

International Paper Presentations (Break out room 3)

Environment Arrangement by Treatment Processing Agriculture Product by Thermochemical Process

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Abstract

Chachoengsao has most industrial drop is mango and coconut. Then many processing agriculture has done and left many waste that is fermented mango peels and coconut shell. With many processing agricultures of them. Then a lot of waste that hard to deplete is an environment pollution. It very interesting to bring process agriculture waste from Chachoengsao, fermented mango peels and coconut shell to treat them as biomass by gasification process. Study their potential and possibly to used them as a renewable energy. Using thermochemical process by gasification. From result has found. Both has potential to use as renewable energy. Biomass gas production of coconut shell and fermented mango peels are 11min/ kg and 5 min/ kg respectively. Then both processing agriculture wastes can be used as a fuel after treat with thermochemical process. This will help reduce energy cost of community and improve environment pollution.

Keywords: Torrefaction, Gasification, Coconut Shell, Mango Peels

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Introduction

In present Thailand was confront a problem about energy. Then renewable energy was interested. Especially an agriculturalist population. The waste from agriculture process can used as a renewable energy. (Department of Alternative Energy Development and Efficiency, 2015). Data from department of alternative energy development and efficiency in 2009 has found biomass from agriculture waste that has potential to use as fuel is sugarcane, soybean, corn, palm, cassava, coconut, and rubber tree. In 2009 waste from agriculture is 146 MT but can used as biomass only 60 MT (504,339.4 TJ). This mean still has a lot of waste that could not bring to use as renewable energy. Most of waste was used as a fertilizer. But if it cannot use as a fertilizer that waste will make pollution for those community and will bring more sanitation problems. (Department of Alternative Energy Development and Efficiency, 2015).

Chachoengsao has area 5,351,000,000 m² own by agriculturist is 3,422,835,200 m². The most industrial drop is mango and coconut. Then many processing agriculture has done and left many waste that is fermented mango peels and coconut shell. In case of fermented mango peels. Because it was fermented then it hard to degradation natural. Both fermented mango peel and coconut shell has waste in one day too many until cannot deplete all of them in one day. Therefore, treatment both waste as a biomass by thermochemical process will help eliminate them effectively. Both may have potential to be a renewable energy after treat with thermochemical process.

Thermochemical process is transformation of biomass to small particles for comfort using and stores them. Prabir Basu. (2018). Gasification is thermochemical process that have purpose to produced biomass gas that have hydrogen and carbon dioxide as a component. This process was operated in temperature range higher than pyrolysis process and need some oxygen in process.

Journalist has interested to bring process agriculture waste from Chachoengsao, fermented mango peels and coconut shell to treat them as biomass by gasification process. Study their potential and possibly to used them as a renewable energy. This will deplete community waste that will make pollution, reduce margin cost of processing agriculture too.

Methodology

Sample

Sample in this paper is fermented mango peels and coconut shell from processing agriculture wastes in Chachoengsao. Fermented mango peel is wastes from Naranchala farm. Coconut shell is waste from farm in Bangkla district. They were used to prepare biomass briquette. The process is drying sample in oven with 103°C for 24 hours to get rid of the water in biomass. Then biomass was chopped by rough pulverize machine and fine pulverize machine. The particles of biomass were reduced to 1 – 5 mm. final process biomass will send to densification process to make biomass briquette. Biomass briquette has 25.4 mm. diameter and 30 mm. length. Biomass briquette was stored in desiccator to store the sample for this experiment. The rough pulverize machine, the fine pulverize machine and biomass briquette has show in figure 1, 2 and 3 respectively.



Figure 1 Rough pulverize Machine



Figure 2 Fine Pulverize Machine



Figure 3 Biomass Briquette

Reactors

This paper use reactors for treatment biomass. The reactor was used is gasification reactor small scale that used for both biomass in experiment. Capacity of reactor is 1 kg.



Figure 4 Gasification Reactor

The experiment was begun with fill the reactor by biomass. Gasification process will operate to find rate of biomass production generate. Each biomass fill reactor has weight 1 kg.

Result and discussion

From result of experiment processing agriculture waste by gasification process. Fermented mango peels can not go on stable operate with gasification. The process can continue only 5 mins and the biomass briquettes are not deplete from gasification reactor. In case of coconut shell the process can operate completely till biomass deplete from gasification reactor. Biomass gas production of coconut shell is 11min/kg. as show in figure 5

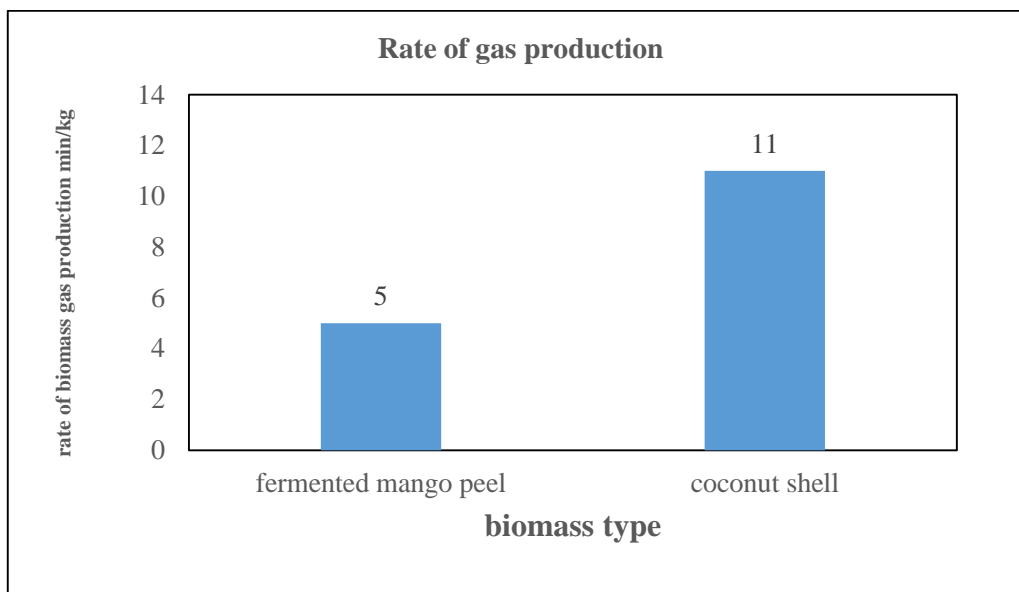


Figure 5 Rate of Production Gas

From result noticed fermented mango peels cannot treat with gasification process because process was not stable. Gasification process cannot complete till biomass briquette depleted. But fermented mango peels can treat with torrefaction process and the product char can used as a renewable energy. High heating value (HHV) is dependent on condition of torrefaction process as show in table 1

Table 1: HHV of fermented mango peels torrefied (Sanphasit C., 2021)

Torrefaction time (hours)	HHV per temperature condition kcal/kg		
	220 °C	250 °C	280 °C
1	4009.65	4162.25	4220.35
1.5	4027.15	4237.90	4716.00
2	4142.40	4475.95	4763.25

From table 1 fermented mango peel also can use as a fuel even it cannot use with gasification reactor. But torrefaction process can improve biomass properties of fermented mango peel to char. Then both processing agriculture wastes has potential to be a fuel for process agriculture.

From experiment result has shown both wastes can improve by thermochemical process. The fuel after treat can be used both in gas and char. Then elimination wastes by transform to renewable fuel is suitable for reduces wastes, environment conservation and can stimulate community to use renewable energy too.

Conclusion

From result have found it possible to use processing agriculture wastes as renewable energy. Both fermented mango peels and coconut shell has potential to use as a fuel to reduce cost of processing production. But fermented mango peel briquette cannot use as a fuel for gasification reactor. During experiment has found the gasification process cannot operate stable with fermented mango peels biomass. The process will stop after 4-5 mins after biomass gas has generate and the fuel briquettes are not completely used. But fermented mango peels briquette has potential to used as char with combustion as show in table 1 (Sanphasit C., 2021). even HHV of fermented mango peels is lower than LPG 3 time Thaigasifier. (n.d.).

Coconut shell pellet can use as fuel with gasification reactor. Biomass gas can generate 11 min/ kg. Then both processing agriculture wastes can be use as a fuel after treat with thermochemical process. This will help reduce energy cost of community and improve environment pollution.

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The Development of Carbon Credit Management Platform in Supply Chain by using Geographic Information System

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Abstract

Based on Paris Agreement to reduce carbon credits and plan to reduce greenhouse gas emissions to net zero by 2065, Thailand has developed plan. The national strategy that set up in the 12th National Economic and Social Development Plan. Carbon credit is one of favorite subject. This research focuses on the improve carbon credit management in supply chain and developed platform that can be used for management. Including adding new opportunities of carbon credit business in which currently has not developed platform of this business yet.

Keywords: Carbon Credit, Carbon Credit Management Platform, Geographic Information System

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Introduction

Today's global warming creates a rapidly changing climate, causing global temperatures to rise rapidly and polar ice caps to melt faster than scientists have predicted for years. It is a factor affecting sea level rise and causing inclement weather throughout the world, such as the El Nino phenomenon or the La Nina phenomenon which caused floods, storms, and disasters in volumes that are increasing faster than expected and in increasing severity. One of the main reasons is the emissions of various industrial sectors. In each country, the volume is increasing steadily throughout the past 100 years that the world entered the industrial age. The carbon dioxide released into the atmosphere gathers in the Earth's atmosphere, creating a greenhouse effect that makes the earth's atmosphere slimmer. As a result, the sunlight that passes through the earth has increased strength and heat as well. (National Geographic, 2019)

The greenhouse effect is an important issue for all countries, then an international agreement known as the Paris Agreement is created. The agreement is under the United Nations Framework Convention on Climate Change aimed to reduce carbon emissions from 2020 onwards. Thailand is a member of the Paris Agreement which joined the agreement on 12 December 2015. The goal is to reduce the world's greenhouse gases by controlling the global temperature, not over 2 degrees Celsius (currently, the goal in 2020 has been moved down to 1.5 degrees Celsius). In the agreement, Thailand's goal is to reduce greenhouse gas by 7-20 percent in 2020 and lower than normal levels by 20-25 percent in 2030. (United Nations Climate Change, 2015) Regarding the Paris Agreement, Thailand prepares to reduce carbon dioxide to achieve the goals and to increase trade competition including an increasing trade barrier, referring to the value of carbon dioxide in international trade negotiations for a variety of products according to the World Sustainable Development Agenda in 2030. Consequently, the 12th National Economic and Social Development Plan has determined the carbon dioxide emissions value in Strategy 4 (Green Growth) and Goal 4 to increase the efficiency of greenhouse gas reduction and adaptability to climate change to prepare for the implementation of the strategy, which was set up according to the time frame by started to collect carbon dioxide emissions data of Thailand in 2016. (Office of the National Economic and Social Development Council, 2017)

The carbon dioxide emissions rate in Thailand has been measured since 2016 or over the past 4 years. The amount of carbon dioxide emissions, the rate was slightly lower in 2019, a roughly 4.9% drop from 2018. It is too far from the goals in the Paris Agreement intended to reduce it, that also

below the normal level of 7-20% in 2020. Therefore, the government sector should accelerate the implementation of measures to achieve its goals and support relevant information as it is a new case study in Thailand and many sectors do not concern about the importance and benefit of reducing carbon dioxide emissions including a different method of operation that has many steps involved. The goal is to reduce the rate of carbon dioxide emissions because carbon dioxide gas is not tangible. Consequently, tools must be used to measure the carbon footprint, which is the value used to measure the rate of carbon dioxide emissions that are greater or less from the birth of things to the end of life (Youmatter, 2020). There is a global standard configuration called the carbon credit, this is the reference value for reducing the amount of greenhouse gas of various agencies. The values that are much or less vary by product, business, or country. As a result, there is a need to buy and sell carbon credit. Thus, the carbon market has been created for the business's benefit in terms of both product and competition. Recently, many countries have had more conditions regarding carbon footprint causing various agency projects in reducing the carbon credit bill in many forms to meet the needs of the carbon market. However, there is not enough to meet the demands that are constantly increasing. (Youmatter, 2020)

The most important thing is carbon credit which is a tradable commodity and can be used to offset the buyer's greenhouse gas emissions. The carbon market is divided into compulsory and voluntary carbon markets and the government agency arising under the Royal Decree establishing the Greenhouse Gas Management Organization (Public Organization) B.E.2550 (2007) has to supervise, control, and educate various departments, but is not widely known in the past as the limited budget that makes various public relations not generally accessible to the agency. (Greenhouse Gas Management Organization, 2020). Currently, the company has started to become aware and interested in reducing its carbon footprint but most of them are a few large companies in Thailand such as oil companies, electricity companies, cement companies, etc. by reducing the carbon footprint of the production process and the value of carbon credit is reduced. Each company has reduced the value of carbon credit but it is private information that could not be shared with other companies in the supply chain. Some businesses such as cement, oil, cars, etc. have a long supply chain (upstream – midstream – downstream), and the different values of carbon credit, then the carbon credit management in the supply chain is not efficient.

There is no platform for the carbon credit management of companies in the supply chain, it can be used as a guideline for carbon credit management which is not limited to the big companies by disseminating knowledge to various business sectors and can be implemented in many ways. The carbon credit management platform is used to help the company in the supply chain to know

the value of carbon credit and manage the carbon credit. The company can decide on selecting another company that has lower carbon credit to join the business to reduce the carbon credit in the supply chain and increase the competitive advantage in the business. Furthermore, the carbon credit consumers, clarity, standards of qualifications, and procedures must be established for entering this business and increasing the use of the carbon credit management system. There is an agency that provides accurate knowledge and advice to expand the carbon credit market, support the operational management, and a higher valued product according to the principle of demand-supply. As the carbon credit market is a newcomer with few rivals, there is an opportunity for businesses.

Considering the benefits that will be gained from the development of the carbon credit management system, it was found that the financial factor is the important factor in motivating to join the business based on the short-term goal of reducing the carbon footprint by 7-20 percent under the Paris Agreement in 2020 but all countries have not been able to achieve that goal. Additionally, there is a new goal to be a world without a carbon footprint (Race to Zero) in the next 50 years (United Nations Climate Change, 2020), and all countries have to be more intense and serious measures. The initial calculation of the carbon credit market value by considering the carbon dioxide emissions in Thailand in 2019, which emitted about 250 million tons of carbon dioxide, carbon dioxide and the market reference price of carbon credit was 600 baht per ton. It can be seen that the initial value is approximately 150,000 million baht per year according to the goal set (The Greenhouse Gas Management Organization, 2019). Currently, the above-mentioned carbon credit is a number collected from some measurable activities, but it is not showing other carbon credits that have not been studied yet.

