importance of fostering entrepreneurial universities in Thailand, the Office of the National Higher Education Science Research and Innovation Policy Council (NXPO) assigned **Chula Unisearch** to conduct a research study: the "*Entrepreneurial University Development Program*," to formulate a strategy to develop and enhance the entrepreneurial competencies of selected universities, which can later serve as role models for other universities. The study also aimed to share relevant policy lessons and guidelines to further advance Thailand's innovation and entrepreneurship ecosystem.

Data related to entrepreneurship within Thai educational institutions were collected and a '*Universities entrepreneurship development framework*' was created. The study examined the status and potential of higher education institutions as well as the entrepreneurship development process of each selected institution. Finally, the study made strategic recommendations based on its findings.

The research was conducted in three phases:

Phase 1: Collected data and review the secondary literature on entrepreneurial universities to create a framework for content analysis and assess the level of maturity of entrepreneurship within Thai universities.

Phase 2: Conducted in-depth interviews with senior university executives responsible for entrepreneurial development and innovation. Topics included the university's stance, potential, development process and trajectory towards transformation to become an entrepreneurial university. The framework was then used to collect data and prepare a systematic analysis for each selected university.

Phase 3: Drafted an Entrepreneurial University Development Program Plan based on study findings.

The research team hopes that this research will contribute to development of entrepreneurial universities in Thailand. The results serve to offer relevant practical guidelines to nurture mechanisms to drive the transformation to an entrepreneurial university as well as to prepare for change efficiently and effectively. The knowledge and good practice gained from this research can be used to develop strategic plans, action plans and entrepreneurial projects/activities. The Office of the National Higher Education Science Research and Innovation Policy Council (NXPO) and other organisations responsible for university policy will receive recommendations that contribute to the formulation of policies, strategies and entrepreneurial projects/activities that can be operationalized practically at national level. This will nurture Thailand's innovation and entrepreneurship ecosystem to drive the country forward, increase its global competitiveness and promote the long-term sustainability of Thai universities.





Seminar of Labour Market Policy

On Wednesday 29 January 2020, CU-ColLaR and **Chula Unisearch** held a seminar on policy regarding the labour market for an ageing population. The seminar, entitled ***“Promoting Valuable Employment for Aged Population following Future Labour Market Trends”*** took place at the Academy CU Innovation Hub, Chaloem Rajakumari 60 Building (Chamchuri 10), Chulalongkorn University. The purpose of the seminar was to present the current employment situation and promote employment of older people to potential employers from both private and public sectors. The workshop also discussed challenges and suggestions from the perspectives of employers and employees, led by Assist. Prof. Ruttiya Bhula-Or, College of Population Studies and the head of CU-ColLaR. Group discussions were also held to revisit policy and legal measures to promote employment of older people.



Collaboration on human resource development for digital, design and advancement of social infrastructure in Thailand

On 6 February 2020, **Chula Unisearch**, Chulalongkorn University signed an MOU with Hitachi Ltd., Hitachi Asia Co., Ltd., and Hitachi Asia (Thailand) Co., Ltd. to collaborate on a human resource development project for digital transformation, design and Thailand's social structure analysis. At the signing ceremony, held at the Crowne Plaza Hotel, Bangkok, Supichai Tangjaitrong, Ph.D., Managing Director of Chula Unisearch and Assist. Prof. Chairat Wiwatwarrapan, Deputy Managing Director represented **Chula Unisearch**; Hitachi was represented by Mr. Yoshito Kodama, Managing Director, Hitachi Asia (Thailand) Co., Ltd., and Mr. Akira Fujibayashi, General Manager of R&D Center, Hitachi Asia Co., Ltd.

The MOU will contribute to Thailand's preparations to meet new challenges in the digital age and increase its resilience to an increasingly unpredictable global market. As the country navigates numerous cultural, economic, technological and infrastructural changes, it is especially crucial to collaborate to develop practical guidelines to succeed in our increasingly digital world.



Chulalongkorn University and NSTDA Agree on Innovation and Technology Assistance Program (ITAP)

On Tuesday 10 March 2020, a signing ceremony took place at Meeting Room 201, Chulalongkorn Research Building, Chulalongkorn University to mark a collaboration agreement between **Chula Unisearch** and the Innovation and Technology Assistance Program (ITAP) under the National Science & Technology Development Agency (NSTDA).

Chulalongkorn University President, Prof. Bundhit Eua-arporn, Ph.D., and NSTDA President, Narong Sirilertworakul, Ph.D., signed the agreement to collaborate to promote adoption of advanced technologies to boost the performance and competitiveness of Thai SMEs on the path of becoming a knowledge-based economy. **Chula Unisearch** will serve as a network for support ITAP in establishing multi-disciplinary collaborations. On this occasion, Supichai Tangjaitrong, Ph.D., Managing Director of Chula Unisearch, Assoc. Prof. Prasert Reubroycharoen, Ph.D., Network Manager of ITAP from Chulalongkorn University and Mr. Chalermopol Tuchinda, Director of ITAP from NSTDA delivered presentations at the event.



Paying Respect to the Two Kings Monument

Directors and staff from **Chula Unisearch** paid respect to the Two Kings Monument on the occasion of the inauguration of the new Managing Director's team. All team members solemnly swore an oath to fulfil their duty loyally and following the founding fathers' footsteps for the prosperity of Chulalongkorn University.



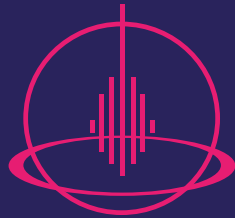
The 34th Anniversary of Chula Unisearch

On Friday 14 February 2020, a celebration was held at **Chula Unisearch** to celebrate its 34th Anniversary at Meeting Room 201, Chulalongkorn Research Building, Chulalongkorn University. The Chairperson of the Chulalongkorn University Council, President of Chulalongkorn University, along with CU executives, joined in this auspicious celebration. On this occasion, **Chula Unisearch** also held an alms-offering ceremony to bless the organisation and its future prosperity.

Together We Work from Home #Stay Home, Stop the Spread for the Nation

During the COVID-19 pandemic, **Chula Unisearch** followed the government's policy to "*Stay Home, Stop the Spread for the Nation*" by closing its doors temporarily from 25 March to 30 April 2020, allowing staff to work from home and continue with their responsibilities effectively.





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