However, carbon credit is not the only domestic market it can also be expanded into a global market that is globally demanded, especially in countries with a large demand for carbon credit such as China, America, India, etc. whereas the country emits much carbon footprint. It can be assumed that the market is large, and the value is unlimited. On the financial side, it could be another opportunity for Thailand to earn more income from trading carbon credit as a seller country of carbon credit in terms of Thailand being an agricultural country and not a major industrial country. The government realizes the importance of carbon credit and aims to achieve the goals agreed upon in the Paris Agreement. Furthermore, adding tax-deductible benefits to companies can reduce their carbon footprint, and providing additional tax deduction benefits to different companies can reduce the carbon footprint. The company can be used as a tax deduction under the Royal Decree on Tax Exemption (No. 514) B.E.2554 (2011) in reducing the carbon credit as an incentive for

companies to more participating in the carbon credit market. The aim of this is the exemption of income tax on the company's net profit, especially for different projects involved in reducing the carbon credit as an incentive for companies to join the carbon credit market and it is the benefit of reducing the company's carbon credit (The Revenue Department, 2011).

On the other hand, indirect benefits that gain from the trading of carbon credit are cost reductions from where the company can reduce carbon credit. There are many reduction models in carbon credit that represent a company's responsibility for its carbon footprint under the agreement that has been made. The company can be used to publicize agencies and reduce the gap in international trade barriers for certain products. The reduction of carbon footprint has to be done through projects that affect the carbon credit, such as a tree-planting scheme that can be sold for carbon credit. There is an increasing demand for carbon credit then there is a need for more tree replacement projects resulting in a positive effect on the environment as well. Therefore, this is an indirect benefit that can be gained from carbon credit trading. Recently, there are limitations in terms of both knowledge and understanding of carbon credit management in the supply chain in Thailand and the companies have not considered the importance of managing and reducing carbon credit. Therefore, it is necessary to set up a management system for managing the supply chain more conveniently and quickly as well as it can benefit the business of various agencies. The system must be effective in response to the needs of management and an incentive to enter the carbon credit business.

From the above-mentioned, this research focuses on carbon credit management to support the national strategy set up in the 12th National Economic and Social Development Plan to improve carbon credit management in the supply chain and opportunities for future carbon credit businesses with the demands in both domestic and global markets. And proposing the carbon credit management platform in supply chain management. The development of the carbon credit management platform that can be used as a convenient, fast, and accurate for management including adding new opportunities for carbon credit business operations in Thailand which currently has not developed a system for this type of business yet. A Geographic Information System (GIS) is used as a tool for presenting information in modern and clear applications to increase the performance of the system.

Research Objectives

- 1) To study the factors affecting carbon credit supply chain management in the supply chain.
- 2) To develop the carbon credit management platform in the supply chain.
- 3) To evaluate the efficiency of factors and the carbon credit management platform in the supply chain.
- 4) To evaluate the effectiveness of the carbon credit management platform in the supply chain.

Literature Review

Carbon credit theory

Carbon credit definition

A carbon credit is a permit that allows the company that holds it to emit a certain amount of carbon dioxide or other greenhouse gases. One credit permits the emission of a mass equal to one ton of carbon dioxide. The carbon credit is one half of a so-called "cap-and-trade" program. Companies that pollute are awarded credits that allow them to continue to pollute up to a certain limit. That limit is reduced periodically. Meanwhile, the company may sell any unneeded credits to another company that needs them. Private companies are thus doubly incentivized to reduce greenhouse emissions. First, they will be fined if they exceed the cap. Second, they can make money by saving and reselling some of their emissions allowances. (Will Kenton, 2020).

A carbon credit represents the right to emit a measured amount of GHG. Carbon credits work as a certification that business or individual owning them is counterbalancing the emission of greenhouse gases (GHG). In this way, the system of carbon credits works as a compensation method assuring a balance between GHG emissions and the respective amounts of certified mitigations. The ultimate purpose of carbon credits is, therefore, to reduce the emission of GHG into the atmosphere. In other words, carbon credits are exchanged in a carbon market, commonly referred to as the cap-and-trade market, where businesses can sell each other's rights to pollute. (YouMatter, 2020)

Carbon credit market

A market in which we trade carbons as products. There are two major types of carbon in the market;(1) “Carbon Credit” that is amount of GHG emission reduction from the projects and/or (2) “GHG Emission Allowance” that organizations can reduce lower than their allocated allowances under the Emissions Trading System. In this market, carbon can be tradable as offset for GHG emissions of the buyers. (Greenhouse Gas Management Organization, 2020) At present, Carbon Market around the World could be divided into two types:

- **Mandatory Carbon Market:** the markets have been trading of carbon credits and GHG emissions allowances. The credits/allowances can be used to offset GHG emissions for achieving GHG emissions reduction with legally binding or in line with the international commitment. For example, Carbon Markets under the Kyoto Protocol as follows.

- **Voluntary Carbon Market:** the market that built up without legal enforcement. The markets are usually set up by voluntary cooperation in private sector in order to cope with Climate Change. Participants in the market may have targets of voluntary cap-and-trade for GHG emissions reduction with Non-legally binding target and conduct buying or selling the carbon credits and GHG emission allowances for offsetting their emissions.

The Carbon Market could be classified by geographical boundaries to two levels as

- **Domestic Carbon Mechanism:** the market mechanism has been trading of carbon credits and/or GHG emissions allowances between people or organizations in the country. The market could be mandatory market or voluntary market. For Thailand, Thailand Greenhouse Gas Management Organization (Public Organization) or TGO has developed Thailand Voluntary Emissions Reduction (T-VER) program since 2014 with objective to support all relevant sectors, in particular for small project developers, to participate in the domestic voluntary GHG emissions. T-VER has simplified process and lower costs compared to the CDM project. Moreover, it has co-benefits of GHG emissions reduction, such as, reduce pollutions; increase shading and green areas; reduce consumption of energy and electricity; support community economy; and generate employment in environmentally friendly business, etc.

- **International Carbon Mechanism:** the market has been trading of carbon credits and/or GHG emissions allowances across the country. Main objective of this is to minimize costs of GHG emissions reduction in case the buyer country has higher costs than that of the seller country. Samples of the international markets include.

- **European Emissions Trading Scheme:** EU ETS is trading of carbon credits and/or GHG emissions allowances of the member countries in the EU and participating countries in the EU ETS totally 28 countries.

- **Linkage of Emissions Trading Scheme:** ETS is trading of California, USA. And Ontario and Quebec, Canada that allows participants in energy sector of these states, where emissions reduction is legally binding, could buy GHG allowance from others to offset their GHG emissions.

Supply Chain theory

Supply Chain Definitions

A supply chain is a network between a company and its suppliers to produce and distribute a specific product to the final buyer. This network includes different activities, people, entities, information, and resources. The supply chain also represents the steps it takes to get the product or service from its original state to the customer. Companies develop supply chains so they can reduce their costs and remain competitive in the business landscape. Supply chain management is a crucial process because an optimized supply chain results in lower costs and a faster production cycle. (Will Kenton, 2020).

Supply Chain Management Definitions

Supply chain management (SCM) is the optimization of a product's creation and flow from raw material sourcing to production, logistics and delivery to the final customer. SCM encompasses the integrated planning and execution of processes required to manage the movement of materials, information and financial capital in activities that broadly include demand planning, sourcing, production, inventory management and storage, transportation -- or logistics -- and returning excess or defective products. Supply chain management relies on both business strategy, specialized software and collaboration to work.

Because it's such an expansive, complex undertaking, each partner -- from suppliers to manufacturers and beyond -- must communicate and work together to create efficiencies, manage risk and adapt quickly to change. In addition, supply chain sustainability -- which covers environmental, social and legal issues, in addition to sustainable procurement -- and the closely related concept of corporate social responsibility -- which evaluates a company's effect on the environment and social well-being -- are areas of major concern for today's companies.

Basic factor in Supply Chain Management

There is a basic pattern to the practice of supply chain management. Each supply chain has its own unique set of market demands and operating challenges and yet the issues remain essentially the same in every case. Companies in any supply chain must make decisions individually and collectively regarding their actions in five areas:

1. Production, what products does the market want? How much of which products should be produced and by when? This activity includes the creation of master production schedules that take into account plant capacities, workload balancing, quality control, and equipment maintenance.

2. Inventory, what inventory should be stocked at each stage in a supply chain? How much inventory should be held as raw materials, semifinished, or finished goods? The primary purpose of inventory is to act as a buffer against uncertainty in the supply chain. However, holding inventory can be expensive, so what are the optimal inventory levels and reorder points?

3. Location, where should facilities for production and inventory storage be located? Where are the most cost-efficient locations for production and for storage of inventory? Should existing facilities be used or new ones built? Once these decisions are made, they determine the possible paths available for product to flow through for delivery to the final consumer.

4. Transportation, how should inventory be moved from one supply chain location to another? Air freight and truck delivery are generally fast and reliable, but they are expensive. Shipping by sea or rail is much less expensive but usually involves longer transit times and more uncertainty. This uncertainty must be compensated for by stocking higher levels of inventory. When is it better to use which mode of transportation?

5. Information, how much data should be collected and how much information should be shared? Timely and accurate information holds the promise of better coordination and better decision making. With good information, people can make effective decisions about what to produce and how much, about where to locate inventory and how best to transport it.

Business Platform theory

Digital platform (Watanyoo Suksa-Ngiam, 2020)

The first means the infrastructure or a collection of products, services, tools and digital information to be used to create new products or services in a business is called vertical

integration. This type of integration is upstream to downstream integration such as tablet computers. We can take the CPU and memory to assemble and build a portable computer with both the CPU and the memory, a product in itself by being rebuilt into a portable computer. In terms of horizontal integration, it means that the product or service can be adapted to new markets, such as the transition from a laptop to a mobile phone. In the digital world, digital platforms will be used for both integrations. Even if the platform can be transformed into new products and services. Or easily adapt to new markets than competitors will have a competitive advantage.

Second meaning refers to the things that help create a network effect means that the more people use digital platforms. Will result in lower costs per user and the benefits to users increase. For example if the number of Facebook users increases, the cost per user will decrease. And users will be more likely to use Facebook because they can communicate with many other users. Like a phone if a person can talk to others more, The benefits of users will increase accordingly. Academically this is called direct network effects. In addition, some digital platforms also cause indirect network effects. For example, if the number of Facebook users increases, marketers and marketers Ads will come to Facebook more as they help reach more customers.

Third meaning refers to things that can create multi-sided markets, multiple digital platforms, create multiple markets such as Amazon, create a market for buyers. Means selling products directly to consumers and also create a market for people who want to sell products. For example when we want to be a seller on Amazon, we have to pay a fee to Amazon. Another example is the Apple iPhone. Apple sells mobile phones to consumers as the first market, and Apple has a second market, Applications market in the App Store. Use can choose to install applications in their own mobile. Apple has a share of the sales of applications, so many markets tend to correlate with network impact. And many of these markets will create the so-called digital ecosystem, where digital platforms are the infrastructure of digital ecosystems.

Digital platforms are therefore creating a monopoly. Because of the impact of multiple networks and markets, superior companies dominate almost all industries. The US E-Commerce industry is dominated by Amazon, or Facebook-dominated social media, so governments in many countries, especially the European Union, are trying to adopt antitrust measures to regulate these digital platforms. Not to monopolize trade in addition, some countries offer digital tax to block monopolies and expand digital platforms.

Digital platforms are something Thai businesses still lack. In the modern business world, it is not focused on creating products and services. Instead, it will focus on building a digital platform. Digital platforms without borders in other words, digital platforms built in the United States can be delivered to Thailand and other countries around the world. If Thai businesses have to compete globally changing the concept of doing business is important. Otherwise, Thai businesses may be destroyed. (Disrupt) finally go like the Thai media industry That at one time used to make enormous profits and had both political and economic influence. But now it has been destroyed by Facebook, Netflix, YouTube and Spotify, so digital platforms are a different form of commerce in the modern world from the imports and exports we are used to.

Digital platforms are online businesses that facilitate commercial interactions between at least two different groups with one typically being suppliers and the other consumers. Airbnb, Amazon, BlaBlaCar, Deliveroo, Facebook, Google, TaskRabbit, Uber, and Xing are all platforms, but they have different business models and they interact with end users and other businesses in different ways. Consequently, each platform has created different rules to optimize these interactions. Some important distinctions are the degree to which a platform relies on advertising revenue versus fees, its rules for managing suppliers and content, and its relationship with consumers. (Information Technology & Innovation Foundation, 2018).

Geographic Information System (GIS)

GIS is an information system designed to collect, store, analyze information of the area. Both the location and description of the characteristics of the area, as well as search and display information. Therefore, GIS is not just a map or a picture. Rather, it is a database which collects information related to the area.

A database in a geographic information system consists of two databases:

1. Spatial database or a visual database (Spatial or Graphic Database) is a database of positional characteristics or symbols of objects, areas or phenomena of nature that appear on the earth's area. Spatial databases have two types of data structures:

- Raster data structure is represented as a uniform grid. It is usually a square grid. First time saying each grid, which references a position in rows and columns, contains a number representing the type or data value that identifies the property of interest.

- Vector data structures use to store positional coordinates (x, y) instead of the map feature (map feature), such as point, line and area. They are mostly used for intermittent spatial information such as streams, roads, etc.

2. Attribute Database

- A relational database is a database that describes the nature or properties of geospatial data, storing both qualitative and numerical relevant data in a variety of database management systems such as dBase, Oracle, Sybase, and Microsoft Access. This database management system manages and processes data that characterizes spatial data. Linking spatial data with relational data is done using Common Key Code.

Conceptual Framework

All related documents and thesis are reviewed. The supply-chain, price and agency have important element of carbon credit. Therefore, this research focused on improve carbon credit management in supply chain to start the carbon credit business. Then related documents and thesis are reviewed again about the factor of supply chain management. The 4 key importance factor of carbon credit management in supply chain is connectivity, co-operation, co-ordination and information transparency. After that developed pilot carbon credit management platform for managing carbon credit. Adopted an online platform as a tool for managing carbon credit. Management Information System (MIS) used to collect data about carbon credit information along with carbon credit history. By applying Geographic Information System (GIS) to display the information on a map for the modern and clarity of the information location. After that, pilot carbon credit management platform is trial by sample and debug platform from any comment and suggestion. Finally, evaluated the carbon credit management platform for the efficiency and effectiveness of the platform. A conceptual framework for this research showing as follows.

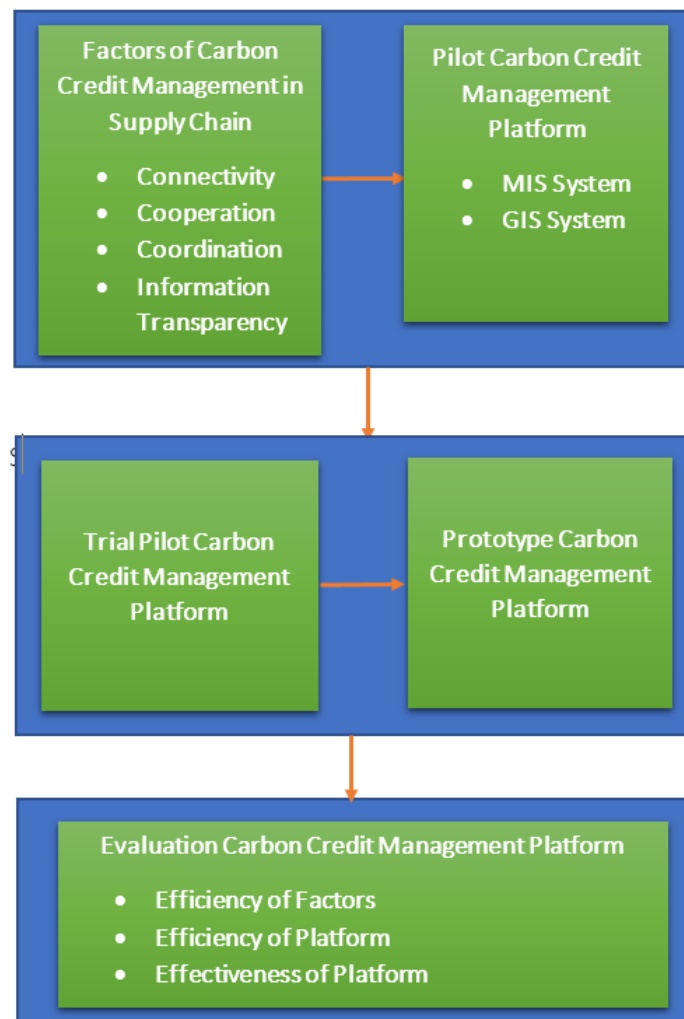


Figure 1 Conceptual Framework

Research Methodology

This Research studies “The Development of Carbon Credit Management Platform in Supply Chain by using Geographic Information System”. Research and Development (R&D) is method to be developed a business platform for carbon credit management in supply chain to use as a platform. This research divided into 2 phases: Phase 1 study factor of carbon credit management in supply chain and develop pilot carbon credit management platform, Phase 2 trial, debug and evaluate the efficiency and effectiveness of carbon credit management platform.

Research Sample

The samples group in this research is selected by specific selection, there are 21 people divided into 3 groups as follows. (7 carbon credit specialists, 7 policymakers carbon credit in Thailand, 7 business-related persons)

Flowchart Methodology

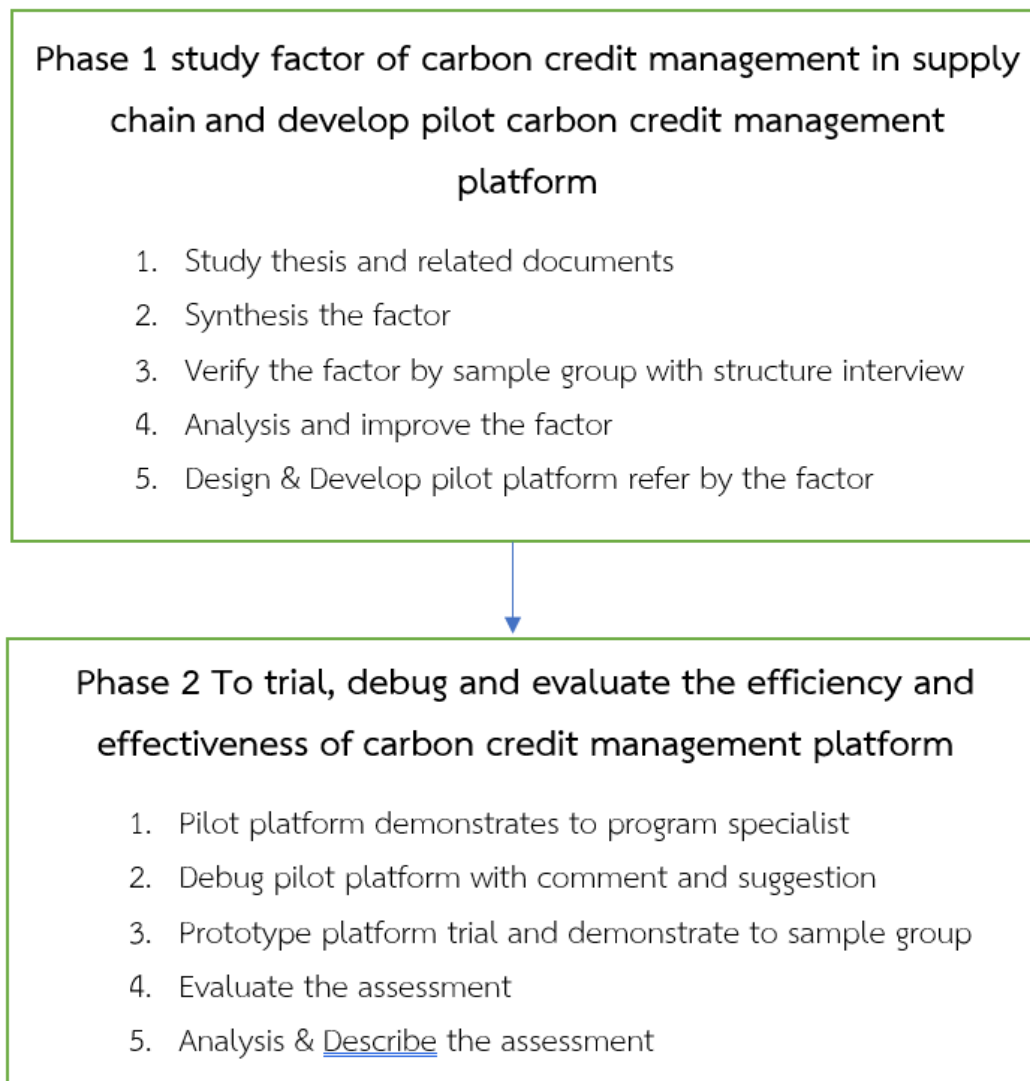


Figure 2 Flowchart Methodology

Results of the Study

This research studies "The Development of Carbon Credit Management Platform in Supply Chain by using Geographic Information System". Research and Development (R&D) is method to be developed a business platform for carbon credit management in supply chain to use as a platform. This research divided into 2 phases: Phase 1 study factor of carbon credit management in supply chain and develop pilot carbon credit management platform, Phase 2 trial, debug and evaluate the efficiency and effectiveness of carbon credit management platform.

Phase 1 study factor of carbon credit management in supply chain and develop pilot carbon credit management platform.

All relation documents and thesis are studied about factor of carbon credit management in supply chain. Based on data from the Greenhouse Gas Management Organization (Public Organization). Various information from the documents are summarize. The factor of carbon credit management in supply chain are analyzed and defined into fundamental factors as follows.

Result fundamental factors from study

Connectivity refers to all unit in carbon credit supply chain (Seller, Buyer and Regulator) can communicate and show information together.

Co-Operation refers to all unit in carbon credit supply chain (Seller, Buyer and Regulator) can join and share information to make business together.

Co-Ordination refers to inside each organization can use and exchange information between each division.

Information Transparency refers to real value of carbon credit from each organization and approve information by regulator.

Develop pilot carbon credit management platform



Figure 3 Develop pilot carbon credit management platform

This screen show main form of Pilot Carbon Credit Management platform. Center of screen show name and developer of this platform. This platform have menu bar to run each function. The researcher developed pilot carbon credit management platform and testing program complete.

Phase 2 Trial, debug and evaluate the efficiency and effectiveness of carbon credit management platform

Table 1: Efficiency of factor on carbon credit management platform

Topic	X	S.D.	Effective	Ranking
1. Connectivity	5.00	0.00	Most effective	1
2. Co-Operation	3.87	0.33	Very effective	3
3. Co-Ordination	3.33	0.46	Very effective	4
4. Information Transparency	4.8	0.39	Most effective	2

Table 2: Efficiency of carbon credit management platform

Topic	X	S.D.	Effective
1. User Interface (Design, Font, Color)	4.33	0.46	Most effective
2. Easy to use	3.87	0.32	Very effective
3. Company System	4.33	0.46	Most effective
4. Trade System	4.60	0.47	Most effective
5. GIS System	4.93	0.24	Most effective
6. Speed of System	4.53	0.48	Most effective
7. Implement Program	3.93	0.43	Very effective

Table 3: Effectiveness of carbon credit management platform

Topic	X	S.D.	Effective	Ranking
1. Implement platform to trading carbon credit	3.93	0.55	Very effective	3
2. Benefit about Buyer	3.73	0.43	Very effective	6
3. Benefit about Seller	3.73	0.43	Very effective	7
4. Benefit about Regulator	3.93	0.24	Very effective	4
5. Benefit about Tax	3.86	0.33	Very effective	5
6. Increase competition in business	3.53	0.47	Very effective	8
7. Increase value of carbon credit	4.13	0.33	Most effective	2
8. Opportunities for new business about carbon credit.	4.73	0.43	Most effective	1

Conclusion, discussion, and recommendation

Conclusion

Study the factors of carbon credit management in supply chain, for the most opinion on the factors affecting carbon credit management in supply chain differed by interviewees in different processes, such as policymaker focus on the factors that direct effect on policy. Carbon credit specialists focus on management processes and want to be most efficient for supply chain. Business-related focus on confident of information because affecting business competition. All of the opinions are consistent with fundamental factors that research is study (Connectivity, Co-Operation, Co-Ordination, and Information Transparency). That direct affect carbon credit management in supply chain. But each factor is weighted differently.

Develop carbon credit management platform, for implement carbon credit management platform in supply chain, everyone agreed that must have the platform that is central standard and providing services for various benefits together. Due to the large number of relevant departments and business organizations with the growing number every year, there need the platform to link all related carbon credit information. Center organizations that come to manage information from whole country which has opinions for government agencies to create a common standard platform. On platform, should have designed and developed that is modern and responsive to the factors of carbon credit management in supply chain, using new technology that is suitable, modern and efficient compared to the investment in development. The opinions from program experts is totally agreement, the platform can use for carbon credit management in supply chain. But concern about how to implement a platform that focuses on the effectiveness of the platform.

Evaluate the efficiency of factors and carbon credit management platform, after trial and debug carbon credit management platform, Efficiency of factor carbon credit management platform is most effective ($\bar{x}=4.25$). Which corresponds to fundamental factors and ranking. First Rank is Connectivity, Information Transparency, Co-Operation and last ranking is Co-Ordination. Efficiency of carbon credit management platform is most effective ($\bar{x}=4.36$), Everyone agreed that the platform must have more function to manage carbon credit in supply chain. Which corresponds to the result of study. First Rank is GIS System, Trade System, Speed of system, User Interface (Design, Font, Color), Implement Program and Last Ranking is Easy to use.

Evaluate the effectiveness of carbon credit management platform, effectiveness of carbon credit management platform is very effective. ($\bar{x}=3.95$), everyone agreed that the platform effect to carbon credit management in supply chain. Organizations use this platform to manage carbon credit information for more opportunities for business and increase value added of carbon credit. Which corresponds to the result of study. First Rank is opportunities for new business about carbon credit is most effective, increase value of carbon credit is most effective, implement platform to trading carbon credit is very effective, benefit about regulator is very effective, benefit about tax is very effective, benefit about buyer is very effective, benefit about seller is very effective and Last Ranking is increase competition in business is very effective.

Discussion

Study the factors of carbon credit management in supply chain, from fundamental factors affected on carbon credit management in supply chain (Connectivity, Co-Operation, Co-Ordination,

Information Transparency). The results are consistent with the research that has been studied. Reference from “The 8 Rules of Successful Communication Logistics” such (Successful communication, Mobility, Individuality & Big Data and Connectivity & real time communication). But will differ in each sample due to the focus on different work systems. And have various factors that effect in carbon credit management supply chain.

Develop carbon credit management platform, from program evaluation standards use to create carbon credit management platform. Reference from System Process (Tongkaw, S, 2017) have 6 procedure (System Design, Analysis, Development, Test, Implement and Maintenance). By following the process step by step correctly, the platform is efficient and responds to each factor of carbon credit management in supply chain. But in this research not use real data (value of carbon credit) that results is not all correctly and need to more practice.

Evaluate the efficiency of factors and carbon credit management platform, the efficiency of the carbon credit management platform direct affects the carbon credit management in supply chain. Increasing efficiency in management should increase the variety of supply chain management factors. It also increases the platform's ability to work better. Doing more will increase management as well. In accordant with (Sezen, 2008) “The level of integration and information sharing are correlated with performance measures rather than with the supply chain design”

Evaluate the effectiveness of carbon credit management platform, the effectiveness of the carbon credit management platform will differ in each sample due to the focus on different work systems. The first ranking about effectiveness of carbon credit management platform is opportunities for new business about carbon credit, that in accordance with improve carbon credit management in supply chain. In accordant with (Cho, Lee, Ahn, & Hwang, 2012) “The role of information technologies is focused on improving the way companies manage their supply chains. Information technology consists of the tools used to gain awareness of information, analyze this information, and act on it to increase the performance of the supply chain.

Recommendation

Study the factors of carbon credit management in supply chain, there are many factors that affect carbon credit management in the supply chain. In this research, focused on the fundamental factors (Connectivity, Co-Operation, Co-Ordination, Information Transparency), then created pilot carbon credit management platform are developed to trial and use. In the future, the platform should be developed to support various factors. Increasing the efficiency of the platform and improve carbon credit management in the supply chain. Follow with the government's policy to

reduce amount of carbon credit and create new business opportunities. That will happen in the future.

Develop carbon credit management platform, the developed platform just a prototype of carbon credit management in supply chain. It has not been used in normal because carbon credit in Thailand is still new and not enough information to use for data management. But it is the starting point for carbon credit in supply chain management, which will bring more benefits in terms of carbon credit in Thailand. Therefore, the platform should be developed more function for support more system such as carbon credit market system.

Evaluate the efficiency of factors and carbon credit management platform, efficiency of factors on carbon credit management platform. In this research, focused on the fundamental factors (Connectivity, Co-Operation, Co-Ordination, Information Transparency). Which have different levels of efficiency depending on each unit business. In order to increase efficiency, additional factors should be added to cover more functions.

Evaluate the effectiveness of carbon credit management platform, In this research focus on sample that relate about carbon credit in 3 groups (buyers, sellers and regulator) only. After more debug and launch platform to use as public platform. Trial carbon credit management platform to more sample include quality and quantity. And use real value of carbon credit to trail. After that the carbon credit management platform have more efficiency and effectiveness.

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Study on the Influence Factors of Customer Satisfaction in the Street Food Restaurant in Asia

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Abstract

There is a long history of street food. Currently, every day, almost 2.5 billion people purchase meals from street sellers. In many Asian towns, street food has assimilated into the local culture and cuisine. Roadside stands have changed with the times to become official, commercialized food markets as people's culinary preferences have expanded. The food and beverage business has, however, experienced a never-before-seen impact with the arrival of the epidemic era, from shopping centers to street sellers, both in terms of closure and turnover, which has continued to stagnate and even regress the traditional food and beverage economy. To revitalize the street food industry, this article focuses on the variables influencing customer satisfaction with street food now that the epidemic is gradually abating.

Keywords: Customer satisfaction, Asia, Street Food, Restaurant

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Research on the Construction of Social Media for User Cognition

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Abstract

In the information era, the volume of data generated by web users has dramatically increased, and advancements in information technology have led to rapid improvements in data storage technology, storage capacity, and network broadband-related technologies, making it possible to process and analyze large amounts of data. Additionally, algorithms for evaluating huge data have emerged. Through data collecting through social media, algorithms have begun to impact human civilization, and their unique mechanisms and many applications are beginning to shape how individuals perceive the world. This paper will consist of the four components listed below. The first step defines social media data and algorithms, the second section illustrates the extent to which social media data algorithms shape people's perceptions of the world through a detailed analysis of several mechanisms of algorithms with case studies, and the third section analyzes the understanding of the world by describing how people's perceptions of themselves and their perceptions of the outside world are both influenced by social media algorithms. The final section analyzes people's worldviews by describing how social media algorithms affect both their ideas of themselves and their perceptions of the outside world. This will illustrate that social media data and algorithms significantly influence people's worldviews.

Keywords: Big Data, Social Media, Algorithms, Mechanism

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Maximization of the Benefits of Monolingual Online Dictionaries to Underpin English Proficiency: Productive and Receptive Skills

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Abstract

As an efficacious usage of monolingual online dictionaries is a quantum leap for English proficiency, this study aims to examine Bangkok University students' use of monolingual online dictionaries and to inspect whether three independent variables (faculty, overseas study plan, and apprenticeship) affect the frequency of the use of monolingual online dictionaries. By means of the stratified random sampling technique based on the Taro Yamane Formula, three hundred and sixteen students from three faculties (Humanities and Tourism Management, Mass Communications, and Engineering) participated in this survey. Descriptive statistics and statistical tests such as mean, standard deviation, t-test, and one-way ANOVA (Welch test) were used to analyze the mean scores of the frequency of the use of online dictionaries. According to the findings, Bangkok university students use monolingual online dictionaries "moderately". The three most frequently used benefits are definitions and example sentences, pronunciation and intonation, and thesaurus. On the contrary, the three least used benefits are grammatical information, frequency, and CEFR-based word levels respectively. To maximize the benefits of monolingual online dictionaries, students should be aware of the frequency with which monolingual online dictionaries are used. The more they use monolingual online dictionaries, the better they become familiar with the features of online dictionaries in all aspects. Based on the research findings indicating that students use online dictionaries moderately, pedagogical

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implications for training online dictionaries usage are explicitly exemplified to help students refine their English proficiency (productive and receptive skills).

Keywords: Vocabulary Learning Strategy, Monolingual Online Dictionary Usage

Introduction

When the researcher first encountered the terms *ob-gyn; ob/gyn; OB-GYN* in a CNN news report, a series of questions emerged. What is the correct spelling, or are there any alternative forms? What do they mean? How are they pronounced? Are they abbreviations, if so, what are their full forms? Which words do they normally collocate with? Which words and a topic are related to these words? Are they specialized terms (register)? To obtain the answers, the researcher then turned to monolingual online dictionaries because the researcher agreed with Bamgbose (2021) & Nation (2008) proposing that we should keep a dictionary as our lingual best companion if we want to use English more proficiently. Based on four monolingual online dictionaries used in this study (Cambridge Online Dictionary (2022), Oxford Advanced Learner’s Online Dictionary (2022), Longman Online Dictionary (2022), and Collins Online English Dictionary (2022), here are the empirical answers: Four spelling variants are *ob-gyn; ob/gyn; OB-GYN; and ob-Gyn*. They are a countable noun. The plural form is *ob-gyns* applied to all four spelling variants. They mean (a) obstetrician-gynecologist: a doctor who specializes in pregnancy, birth, and diseases affecting women’s reproductive organs; and (b) the branches of medicine that deal with the birth of children (obstetrics) and the diseases of women (gynecology). A variant spelling of *gynecology* (US) is *gynaecology* (UK). They are abbreviations for (a) obstetrician-gynecologist, and (b) obstetrics-gynecology/ gynaecology. They are not specialized terms, yet their register is “*informal*” as shown:

ob-gyn noun [C] US **informal** (also OB/GYN, *ob/gyn*) from Cambridge dictionary online, and *ob/gy n* noun especially American English **informal** from Longman dictionary online.

The following variant pronunciations of this term were searched from four online dictionaries, as shown:

1. Cambridge Online Dictionary	<p>ob-gyn <i>noun</i> [C] US informal UK  /'əʊ.bi.dʒi.waɪ.en/ US  /'oʊ.bi.dʒi.waɪ.en/</p>
2. Oxford Advanced Learner’s Online Dictionary	<p>ob-gyn <i>noun</i>  /,ɒb 'gaɪn/  /,ɑːb 'gaɪn/</p>
3. Longman Online Dictionary	<p>ob/gyn /əʊbi: 'gaɪn \$ ɔu-/ <i>noun</i> especially American English informal  </p>
4. Collins Online English Dictionary	<p>ob/gyn Collins COBUILD (oʊ bi dʒi waɪ gn  ⓘ) also ob-gyn also Ob-Gyn also OB/GYN</p>

And, they normally collocate with the following words as shown in example sentences: *She works in the ob-gyn ward., Women see their ob-gyns on an annual basis. An ob-gyn will perform a gynecological exams., Women may have an ob-gyn for pap smears., An ob-gyn took care of a pregnant woman when she had labor pains., A couple had an infertility problem, so they saw an ob-gyn for IVF (in-vitro fertilization or a test-tube baby), Her ankles were placed on the stirrups or lithotomy stirrups during childbirth delivered by an ob-gyn.*

Apparently, taken for granted by the students, online dictionaries are not a source of words. Rather, they offer the profusion of benefits being attested by several educators (Schmitt, 2000; Nist and Simpson, 2001; Thornbury, 2002; Nation, 2008; Liu, 2014; Bamgbose, 2021) as being a treasure trove of informative English knowledge, a toolbox where you can find content-wise tools to fix your English proficiency and sculpt your language with idiomatic expressions and connotations, a troubleshooter or a vocabulary solver serving as course material, and the best companion in mastering English with unparalleled word knowledge resource.

However, to obtain astuteness in the empirical support and rationale as well as perspectives pertaining to aspects of online dictionary use, the researcher would like to elaborate on the following studies accordingly: Bamgbose (2021) discussed the major benefits or functions that the dictionary performs: to give proper spellings of words. Some dictionaries give variant spellings of words, such as the American and British variants. For instance, fulfil and fulfill depict British orthography and American orthography respectively, to give the appropriate syllable breakdown in a word. This breakdown is indicated with dots between the syllables. The knowledge of syllabification notifies us where to split the word at the end of the line when writing and typing, to help with pronunciation of words through the representation of words as sounds which is called transcription, and transcribed words are put between two slashes. Within this transcription, stress marks are deployed to show primary stress and secondary stress, to indicate the word class or a part of speech. A word can function more than one class, and this may affect the pronunciation of such word. For example, the word refuse is pronounced /rɪˈfjuːz/ as a verb and pronounced /ˈrefjuːs/ as a noun, to reveal the inflected forms of words which help us use words appropriately. The dictionary, for instance, discloses that the past tense and past participle of the word traffic is trafficked, to supply the etymology or the word origin. The knowledge of etymology serves as a guide on how the word evolved, to indicate a register as to whether a word is formal, informal, disapproving, vulgar, slang, or dialect, to provide synonyms and antonyms, and to supply the

idiomatic senses in which a word can be used, and its denotative and connotative meanings are provided. A denotative meaning is the literal meaning of a word while a connotative meaning refers to a figurative meaning. Bamgbose finally concluded that a dictionary is a critical communicative tool for everyone who wishes to use a language well. As a result, teachers should encourage students to use a dictionary effectively and properly.

Putting the benefits or features of a dictionary proposed by Bamgbose (2021) into practice, Schmitt (2000) considered the use of online dictionaries as being vocabulary learning strategy (VLS). He categorized them into two groups. To begin, strategies for the discovery of a new word's meaning comprise the use of a dictionary, pondering parts of speech, analyzing affixes and roots, guessing meaning from a context clue, and asking teachers and classmates for meanings, to name but a few. Second, strategies for consolidating a word once it has been encountered, consisting of imaging word form, using keyword method, grouping words together to study them, studying the spelling of a word, connecting the word to its synonyms and antonyms, associating the word with its coordinates, keeping a vocabulary notebook, and so forth. In brief, vocabulary learning strategies (VLS) are used to unlock the meanings of new words and retain them in memory. Hence, to use a dictionary which is regarded as one of the vocabulary learning strategies (VLS) can decode the meanings of new words and give rise to the memorability of the words as well.

With regard to the definitions written by a team of lexicographers of a dictionary, Nist and Simpson (2001) mentioned four characteristics good dictionary definitions should have: First, the definition does not contain another form of the word being defined. For example, defining regulator as one that regulates would give virtually no information about the meaning of the word. Such a definition would be very ineffective. Second, the definition provides examples, when necessary, so that readers can see proper usage of the word, particularly in situations in which it may be easy to misinterpret the stated definition. The definition of chronic is continuing for a long time especially of a disease or something bad, and it gives examples of correct context: chronic diseases, and a chronic shortage of teachers, which can extend dictionary understanding. Third, the definition uses precise language that has a high degree of explaining power. For example, the word archipelago is defined as a group of small islands with a clear example of *the Hawaiian archipelago*. Fourth, the definition is written in such a way that readers are not likely to substitute an incorrect synonyms for the word being defined.

Given a broader view of key skills involved in effective dictionary usage, Thornbury (2002) proposed that the students should be able: to recognize features of a dictionary layout, such as use of alphabetical order, headwords, grammar and pronunciation information, definitions, etc., to understand the way dictionary entries are coded- particularly the use of abbreviations, such as *adj* (adjective), *sth* (something), *conj* (conjunction), *derog* (derogatory), etc., and to cross-check the controversial English problems. For example, the students wrote the following two sentences and wanted to know which was correct. *a) He hopes not to vomit again. b) He hopes to not vomit again.* If they cross-check this grammar problem from several online dictionaries, they will find out that both sentences are grammatically correct, but the first one is more acceptable than the second one because to is followed by *infinitive* immediately in the first one whereas the second one contains a *split infinitive* in which *not* appears between to and *infinitive*, which is not widely acceptable. Thus, to be able to cross-check problematic English issues from different online dictionaries can help enhance the accuracy of the students' English. Lastly, to infer the spelling of an unfamiliar word from only having heard it, in order to check its meaning in the dictionary, using the feature of smart spelling or search suggestion.

Similarly, Nation (2008) treated a productive dictionary use as a strategy consisting of four steps: (1) to find the wanted word. (2) to check to see that the word is not old-fashioned, impolite, only used by children or to children, or if there is any other constraints on its use. (3) to work out the grammar and collocations of the word. This will be made easier if there are example sentences. (4) to check the spelling or pronunciation of the word just before using it. What's more, he stated that a good dictionary should contain the features or benefits as follows: (a) plenty of words, (b) clear understandable definitions using controlled defining vocabulary not more than 3,000 words, (c) many example sentences, (d) grammar information and collocations of the word, (e) pronunciation of the word, (f) the inflected and derived forms, (g) register or constraints on the use of the words, (h) frequency information, (i) related words and word parts.

Lastly, to be able to write English in a sophisticated and innovative way, Liu (2014) suggested three ways to use a dictionary to become a better writer. First, to replace a word with its definition. Let's see the definition of the word shiver: shiver (v) means to shake or tremble with cold, fear, or excitement. The students can use its definition to write a new sentence in an innovative way as: *Trembling with cold, I was taken to the hospital last night.* Second, to look up the example sentences. Example sentences in online dictionaries will

illustrate how to use targeted words and develop the students' world knowledge because they are taken from authentic and real-world sources such as newspapers, journals, websites, and so forth. For example, when the students look up the word *free radical* in a dictionary, what they see are (a) Definition: molecules produced in the body by tobacco smoke, toxins, or pollutants. (b) Example sentence: *Safeguarding skin from free radical damage, this moisturizer functioning as an antioxidant can reduce inflammation and minimize the appearance of fine lines and wrinkles.* By applying the definitions and example sentences of the word *free radical*, students can write new sentences accordingly: *This moisturizer can prevent the skin from free radicals which are caused by tobacco smoke, toxins, and pollutants. We should quit smoking because the smoke causes free radicals which are linked to fine lines and wrinkles on our skin. An antioxidant is an antidote to or a way of preventing free radicals.* Third, to use thesaurus sensibly by checking the definition of each and finding the exact meaning. Using a thesaurus correctly will add flavors to the students' writing assignments and make them more intriguing. However, they must know the nuances of synonyms and antonyms by checking the precise meaning from online dictionaries before using them. Let's consider the examples below to see how thesaurus helps students write more innovatively. If students look up the word *understand* in a thesaurus, they find *apprehend, realize, recognize, interpret, conceive, sense, figure out, be aware of*. To know which word to use, they should check the meaning of each in online dictionaries.

Let's try to figure out the difference between *apprehend, conceive, and interpret*.

Apprehend: To take hold of with understanding

Conceive: To form and generate in a mind

Interpret: To explain or tell the meaning of, to decipher

Each word is different and unique and replaces *understand* in a unique situation.

I can't understand this difficult concept. = I can't apprehend this difficult concept.

I understood the idea one day in my sleep. = I conceived the idea one day in my sleep.

I can't understand the meanings of his words. = I can't interpret the meanings of his words.

As far as the literature review is concerned, the following research is worth mentioning.

First and foremost, Jenpattarakul (2012) pointed out attributes good dictionaries should have. He surveyed the use frequency of online dictionaries of forty Thai undergraduates and found that they used the dictionaries moderately and that they had limitations in using grammar information provided in dictionaries, including grammar patterns and grammar

terminologies. In contrast, they enjoyed listening to audio pronunciation and reading real-life example sentences as they think that they can develop their vocabulary learning.

Another research was conducted in Ukraine by Pikinyak et al. (2020). They analyzed sixteen functions or features of world-renowned dictionaries such as Cambridge Online Dictionary, Oxford Advanced Learner's Online Dictionary, and Longman Online Dictionary. The functions they reviewed include definitions writing style of lexicographers; video of pronunciation; image of the words; the rank of words (CEFR); collaborative editing which allows the users to cooperatively edit the contents, add new terms, change and improve existing ones; thesaurus; learning tools (grammar exercises and quizzes); blogs; and paid services which include paper books, training courses, contents with richer lexicographic data, and language testing materials. The results from their comparative analysis revealed that online dictionaries were used as a learning tool because they can assist students in expanding vocabulary, finding the meanings of words, building derivatives, improving pronunciation, and most importantly keeping the students motivated to learn English because it is not monotonous.

Likewise, researchers (Collins, 2016; Hakim et al., 2018; Sun, 2021) proposed that students in Japan, Indonesia, and China respectively agreed that online dictionaries help them in terms of vocabulary acquisition because they always got better scores when online dictionaries are incorporated into the classroom. Online dictionaries serve as a learning tool to tackle English problems, such as grammar, pronunciation, spelling, alternative forms, and thesaurus (synonyms and antonyms). Additionally, the outcome of the three research studies corresponded in that the vast majority of students prefer online dictionaries (websites and applications) to printed dictionaries due to the fact that they master technology and have complete internet access.

Lastly, the case study by Mohamad et al. (2017) proposed both advantages and disadvantages of online dictionaries. They surveyed the opinions of Malaysian TESL undergraduates by using focus group interview, open-ended questionnaires, and emails. The results revealed that the advantages of online dictionaries are (1) to help students learn new words anytime and anywhere; (2) to assist them in acquiring proper pronunciation and identifying the word origins effectively, and (3) to give clearer vocabulary instruction. On the other hand, the disadvantages include limited internet access, incomplete definitions, and a lack of adequate examples. Nevertheless, the students prefer online dictionaries because the benefits far outweigh the drawbacks.

In short, having reviewed numerous perspectives and research studies, the researcher found that dictionaries, no matter what format (printed or online), are substantially beneficial to English proficiency. However, in this research, in the era of the digital world where the internet connection is widespread, the researcher chose monolingual online dictionaries as a learning and training tool for the students. Those include Cambridge Online Dictionary (2022), Oxford Advanced Learner's Online Dictionary (2022), Longman Online Dictionary (2022), and Collins Online English Dictionary (2022). The seven underlying reasons for this are: (1) Currently, digital gadgets such as a smartphone, tablet, laptop, and so on are at the students' disposal, leading to them being able to access online dictionaries at will (wherever and whenever they need). (2) Unlike printed dictionaries, they provide audio pronunciations and intonation patterns. (3) Online dictionaries are primarily unabridged; that is, informative and complete data are available. (4) Since English is a dynamic, innovative, and ever-increasing, and worldwide-used language, online dictionaries are always updated because words are added on a regular basis: monthly, quarterly, and annually. (5) Every entry has a CEFR level (Common European Framework of Reference) which enables the students to prioritize their vocabulary learning. (6) In defining a dictionary entry, monolingual online dictionaries use the common vocabulary of around 3,000 words which are covered by English knowledge of the university level. (7) In case that the students are not exact about the spelling of a targeted word, smart spelling or search suggestion will facilitate them by putting some letters of a targeted word into a search bar. For example, if they want to look up the word eavesdrop in spite of not remembering or knowing the exact spelling of it, they just put some letters of it, and a laundry list of words shown below will appear, helping them locate the targeted word.

Besides, given a conceptual framework of this research, the afore-mentioned perspectives, empirical studies from researchers and educators (Schmitt, 2000; Nist and Simpson, 2001; Thornbury, 2002; Nation, 2008; Jenpattarakul, 2012; Liu, 2014; Collins, 2016; Mohamad et al., 2017; Hakim et al., 2018; Pikinyak et al., 2020; Sun, 2021; Bamgbose, 2021) combined with the users' guides of four dictionaries: Cambridge Online Dictionary (2022), Oxford Advanced Learner's Online Dictionary (2022), Longman Online Dictionary (2022), and Collins Online English Dictionary (2022) were gathered, analyzed, and taxonomized to design a conceptual framework which serves as survey questions in the second part of the questionnaire to determine how frequently students use monolingual online dictionaries as shown.

Table 1: Benefits derived from the features provided in monolingual online dictionaries

Benefits derived from the features provided in monolingual online dictionaries	Descriptions																		
1. Grammatical information	<ol style="list-style-type: none"> 1. Identify parts of speech or a word class (noun, adjective, pronoun, verb, adverb, conjunction, etc.). 2. Check whether a word is a countable noun or an uncountable noun or both; and transitive or intransitive verb. 3. Examine the inflections of the words (past tense, past participle, singular, plural forms). 4. Practice grammar tests. 5. Check adjective patterns (attributive, predicative, post-positive) and (gradable or non-gradable/ not gradable). 6. Investigate the shortened form of a word, such as <i>ob-gyn</i> being a shortened form of <i>obstetrics and gynecology</i>. 7. Consult grammar patterns of the targeted word to see how the word is operated in a sentence such as [T+ that]; [T usually passive]; [C, + sing/ pl verb]; etc. 8. Determine spelling variants commonly used in both American and British English. 9. Check spelling variants between American and British English. 																		
Vocabulary/lexical information:																			
2. Definitions and example sentences	<ol style="list-style-type: none"> 1. Pinpoint or select the appropriate denotative (literal) or connotative (figurative) meanings of a targeted word to fit the context or make sense in the context. 2. Search for collocations and multiword units (idioms, phrasal verbs, compound words, fixed expressions) relevant a targeted word. 3. Ascertain the word family (derivative) of a targeted word. For example, <i>context</i>, <i>contextual</i>, <i>contextualize</i>, <i>contextualization</i>, and <i>contextualism</i>. 4. Inspect plural forms, verb forms, comparative and superlative forms if a targeted word is irregular. 5. Search for American English vocabulary and their British. For example: 																		
<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>American English</th> <th>British English</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Movie</td> <td>Film</td> </tr> <tr> <td>2</td> <td>Janitor</td> <td>Caretaker</td> </tr> <tr> <td>3</td> <td>Drug store</td> <td>Chemist's</td> </tr> <tr> <td>4</td> <td>French fries</td> <td>Chips</td> </tr> <tr> <td>5</td> <td>Denver boot/ boot</td> <td>Wheel clamp</td> </tr> </tbody> </table>			American English	British English	1	Movie	Film	2	Janitor	Caretaker	3	Drug store	Chemist's	4	French fries	Chips	5	Denver boot/ boot	Wheel clamp
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<ol style="list-style-type: none"> 6. Find out correct prepositions following noun, verb, adjective, such as focus <i>on</i> sth; raise my awareness <i>of</i> sth; driving <i>under</i> the influence; ect. 7. Look up example sentences to learn how the targeted words are used in real-world settings. 																			

Table 1: Continue

Benefits derived from the features provided in monolingual online dictionaries	Descriptions												
3. Pronunciation and intonation	<ol style="list-style-type: none"> 1. Listen to audio pronunciation and intonation of a targeted word. 2. Inspect the International Phonetic Alphabet (IPA) to ensure correct pronunciation. 3. Check stress marks to ensure which part or parts you should stress when saying that word. 4. Check pronunciation of the word with multiple parts of speech such as noun, verb, or adjective. 5. Identify how many syllables the word has and how it is broken or syllabified. 6. Check pronunciation variants in American and British pronunciations of the same targeted word. 7. Listen to the intonation of the sentences in which the targeted words are used and speak along them. 												
4. Levels of words based on the Common European Framework of Reference (CEFR) / CEFR-based word levels	<ol style="list-style-type: none"> 1. Determine six levels of the words ranging from A1 to C2 as shown below: <table border="1" data-bbox="625 891 1315 1066"> <thead> <tr> <th></th> <th>CEFR levels</th> <th>Descriptions</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>A1-A2</td> <td>Basic</td> </tr> <tr> <td>2</td> <td>B1-B2</td> <td>Intermediate</td> </tr> <tr> <td>3</td> <td>C1-C2</td> <td>Proficient/Advanced</td> </tr> </tbody> </table> 2. Check which words you should prioritize in your vocabulary learning and use properly to respond to your purposes and ability. 		CEFR levels	Descriptions	1	A1-A2	Basic	2	B1-B2	Intermediate	3	C1-C2	Proficient/Advanced
	CEFR levels	Descriptions											
1	A1-A2	Basic											
2	B1-B2	Intermediate											
3	C1-C2	Proficient/Advanced											
5. Frequency	<ol style="list-style-type: none"> 1. Check whether the targeted word is used with high frequency, middle frequency, or low frequency so that you can prioritize vocabulary learning as to which words you should learn first for your writing and speaking. 2. Discover which words are popular or used frequently in the current world of English, being monitored by online dictionaries. 												
6. Register/ pragmatics	<ol style="list-style-type: none"> 1. Discover which words are more appropriate for written and formal English, and which are more suited to spoken and informal English. 2. Look up which words are used by children or to children. 3. Examine which words are offensive, polite, non-standard, humorous, a taboo, or a slang. 4. Determine which words are used to approve (praise) and disapprove (dislike) someone or something. 5. Inspect whether a targeted word is a specialized term or field-specific vocabulary, such as medical science, business, computing, journalism, legal system or legality, etc. 												
7. Etymology	<ol style="list-style-type: none"> 1. Trace and listen to the podcast discussing the history and story of a targeted word. 2. Analyze the word parts of a targeted word (root, prefix, and suffix). 3. Inspect the evolution of a targeted word as to whether it is a loanword or portmanteau. 4. Investigate the cognate and origin in other languages of a targeted word. 												
8. Thesaurus	<ol style="list-style-type: none"> 1. check nuances of synonyms and antonyms to avoid unclear words. 2. exploit synonyms and antonyms to replace another word when speaking and writing. 3. find out related words of a targeted word and a topic to which a targeted word belongs. 												

Research Framework

In this study, the independent variables are comprised of faculty, overseas study plan, and apprenticeship while the dependent variable is the frequency of use of monolingual online dictionaries by students. The research framework is displayed accordingly.

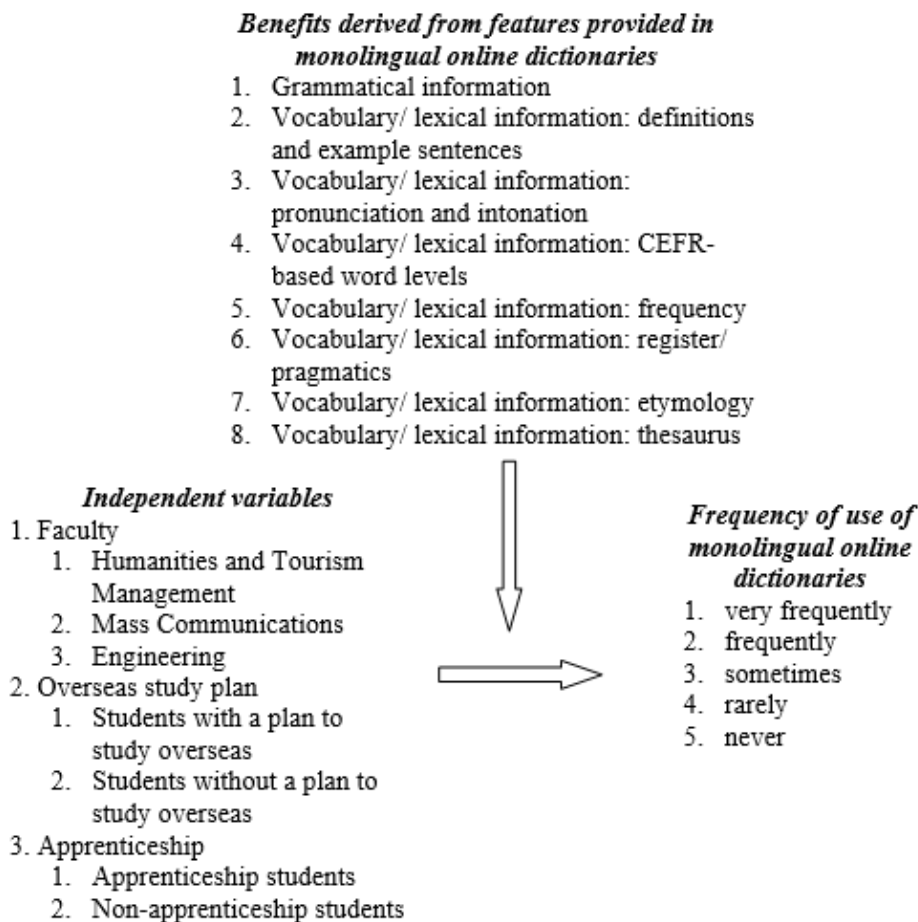


Figure 1 Conceptual Framework

Purposes of the Study

The study's objectives are as follows:

- 3.1 To survey the students' use frequency of monolingual online dictionaries.
- 3.2 To compare the use frequency of monolingual online dictionaries of the students in three faculties: Humanities and Tourism Management, Mass Communications, and Engineering.
- 3.3 To compare the use frequency of monolingual online dictionaries between the students with a plan to study overseas and without a plan to study overseas.

3.4 To compare the use frequency of monolingual online dictionaries between the apprenticeship students and non-apprenticeship students.

Research Questions

The research questions are as follows:

4.1 What is the students' use frequency of monolingual online dictionaries?

4.2 To what extent are there distinction in the use frequency of monolingual online dictionaries of the students from three faculties: Humanities and Tourism Management, Mass Communications, and Engineering?

4.3 To what extent are there distinction in the use frequency of monolingual online dictionaries of students with a plan to study overseas and without a plan to study overseas?

4.4 To what extent are there distinction in the use frequency of monolingual online dictionaries between apprenticeship students and non-apprenticeship students?

Research Methodology

Research design: This research was a survey design. The population was 1,500 fourth-year Bangkok University students in the Intermediate English subject from three faculties: Humanities and Tourism Management, Mass Communications, and Engineering, and 316 samples were selected using the stratified random sampling technique. The estimated sample size was based on Taro Yamane's Formula. A 95% confidence level was selected with a precision rate of $\pm 5\%$. The independent variables in this study are faculty, overseas study plan, and apprenticeship of the students.

Instrument: A questionnaire was used as an instrument to determine the frequency of use of monolingual online dictionaries among the students. The questionnaire consists of two parts. The first part dealt with the respondents' faculty, overseas study plan, and apprenticeship. The second part of the questionnaire contained 39 items derived from the benefits of features of monolingual online dictionaries. Respondents have a range of answers that target more specifically how often they use online dictionaries, which offer many beneficial features including grammatical information, word definitions and examples, pronunciation and intonation, CEFR-based word levels, frequency, register/pragmatics, etymology, and thesaurus in the form of a 5-

point Likert rating scale ranging from *very frequently, frequently, sometimes, rarely, to never*. These unipolar scales are simple for respondents to understand, and they can be assured that one end is the polar opposite of the other. The Likert-type questions allow the researcher to reveal the degrees of students' opinion, which allows the researcher to pinpoint the areas where the students need more exposure.

Each of the Likert-type questions in the second part of the questionnaire began with the initial phrase, "*How frequently do you (the respondent) use monolingual online dictionaries to...*", and was followed up with statements presenting features of online dictionaries, as demonstrated.

"How frequently do you (the respondent) use monolingual online dictionaries to...,

1. Identify parts of speech or a word class (noun, adjective, pronoun, verb, adverb, conjunction, etc.)?
2. Check whether a word is a countable or uncountable noun or both; and a transitive or intransitive verb?
3. Examine the inflections of the words (past tense, past participle, singular, plural forms).
4. Practice grammar test?
5. Check adjective patterns (attributive, predicative, post-positive) and (gradable or non-gradable/ not gradable) ?
6. Investigate the shortened form of a word, such as *ob-gyn* being a shortened form of "*obstetrics and gynecology.*" ?
7. Consult grammar patterns of the targeted word to see how the word is operated in a sentence such as [T+ that]; [T usually passive]; [C, + sing/ pl verb]; etc. ?
8. Determine spelling variants commonly used in both American and British English. For example: *ax (also axe) enquire/ inquire, instalment/ installment, ageing/ aging* ?
9. Check spelling variants between American and British English. For example: *neighbor/neighbor, center/centre*?
10. Pinpoint or select the appropriate denotative (literal) or connotative (figurative) meanings of a targeted word to fit the context or make sense in the context ?
11. Search for collocations and multiword units (idioms, phrasal verbs, compound words, fixed expressions) relevant a targeted word?
12. Ascertain the word family (derivative) of a targeted word. For example, *context, contextual, contextualize, contextualization, contextualism*?
13. Inspect plural forms, verb forms, comparative and superlative forms if a targeted word is irregular?

14. Search for American English vocabulary and their British English equivalents?
15. Find out correct prepositions following noun, verb, adjective, such as focus on sth (something); raise my awareness of sth; driving under the influence; ect. ?
16. Look up example sentences to learn how the targeted words are used in real-world settings?
17. Listen to audio pronunciation and intonation of a targeted word?
18. Inspect the International Phonetic Alphabet (IPA) to ensure correct pronunciation?
19. Check stress marks to ensure which part or parts you should stress when saying that word?
20. Check pronunciation of the word with multiple parts of speech such as noun, verb, or adjective?
21. Identify how many syllables the word has and how it is broken or syllabified?
22. Check pronunciation variants in American and British pronunciations of the same targeted word?
23. Listen to the intonation of the sentences in which the targeted words are used and speak along them?
24. Determine six levels of the words ranging from A1 to C2. A1-A2 denotes the basic level, B1-B2 the intermediate level, and C1-C2 the proficient/advanced level?
25. Check which words you should prioritize in your vocabulary learning and use properly to respond to your purposes and ability?
26. Check whether the targeted word is used with high frequency, middle frequency, or low frequency so that you can prioritize vocabulary learning as to which words you should learn first for your writing and speaking?
27. Discover which words are popular or used frequently in the current world of English, being monitored by online dictionaries?
28. Discover which words are more appropriate for written and formal English, and which are more suited to spoken and informal English?
29. Look up which words are used by children or to children?
30. Examine which words are offensive, polite, non-standard, humorous, a taboo, or a slang?
31. Determine which words are used to approve (praise) and disapprove (dislike) someone or something?
32. Inspect whether a targeted word is a specialized term or field-specific vocabulary, such as medical science, business, computing, journalism, legal system or legality, etc.?

33. Trace and listen to the podcast discussing the history and story of a targeted word?
34. Analyze the word parts of a targeted word (root, prefix, and suffix) ?
35. Inspect the evolution of a targeted word as to whether it is a loanword or portmanteau?
36. Investigate the cognate and origin in other languages of a targeted word. For example, if the targeted word is *benign*, its cognates are *benevolent*, *benefactor*, *beneficiary*, and *benediction* because all of them originate from the Latin root *benignus*?
37. Check nuances of synonyms and antonyms to avoid unclear words?
38. Exploit synonyms and antonyms to replace another word when speaking and writing?
39. Find out related words of a targeted word and a topic to which a targeted word belongs. For example, the topic and related words of the word *company* are: The topic is *business* (*merger and acquisitions*). The related words are *firm*, *corporation*, *business*, *conglomerate*, *giant*, *subsidiary*, *multinational*, *syndicate*, and *partnership*?

The researcher then divided the 39 Likert questions into eight categories (grammatical information, word definitions and examples, pronunciation and intonation, CEFR-based word levels, frequency, register/pragmatics, etymology, and thesaurus) to make it easier to analyze the summed data and report the results from the eight benefits of online dictionaries.

To calculate the Item-Objective Congruence (IOC) index or the content validity of the questionnaire, the questionnaires were given to the experts at Bangkok University to examine and rate each item to ensure that the content met the objectives of the study. The IOC was calculated by assigning scores to three types of answers: congruent = 1, uncertain = 0, incongruent = -1. In this study, the IOC was 0.90 which was regarded as acceptable. Furthermore, the reliability of the questionnaire calculated by Cronbach's coefficient alpha was 0.95, and the reliability of the eight benefits was as follows: grammatical information (0.95), definitions and example sentences (0.96), pronunciation and intonation (0.95), CEFR-based word levels (0.94), frequency (0.96), register/pragmatics (0.95), etymology (0.94), and thesaurus (0.95).

Data analysis: Descriptive statistics (mean as well as standard deviation) and inferential statistics or statistical tests, including the t-test and one way ANOVA (Welch test), were used to analyze the mean scores of the frequency of the use of monolingual online dictionaries. If a statistically significant difference existed, then the post hoc test method (Dunnett's T3 for non-equal variance) was used to compare each pair. The frequency of use of monolingual online dictionaries is shown. As the average range of 4.00 to 5.00 shows, students frequently use monolingual online dictionaries. The student uses monolingual online dictionaries moderately, as

indicated by the average range of 3.00 to 3.99. While the average range of 1.00 to 2.99 shows that the student rarely uses monolingual online dictionaries.

Results and Discussions

Tables 1-2 present the results of the study in response to research questions 1-4, and the implications of these findings are discussed in light of previous research studies.

Table 2: The results on the frequency of use of monolingual online dictionaries by the students.

Research question 1: What is the students' use frequency of monolingual online dictionaries?

The benefits derived from features provided in monolingual online dictionaries	Means	Usage frequency
1. Grammatical information	2.50	Rarely
2. Lexical information: definitions and example sentences	3.75	Moderately
3. Lexical information: pronunciation and intonation	3.60	Moderately
4. Lexical information: CEFR-based word levels	3.05	Moderately
5. Lexical information: frequency	3.00	Moderately
6. Lexical information: register/ pragmatics	3.20	Moderately
7. Lexical information: etymology	3.22	Moderately
8. Lexical information: thesaurus	3.30	Moderately
Total	3.20	Moderately

Table 2 shows that the overall use frequency of monolingual online dictionaries of Bangkok University students is **moderately**. The three most frequently used benefits derived from features provided in monolingual online dictionaries are definitions and example sentences, pronunciation and intonation, and thesaurus. On the contrary, the three least used benefits derived from features provided in monolingual online dictionaries are grammatical information, frequency, and CEFR-based word levels respectively.

The Findings in Table 3 answer research questions 2-4 accordingly, To what extent are there distinctions in the use frequency of monolingual online dictionaries of the students from three faculties: Humanities and Tourism Management, Mass Communications, and Engineering?, To what extent are there distinctions in the use frequency of monolingual online dictionaries of students

with a plan to study overseas and without a plan to study overseas?, and To what extent are there distinctions in the use frequency of monolingual online dictionaries between apprenticeship students and non-apprenticeship students?

Table 3: The comparison of the frequency of use of monolingual online dictionaries by students, classified according to three factors.

Independent variables	Statistical test P-value < .05
1. Faculty	
1. Humanities and Tourism Management (\bar{X} = 4.32)	
2. Mass Communications (\bar{X} = 4.07)	.002*
3. Engineering (\bar{X} = 3.81)	
2. Overseas study plan	
1. students with a plan to study overseas (\bar{X} = 4.18)	
2. students without a plan to study overseas (\bar{X} = 2.94)	.00*
3. Apprenticeship	
1. apprenticeship students (\bar{X} = 4.22)	
2. non-apprenticeship students (\bar{X} = 3.74)	.01*

Table 3 shows the results of research questions 2-4 accordingly.

Research question 2: To what extent are there distinction in the use frequency of monolingual online dictionaries of the students from three faculties: Humanities and Tourism Management, Mass Communications, and Engineering?

With regard to the frequency of use of monolingual online dictionaries of students from three faculties, statistically significant difference occurred with the students from Humanities and Tourism Management having used the online dictionaries **most frequently**, followed by Mass Communications with the usage level of **frequently**, and Engineering with the level of **moderately**.

The reasons for this are: In Humanities and Tourism Management, the English major students have had ongoing exposure to English learning materials written in English; thus, online dictionaries are used as a learning tool to ascertain definitions of troublesome words. What's more, when studying writing, they need online dictionaries to consult grammar patterns to write English grammatically, and a thesaurus, which are the features provided by online dictionaries to substitute repeated words so as to diversify their writing style and avoid the banality of their writing

assignments (Schmitt, 2000; Nation, 2008). In a similar manner, students with a major of Tourism Management also use English as a medium of communication in their hospitality career. As such, online dictionaries are predominantly used to enhance pronunciation and intonation, and to examine a register which refers to a situation in which they use the appropriate words to achieve specific purposes, such as polite request and prohibition for the guests smoking at a non-smoking area; recommendation for the guests in need of help; and offer to make the guests feel relaxed and comfortable. Whether they want to be receptionists, housekeepers, maitres d'hôtel, concierges, or cabin crew in the future, being able to use English proficiently and confidently is imperative to handle the guests' different demands and expectations (Hakim et al., 2018).

Concerning Mass Communications which involves multidisciplinary and is made up of plenty of majors such as journalism, branding, broadcasting, performing arts, cinematography, marketing communication, and advertising, the students of these majors use unique English, so they need online dictionaries for different purposes. Take for example advertising in which English is used in daily life as a bridge or vehicle to communicate between consumers and advertisers. With rich vocabulary, advertisements or ad slogans become eye-catching, convincing, and able to grasp the consumers' attention, conveying the key messages related to the products to consumers (Nist & Simpson, 2001). Since English has immeasurable words, it is easier to choose words, and online dictionaries are good sources of words where the students can choose the most persuasive words used in their advertisements. These facts support the study's conclusion that mass communication students **frequently** use online dictionaries.

It would be a surprise; however, to find that Engineering students used online dictionaries **moderately** despite the fact that the mean scores should have been greater. The probable reason is that most of them have used a content-specific dictionary like the Dictionary of Engineering Terminology. The results were in contrast to (Schmitt, 2000; Nation, 2008) proposing that English is important for Engineering students to both study and career. The reasons that they must master English, or they will face problems are that (1) the work of research and academics are written in English. To be fully conversant with the recent engineering breakthroughs, fluent English will help them develop more exponentially. (2) they are more likely to work for multinational corporations. As industrial factories and the majority of corporations are owned by foreigners, they seek only candidates whose English is sound because it is used in reading materials and in communication among people with culturally, linguistically, and technologically diverse background. (3) if they want to further their education abroad, standardized tests such as IELTS or TOEFL will be used to measure their English proficiency, and higher scores will be used for admission to most trusted

Engineering schools. All in all, if Engineering students must use English proficiently in academic and professional life, precision and correctness are the top priority, which is in accordance with the assumption lying that the more they use English, the more dependable on online dictionaries they are because features provided in online dictionaries help them correct language errors (Thornbury, 2008).

Research question 3: To what extent are there distinctions in the use frequency of monolingual online dictionaries of students with a plan to study overseas and without a plan to study overseas?

The results showed that statistically significant difference appeared between the frequency of the use of monolingual online dictionaries of the students with a plan to study overseas and the students without a plan to study overseas. The former used online dictionaries at the level of **frequently** whereas the latter used **rarely**.

The results corresponded to (Cullen et al., 2014; Bamgbose, 2021) explaining that the students with plan to study overseas realized that they must take one of the internationally-accredited standardized tests, such as IELTS, TOEFL, or CEFR, used to determine English proficiency of the students who plan to study in USA, UK, and Europe. This goal has provided them the impetus for using online dictionaries as an English learning tool to conquer the tests with high scores. Now, let's contemplate the criteria of the IELTS test (writing module) which commands the considerable online dictionary usage (Cullen et al., 2014). They include: coherence and cohesion (easy-to-understand and well-organized writing) which requires the usage of grammar patterns and paraphrasing; lexical resource (using a plethora of advanced vocabulary) which requires the guided-practice of definitions and example sentence, CEFR-based word levels, frequency, register, and thesaurus; grammatical range and accuracy (using grammar rule accurately) which requires the usage of grammar information: (1) identify parts of speech or a word class (noun, adjective, pronoun, verb, adverb, conjunction, etc.); (2) check whether a word is countable noun or uncountable noun or both, and transitive or intransitive verb; (3) examine the inflections of the words (past tense, past participle, singular and plural forms); (4) check adjective patterns (attributive, predicative, post-positive) and (gradable or non-gradable/ not gradable); (5) investigate the shortened form of a word, such as ob-gyn being a shortened form of obstetrics and gynecology; (6) consult grammar patterns of the targeted words to see how the words are operated in a sentence such as [T+ that], [T usually passive], [C, + sing/ pl verb], etc.; and (7) check spelling variants between American and British English.

To achieve these criteria, students with a plan to study overseas must master all aspects of English. Hence, the benefits derived from features of online dictionaries such as grammatical rules and grammar patterns, definitions and example sentences, CEFR-based word levels, frequency, and thesaurus play an integral role in sharpening writing ability. That's why they must be highly motivated to use online dictionaries at the level of **frequently**.

Research question 4: To what extent are there distinction in the frequency use of monolingual online dictionaries between apprenticeship students and non-apprenticeship students?

Statistically significant difference was found in the use of monolingual online dictionaries between apprenticeship students and non-apprenticeship students. The former revealed the usage level of **frequently** while the latter exhibited the usage level of **moderately**. The results conformed to Hiebert & Kamil (2005) mentioning that 30% of the daily working hour of employees was spent reading for gathering information, equally approximately 2.5 hours in an 8-hour shift. This is why they need online dictionaries to definitively ensure the meanings of difficult words when reading. In addition, Nation (2008) confirmed that employees have to write English in their professional world with the support of online dictionaries as a writing tool used to enhance grammar, word choice, and ideas conveyed. Overall, there would be no surprise that apprenticeship students use online dictionaries at the level of **frequently** since apprenticeship is the initial entering the world of careers in which the use of online dictionaries is considerably involved. This can be supported by the fact that the more they use English in both study and job, the more mistakes they make, and the more chance that they must consult online dictionaries, leading to far more enhanced English proficiency (Nist & Simpson, 2001).

Recommendations





Based on the current findings indicating that students use monolingual online dictionaries **moderately**, the researcher would like to convey two recommendations: the incorporation of online dictionary training into a classroom; and addressing misconceptions about online dictionary usage. The recommendations provide helpful guidelines for promoting the frequent use of online dictionaries.

Recommendation 1: According to researchers and educators (Nation, 2008; Nist & Simpson, 2001; Thornbury, 2008; Schmitt, 2000; Hiebert & Kamil, 2005), teachers should incorporate online




dictionaries training into a classroom because they can refine the students’ English proficiency: productive skills (writing and speaking); and receptive skills (reading and listening). However, the bottleneck is that the students take online dictionaries for granted and are not familiar with the dictionary convention (format and style), so teachers should train them to use features provided by online dictionaries incrementally until they can use them without teachers’ supervision. Here are some guidelines and a practicum as to how online dictionaries help the students underpin four skills of English proficiency: writing, reading, speaking, and listening.

With regard to a writing skill, the researcher would like to propose guidelines based on (Nation, 2008), according to which the researcher has used online dictionaries to facilitate writing ability of my students. To illustrate, let’s consider the practicum which contains students’ grammatical errors; how teachers correct them; as well as solve the problem based on online dictionaries usage.





Example 1

Student’s version:	My friends arrived and helped me <i>timely</i> .
Corrected version:	My friends arrived and helped me <i>in a timely manner /way/ / fashion</i> .
Problem:	The problem is that the students have been taught that an adverb normally ends with -ly , so when they see the words like <i>friendly, manly, costly, lively, deadly</i> , etc., they tend to think that these words function as an adverb. Therefore, they use these words as an adverb instead of an adjective.
Solution based on the features of an online dictionary:	To solve this problem, online dictionaries have been used to show the grammar pattern or collocation of this word as in <i>in a timely manner / fashion /way/as</i> indicated in Longman dictionary online. <div style="background-color: #007bff; color: white; padding: 2px; margin: 5px 0;">From Longman Dictionary of Contemporary English</div> <p>time·ly /ˈtaɪmli/ ●○○ adjective  </p> <p>done or happening at exactly the right time</p> <p> The fight ended only with the timely arrival of the police.</p> <p>in a timely manner/fashion (=as quickly as is reasonable in a particular situation)</p> <p> We aim to settle all valid claims in a timely manner.</p>




Example 2

Student's version:	She <i>paniced</i> when she had seen a poisonous snake in her house.
Corrected version:	She <i>panicked</i> when she had seen a poisonous snake in her house.
Problem:	The problem is that the students use the wrong <i>inflected form</i> of this word. They think that the past tense and past participle of this word are just to add <i>-ed</i> at the end. Indeed, the rule is that if the verb ends in <i>-c</i> , it must be added <i>-k</i> before <i>-ed</i> . The other examples of these words are <i>traffic</i> , <i>frolic</i> , and <i>mimic</i> . Let's see the correct inflected form of the word <i>panic</i> in Cambridge dictionary online below:
Solution based on the features of an online dictionary:	 <p>panic <i>verb</i> [I or T] UK  /'pæ.n.ɪk/ US  /'pæ.n.ɪk/ present participle panicking past tense and past participle panicked</p> <p>B2 to suddenly feel so worried or frightened that you cannot think or behave calmly or reasonably:</p> <ul style="list-style-type: none"> • <i>Don't panic! Everything will be okay.</i>






Example 3





Student's version:	I don't know how to use this program, <i>nor I am</i> interested in it.
Corrected version:	I don't know how to use this program, <i>nor am I</i> interested in it.
Problem:	The problem is about the <i>grammar pattern</i> of an <i>inversion</i> .
Solution based on the features of an online dictionary:	<p>According to Longman dictionary online, <i>nor</i> is used after a negative statement in order to introduce another negative statement containing a similar kind of information. Let's examine the example sentence below which implies that in the second negative statement, an <i>inversion</i> of a subject and verb (question word order) must be used.</p> <p>From Longman Dictionary of Contemporary English</p> <p>nor /nɔː \$ nɔːr/ ●●● S2 W1 conjunction , adverb  </p> <p>1 → neither ... nor ...</p> <p>2 formal used after a <u>negative statement</u> in order to introduce another negative statement containing a <u>similar kind of information</u></p> <ul style="list-style-type: none">  I don't expect children to be rude, nor do I expect to be disobeyed.  It was not my fault, nor his.

Example 4

Student's version:	The candy stores <i>are galore</i> at Narita Airport in Japan.
Corrected version:	There are <i>candy stores galore</i> at Narita Airport in Japan.
Problem:	The problem derives from the student's fixed idea that an adjective must be put either before a noun or after a verb to be.
Solution based on the features of an online dictionary:	<p>In fact, it is partially true because an adjective can be commonly put in four positions:</p> <ol style="list-style-type: none"> 1. <i>Before a noun</i> (attributive adjective) such as living, chemical, electronic, preliminary, ovarian, etc. 2. <i>After a verb to be</i> (predicative adjective) such as alive, afraid, asleep, afloat, etc. 3. <i>Both positions</i> (before a noun and after a verb to be or a linking verb) such as essential, quiet, soft, comfortable, hungry, cute, punctual, etc. 4. <i>After a noun</i> (postpositive adjective). A postpositive adjective mainly occurs in a <i>set phrase</i> in which a postpositive adjective follows a noun. Here are the common examples of a <i>set phrase</i> containing a postpositive adjective: heir <i>apparent</i>, professor <i>emeritus</i>, Amnesty <i>International</i>, god <i>almighty</i>, court <i>martial</i>, athlete <i>extraordinaire</i>, attorney <i>general</i>, malice <i>aforethought</i>, president <i>elect</i>, accounts <i>payable</i>, Bangkok <i>proper</i>, etc. <p>In this case, <i>galore</i> is a postpositive adjective which has to be put after a noun. Therefore, the sentence was corrected as <i>candy store galore</i>. However, no need to remember all postpositive adjectives, but students must be aware of looking up in online dictionaries whenever they want to use unknown adjectives. Let's see the example below how Longman dictionary online tells the position of <i>galore</i>.</p> <p>From Longman Dictionary of Contemporary English</p> <p>ga·lore /gə'lo: \$-'lə:r/ adjective [only after noun]  </p> <p>in large amounts or numbers</p> <p> bargains galore in the sales</p> <p>Examples from the Corpus</p> <p>galore</p> <ul style="list-style-type: none"> • At the <u>flea market</u>, there were <u>quilts</u>, <u>furniture</u>, and books galore. • There are also chair lifts galore. • Lots of <u>fun</u> for the kids! Rides and games galore! • Great <u>visuals</u>, great <u>performances</u>, great <u>soundtrack</u>, plus cameos galore.

Example 5

Student's version:	I wanted to raise fund to renovate <i>my old school</i> because it is rather <i>old</i> .
Corrected version:	I wanted to raise fund to renovate <i>my alma mater</i> because it is rather <i>dilapidated or run-down</i> .
<p>Problem:</p> <p>Solution based on the features of an online dictionary:</p>	<p>As a matter of fact, this sentence is grammatically correct, but the word choice is not appropriate. That is, if the students want to get higher scores in standardized tests like IELTS, the word <i>old</i> is too basic and may cause confusion in this sentence because the first use means <i>belonging to past times or a past time in your life</i> while the second use refers to <i>having existed or been used for a long time; in very bad condition</i>. To solve this problem, the sentence was changed as presented in the corrected version.</p> <p>Therefore, confusion is avoided, and the students learn how to use more suitable words from the <i>CEFR-based word levels</i>, which can assist them in using more advanced vocabulary and prioritizing their vocabulary learning. Let's examine how CEFR [A1(basic)- C2 (advanced)] from Cambridge dictionary online and Oxford dictionary online tells the students the levels of words as shown below:</p> <div data-bbox="523 1041 1082 1675" style="border: 1px solid black; padding: 10px;"> <p>old <i>adjective</i> UK  /əʊld/ US  /oʊld/</p> <hr/> <p>old adjective (NOT YOUNG/NEW)</p> <p>A1</p> <p>having lived or existed for many years:</p> <p>alma mater <i>noun</i>  /,ælmə 'mɑ:tə(r)/,  /,ælmə 'meɪtə(r)/  /,ælmə 'mɑ:tər/ (also Alma Mater) [singular] (especially North American English)</p> <p>★ the school, college or university that somebody went to • He donated \$20 million to his <i>alma mater</i>, Columbia University.</p> <p>TOPICS Education C2</p> </div>

	<p>dilapidated <i>adjective</i></p> <p> /dɪ'læpɪdeɪtɪd/</p> <p> /dɪ'læpɪdeɪtɪd/</p> <p>★ (of furniture and buildings) old and in very bad condition</p> <p>SYNONYM ramshackle</p> <ul style="list-style-type: none"> • <i>The old house was in a somewhat dilapidated condition.</i> <p>TOPICS Buildings C2</p> <hr/> <p>run-down <i>adjective</i></p> <p> /ˌrʌn 'daʊn/</p> <p> /ˌrʌn 'daʊn/</p> <p>1 ★ (of a building or place) in very bad condition; that has not been taken care of</p> <p>SYNONYM neglected</p> <ul style="list-style-type: none"> • <i>run-down inner-city areas</i> • <i>a rather run-down part of town</i> <p>TOPICS Buildings C2</p>
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To summarize, teachers should encourage students to use online dictionaries regularly and to learn about the features that can help them improve their writing skills.

The ultimate goal of reading is to thoroughly comprehend reading materials. To this end, the students may use various reading strategies, such as scanning, skimming, using grammatical clues, identifying main ideas, using word parts, inferencing, to name but a few, to unlock the meanings and get the gist of the text. However, the most critically important factor to accomplish reading comprehension is huge vocabulary. Researchers and educators (Nation, 2008; Thornbury, 2008; Schmitt, 2000) attested that vocabulary and reading comprehension are closely connected and must go hand in hand. That is to say, students with poor vocabulary have difficulty comprehending reading materials. In addition, students with poor vocabulary read slowly and less, acquiring few new words whereas students with rich and large vocabulary read rapidly and more, improving comprehension and enriching new vocabulary. They further suggested that if the students encounter unknown words exceeding 50% of the total words in the text, reading incomprehension will occur because the flow of reading will be impeded. In consequence, possessing huge vocabulary plays a pivotal role in understanding the texts. To achieve this aim, online dictionaries are great sources which are substantially instrumental in expanding the students' vocabulary with the bolstering of three benefits of features of online dictionaries: *definitions and example sentences, thesaurus, and collocations*. Now, let's ponder how the three benefits of online dictionaries build up and expand the students'

vocabulary so that teachers can guide them to use the benefits effectively to achieve reading comprehension.

The benefit of online dictionaries: definitions and example sentences.

When the students look up the word defibrillator in a Cambridge dictionary online, they will see the following details:

defibrillator

noun [C] • specialized

UK  /,di:'fɪb.rɪ.leɪ.tə/ US  /,di:'fɪb.rə.leɪ.tə/



porpeller/Stock/Getty Images
 Plus/Getty Images

a machine that uses an electric current to make someone's heart beat (= move) in a normal, regular way when it has stopped doing this, or to start a heart beating again when it has stopped:

- *The paramedic had to use a defibrillator to shock the woman's heart into restarting.*
- *We have installed portable defibrillators in public buildings.*

— More examples

- *The plane has a locked overhead bin where an emergency defibrillator is stored.*
- *All schools should be required to buy and maintain cardiac defibrillators and train staff to use them.*
- *A weak heart is prone to developing life-threatening rapid heartbeats that a defibrillator can stop.*
- *Over the years, pacemakers and defibrillators have saved millions of lives and revolutionized cardiac care.*
- *The defibrillator pads are placed on the patient's chest.*

Figure 2

Therefore, with only one visit to an online dictionary to search for the definition and example sentences of the word defibrillator, it is obvious that new words that the students may acquire are the heartbeat, in a normal or regular way, paramedic, to shock the heart into restart, install, portable, an overhead bin, cardiac, prone to, life-threatening, pacemaker, revolutionize, and defibrillator pad.

The benefit of online dictionaries: thesaurus

When students look up the word company in Longman dictionary online, its thesaurus will expand the students' word power to other words which are related to the looked up words as shown below:

THESAURUS

company an organization that makes or sells something, or provides a service

big oil companies

telephone companies

He runs a software company.

firm a company, especially one that provides a service rather than producing goods

a law firm

a firm of accountants

a security firm

business a company – often used when talking about a company that employs only a small number of people

She set up her own catering business.

small businesses

a family business

corporation a large company that often includes several smaller companies

IBM is one of the biggest corporations in the world.

multinational a very large company with offices in many different countries

American multinationals are establishing research and development facilities across the developing world.

conglomerate /kən'glɒmərat \$-'glɔ:-/ a very large company that consists of several different companies which have joined together

The company was taken over by a German media conglomerate.

giant a word used mainly by newspapers for a very large company

Their clients include the retail giant, Wal-Mart.

subsidiary a company that is owned by a larger company

The company runs its New York operations through a US subsidiary.

Figure 3

In closing, the students should be encouraged to use the thesaurus whenever they study vocabulary information in online dictionaries because their vocabulary can be enlarged immensely.

The benefit of online dictionaries: collocations

When the students look up the word issue in Longman dictionary online, collocations of this word will expand the students' vocabulary as illustrated below:

COLLOCATIONS

VERBS

discuss/debate an issue

They met to discuss the issue of working conditions at the factory.

raise an issue/bring up an issue (=say an issue should be discussed)

Some important issues were raised at the meeting.

deal with/tackle an issue (also **address an issue** *formal*)

The government must deal with the issue of gun crime.

The company said that it will address the issue at the next scheduled board meeting.

decide/settle/resolve an issue (=solve it)

The issue was settled after some tough negotiations.

No deadline has been set to resolve the issue.

face an issue (=accept that an issue exists and deal with it)

Politicians seem to be reluctant to face the issue.

avoid/evade an issue (also **dodge/duck an issue** *informal*) (=avoid discussing an issue)

There is no point in evading the issue any longer.

confuse/cloud/muddy the issue (=make an issue more difficult to understand or deal with than it needs to be)

You must not let your feelings cloud the issue.

highlight an issue (=bring attention to it)

The minister used his speech to highlight the issue of global warming.

an issue comes up (also **an issue arises** *formal*) (=people started to discuss it)

The issue arose during a meeting of the Budget Committee.

the issues surrounding something

This chapter discusses the ethical issues surrounding genetically modified foods.

Figure 4

To wrap up, the three benefits of online dictionaries (definitions and example sentences, thesaurus, and collocations) can enlarge the students' vocabulary; therefore, once their vocabularies are huge, reading comprehension is better achieved. That's why online dictionaries can facilitate the students' proficient reading.

Speaking and listening are virtually the same skills: speaking is a productive skill while listening is a receptive skill. If the students know correct pronunciation, stress, intonation, linking, reduction, contraction, and elision, when speaking, they will be understood, and when listening, they will understand the utterances. However, Nation (2008); Thornbury (2008); Schmitt (2000) suggested that English is a language in which spellings and sounds do not correspond, and pronunciation rules can't be always applied, making the pronunciations of English words unguessable, unpredictable, and problematic to non-native speakers when speaking and listening. Thus, whenever the students come across new words, the first thing they are supposed to do before searching for definitions is to check the pronunciations. To this end, the students should

be trained to maximize the pronunciation features in online dictionaries. With the provision of audio pronunciations and phonetic symbols, online dictionaries, including Cambridge Online Dictionary (2022), Oxford Advanced Learner’s Online Dictionary (2022), Longman Online Dictionary (2022), and Collins Online English Dictionary (2022) can boost the students’ pronunciations accordingly.

The benefit of online dictionaries: British and American pronunciations

They provide the students with both British and American pronunciations of the same word as shown below:



Figure 5

The benefit of online dictionaries: the pronunciations of phonetics

They help the students to check the pronunciations of phonetically confusing pairs as shown below:

leopard	/ˈlepəd \$ -ərd/	, but leotard	/ˈliːətɑːd \$ -ɑːrd/
label	/ˈleɪbəl/	, but lapel	/ləˈpeɪl/
pass	/pɑːs \$ pæs/	, but passe	/ˈpæseɪ, ˈpɑː- \$ pæˈseɪ/
etymology	/ˌetɪˈmɒlədʒi/	, but entomology	/ˌentəˈmɒlədʒi/

The benefit of online dictionaries: accurate pronunciation

They assist the students in finding accurate pronunciations of commonly-mispronounced words as illustrated below:

ukulele /ˌjuːkəˈleɪli/
 southern /ˈsʌðən \$ -əm/
 genre /ˈʒɒnrə \$ ˈʒɑːnrə/
 ensemble /ɒnˈsɑːmbəl \$ ɑːnˈsɑːm-/
 concerto /kənˈtʃɜːtʊ \$ -ˈtʃertoʊ/

The benefit of online dictionaries: silent sounds in some English words

They aid the students to check the silent sounds in some English words as shown below:

Silent /B/	Silent /C/	Silent /G/	Silent /T/	Silent /W/
debt /det/	conscience	benign	bristle /'brɪsəl/	sword
subtle	/'kɒnjəns /	/bɪ'naɪn/	castle	/sɔ:rd/
/'sʌtl/	descend /dɪ'send/	cologne	/'kɔ:səl \$ 'kæ-/	wrap /ræp/
numb	disciple/dɪ'saɪpəl/	/kə'loʊn/	moisten	wreath /ri:θ/
/nʌm/		gnaw	/'mɔɪsən/	
		/nɔ: \$ nɒ:/		

The benefit of online dictionaries: precise pronunciations

They ensure precise pronunciations when there is a sound-spelling mismatch. For example, many English words contain the spelling *-ough*, but the sounds are totally different and unpredictable, causing the students to check every word whose spelling contains *-ough*.

Let's review the examples below:

/ʌf/	as in	tough /tʌf/; rough/ /rʌf/; enough /ɪ'nʌf/
/ɒf/	as in	cough /kɒf/; trough /trɒf/
/ʌp/ or /əp/	as in	hiccough /'hɪkʌp, -kəp/
/ɔ:t/ or /ɒ:t/	as in	bought /bɔ:t \$ bɒ:t/; fought /fɔ:t \$ fɒ:t/; ought /ɔ:t \$ ɒ:t/
/əʊ/ or /oʊ/	as in	though /ðəʊ \$ ðoʊ/; doughnut /'dəʊnʌt \$ 'doʊnʌt/; borough /'bʌroʊ/; thorough /'θʌroʊ/; furlough /'fɜ:ləʊ \$ 'fɜ:rləʊ/
/aʊ/	as in	plough /plaʊ/; drought /draʊt/; bough /baʊ/; doughty /'daʊti/
/u:/	as in	through /θru:/; throughout /θru:'aʊt/

The benefit of online dictionaries: the word's pronunciation changes by a part of speech

They help the students to examine the pronunciation in case the word's pronunciation changes by a part of speech. Put in perspective, let's see the following examples:

Verb	Noun
produce /prə'dju:s \$ -'du:s/	produce /'prɒdju:s \$ 'prɒʊdu:s/
record /rɪ'kɔ:d \$ -ɔ:rd/	record /'rekɔ:d \$ -ərd/
refuse /rɪ'fju:z/	refuse /'refju:s/
contract /kən'trækt/	contract /'kɒntrækt \$ 'kɒ:n-/
minute (adj.) /maɪ'nju:t \$ -'nu:t/	minute (noun) /'mɪnət/

The benefit of online dictionaries: suprasegmental feature

Aside from a segmental feature or the word pronunciation (consonant and vowel sounds), online dictionaries also provide a suprasegmental feature which includes intonation pattern (rising and falling sounds in a sentence); stress; linking; reduction; contraction; and elision. In fact, example sentences with audio pronunciations help the students see a spoken sentence in its written form full of words strung together without clear borderlines between each word. That is to say, some words are lost and some sounds are linked together, resulting in the students' enhanced speaking and listening skills. Below are example sentences with audio pronunciations of the word *conversation* provided by Longman dictionary online.

From Longman Dictionary of Contemporary English

con-ver-sa-tion /ˌkɒnvəˈseɪʃən \$ ˌkɑːnvər-/ ●●● S1 W2 noun 🔊 🔊

[countable, uncountable] an informal talk in which people exchange news, feelings, and thoughts

🔊 a telephone conversation

🔊 Children quickly get bored by adult conversation.

conversation with

🔊 a short conversation with the teacher

conversation about

🔊 a conversation about family and friends

🔊 They **had** a short **conversation** in German and seemed to be disagreeing about something.

🔊 It's impossible to **carry on a conversation** with all this noise in the background.

🔊 'Did you have a good journey?' he said, trying to **make conversation**.

🔊 He was silent, no matter how hard Sofia tried to **engage him in conversation**.

🔊 After a while, the **conversation turned to** a friend's coming wedding.

🔊 They were **deep in conversation**, relaxed and smiling.

🔊 He could hear **snatches of conversation** from across the room.

Figure 6

In a nutshell, Schmitt (2000); Nist & Simpson (2001); Hiebert & Kamil (2005); Nation (2008); Thornbury (2008); Bamgbose (2021) said that online dictionaries are essential resources for language learners to refine their English proficiency: writing, reading, speaking, and listening. If they get some systematic guidance and practice in their use, they can get maximum advantages from them. After all, training the students to use online dictionaries is incremental like the continuum of knowing vocabularies which is time-consuming.

Therefore, teachers should design training sessions in a way that the students feel comfortable to learn and are familiarized with online dictionaries. In addition, if possible,

training them to use online dictionaries to develop four skills of English proficiency should not be performed in an isolated manner; rather, those skills should be incorporated and trained holistically. To put it simply, when writing is trained with an aid of online dictionaries, other benefits of the dictionaries relevant to vocabulary enrichment as well as pronunciation and intonation development should be emphasized concurrently. As mentioned earlier, learning to use online dictionaries is an incremental process; therefore, achieving automaticity of using them may take prodigious and ongoing practice, which requires a combination of concerted effort and perseverance among the teachers and students.

Recommendation 2: The following misconceptions about dictionaries usage should be brought to the students' attention. Online dictionaries are meant to be predominantly consulted, and not to be read like books. In fact, the students should look up online dictionaries when they encounter new words which they need to confirm correct meanings after other strategies used to guess the meanings fail. The habit of remembering the wordlists from dictionaries should not be encouraged because they will be put in short-term memory and not be memorable (Thornbury, 2008). Like human beings, online dictionaries written by lexicographers could have errors in spite of rare opportunity. Therefore, if possible, the students may use several brands of dictionaries to crosscheck the problematic and controversial vocabulary (Jenpattarakul, 2012). It is erroneous to assume that a word does not exist because it is not included in some dictionaries (Bamgbose, 2021). To illustrate, the word *overattention* was not found in Cambridge Online Dictionary (2022) and Oxford Advanced Learner's Online Dictionary (2022), yet it has been found in Collins Online English Dictionary (2022). As mentioned earlier, using several dictionaries is essential. However, content-specific or special dictionaries such as a Dictionary of Economics, a Dictionary of Anthropology, a Dictionary of Medical Science, a Dictionary of Insurance, etc. should be available in case general online dictionaries can't give much information about specialized words.

Despite being in the digital world where online dictionaries are at the students' disposal, nowadays printed dictionaries or a hardcover or paperback dictionaries are still popular due to several advantages (Pikilnyak et al., 2020): There are no advertisements distracting the students' attention from their studies. They serve as a brain exercise by which the students must know and retrieve exact spellings like activating their brains to find out targeted words because printed dictionaries don't provide smart spelling or search suggestion like online dictionaries do. Serendipity is allowed as the students will see other words by

chance in two pages for one look-up. They can be used as back-up dictionaries in case there is no internet connection or the internet crashes. Not only does mispronunciation affect speaking negatively, but also it aggravates writing and reading. It may sound strange, but it's a common misleading concept that the students don't have to put an emphasis on pronunciation when writing and reading. The fact proposed by Hiebert & Kamil (2005) is that when writing you have to maintain tone and rhythm. Imagine when you read, you tend to pronounce every word in your head. This means what sounds incorrect and unnatural verbally will do the same thing in writing and reading. For this reason, the students must check accurate pronunciations of the words used in writing and the words met in reading. The use of online dictionaries is lifelong learning and experience. Unlike grammar which is largely in place and made up of limited set of rules, vocabularies are ever-increasing or always coined due to development in all domains: technology, computing, medical science, education, society, and so on. Therefore, new words are added in online dictionaries on a regular basis (monthly, quarterly and yearly), making the students able to keep abreast of the development of the myriad vocabularies (Schmitt, 2000).

Conclusion

The students at Bangkok University used monolingual online dictionaries at the level of *moderately*, but some benefits derived from features provided in monolingual online were used in an unsatisfied manner, such as grammatical information ($\bar{X} = 2.50$); frequency ($\bar{X} = 3.00$); and CEFR-based word levels ($\bar{X} = 3.05$). The analysis leads to the following conclusions: Some benefits of monolingual online dictionaries with the level of *moderately* can be promoted and trained towards the level of *frequently* because the more frequently the students use online dictionaries, the better and more accurate their English becomes. These benefits derive from features provided in monolingual online dictionaries, including register or pragmatics; etymology; thesaurus; pronunciation and intonation; definitions; and example sentences. Besides, the mean scores in the three variables were different significantly. Teachers should encourage their students to use online dictionaries frequently and help them to understand the features that provide numerous benefits for language learning.

Limitation

In response to the experts' constructive advice and concerns, two limitations of this research should be addressed: (1) Because the sample was drawn from three faculties (humanities and tourism management, mass communications, and engineering), the results may not be generalizable to other student populations. Consequently, practitioners must apply the study results to their specific teaching circumstances. (2) Future research should use sociocultural theories to gather more evidence to support assumptions.

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