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Miscarriages of Justice in Thailand

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Abstract

This article reflects the situation of miscarriages in the Thai justice system, antecedents of scapegoat, impact on the scapegoat, human rights, reviving the scapegoat cases, compensation for scapegoats, and to provide policy recommendation for policy makers. The author found that the problem of "scapegoats" in the Thai justice system has been deeply rooted in Thai society for a long time. The antecedents of this problem are associated with the police, the prosecutors, and the courts. This problem has a severe impact on the mental, physical, economic, and social conditions of the "scapegoats". Although the law provides basic principles for protecting the rights of the accused but in practice there are still problems causing the accused or "scapegoats" to not be treated and protected by the government with equality, fairly, accurately, and speed in accordance with the established principles. Even though the Resurrect Criminal Case for Reconsideration Act B.E. 2526 allows the "scapegoats" to request for a resurrect but the scapegoats must confront several practical problems. In addition, the compensation provided by the government in accordance with the law is quite small. Therefore, government agencies should turn their attention to this problem urgently and the people who are involved in driving the policy, should pay more attention to this problem and put this as an urgent agenda for reform of the Thai justice system.

Introduction

Miscarriages of justice have always appeared in Thai society. The innocent, who is not the real culprit as alleged, is known as a "scapegoat" in the criminal justice. The scapegoat or innocent person was punished because of the shortcoming of the justice process regardless of whether the defect in the work of a police officer, prosecutor, or court. Thaweesak (2017) defined miscarriage in justice as an arrest and conviction of people who have not actually committed the crime. He also stated that miscarriages of justice in Thailand have dramatically increased. This results in a social problem that people in society and related parties must come together to deal with the said issue. According to Nobles & Schiff (2017), the arrest of innocent people is basic information in evaluating criminal investigations, evidence search, the process of justice, conviction, and appeal which are reflections of morality and ethics in the judicial process.

The above problems have a profound effect on the Thai family because most people who are "scapegoat" is a group of people who lack the bargaining power, lack

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of ability and potential for access to justice. Moreover, their social and economic status is an important factor leading to being exploited by others who have more bargaining power, including being exploited by officials who aim to find benefits for themselves. The government agencies also give little importance to solve the problem for the disadvantaged social groups. Hence, the innocents have lost their freedom. They experience mental trauma and became the target of attack in the society, face economic losses due to expenditures arising from the fight in the judicial process, suffer from imprisonment in correctional facilities, have limit opportunities to take care of the family, and confronted with problems of separation and relationships between family members. Their families can not deal with the financial problems due to lack of family leaders causing some families to live in poor conditions, experience quality of life that is substandard. The child is not educated, and family members who are sick cannot access good standardized medical services. Miscarriages of justice is, therefore, an issue that reflects the failure of the Thai justice process (Kecharoen & Phumpetch, 2017).

The said problems are caused by various factors. The root cause of the miscarriages of justice is partly a result of discrimination by officials in government agencies. The power of "money" gives some groups more privileges than others in the society as we can see from the social issues that appear through the mainstream media and social media. This reflects discrimination against people of different socioeconomic status. The offense of the same charge, each suspect is treated differently from government officials including receiving different penalties. These incidents reflect the inequality treatment of people which is considered a violation of the fundamental human rights, and clearly against the principles of human rights. How should the government or related sectors share responsibility, and how to compensate those people are issues that must be considered in detail. Although there is a Damages for the Injured Person and Compensation and Expense for the Accused in Criminal Case Act, B.E. 2544 but there are still many practical problems that cause delayed compensation to victims of "scapegoats". Furthermore, these people were compensated in term of monetary compensation only (Cross Cultural Foundation, 2015).

The "scapegoat" in the judicial process is therefore a problem that reflects the efficiency and accuracy of the justice process. This may be caused by many factors such as transparency, dark influence, including lack of prudence in screening the case (Thaweesak, 2017). These causes the court to make judgments based on the evidence appearing in the case file leading to the punishment of innocent people. This article therefore would like to reflect on the situation of miscarriages in the Thai justice. In this article, the term "scapegoat in the judicial process" is used to make it easier to communicate meaning and understanding of miscarriages. In addition, the author will analyze the root causes of becoming scapegoats, the impacts on the scapegoat, human rights issues and abuse of scapegoats, remedies and solutions to problems as well as providing policy suggestions to those involved, including those who have a role in determining the country's justice administration policy.

Scapegoats: A chronic problem in the criminal justice

The problem of miscarriages in the Thai justice system that results in the innocent becoming a scapegoat and being punished on behalf of the actual offender is a problem that has created a crisis of faith in the Thai criminal justice system for a long time. It can be said that the most well-known and affecting cases of Thai justice system is the murder of Cherry Anne Duncan in 1986. Cherry Anne Duncan, a high school student, disappeared after school and was found dead later. The police arrested four suspects in just one month consisting of Rungchalerm Kanokchawalachai, Phithakkha Khakai, Krasae Ploiklum, and Thawatchai Kitprayoon. The inquiry official sent the file to the prosecutor and the prosecutor ordered the prosecution according to the evidence created by the investigating officer. The Civil Court sentenced to death the accused. However, the Appeal Court dismissed all the suspects but all four were still in prison while awaiting the result of the Supreme Court's decision. In the meantime, Rungchalerm died in prison from a heart attack prior to the decision of the Supreme Court ruling that all four were innocent in the year 1993. All three "scapegoats" that are alive were released. Even though they were given freedom, Phithak and Pichai later died from a disease from being infected in the prison as well as Krasae who became disabled due to a fractured spine. Subsequently, the court ordered the Royal Thai Police to compensate for over 38 million Baht in damages. However, is such compensation worth the loss of individual freedom? It is a matter that society has criticized in many different perspectives.

The case of Cherry Anne Duncan lapsed for 8 years before the police arrested the real suspect in 1995

after the Court of Appeals ruled that all four "scapegoats" are innocent. The real suspects included Suwibun Phatpanit, Somchai Bunyarit, Sompong Bunyarit, Samak Thubbuchacharn and Peera Wongwaiwut. They murdered Cherry Anne Duncan due to the jealousy of Suwibun. On 6 August 1997, the Civil Court ordered the death penalty for Suwibun, the principle, including Sompong and Samak. The Court of Appeal has considered the death penalty which was consistent with the Civil Court. Surprisingly, the Supreme Court ordered the release of Suwibun due to insufficient evidence and there was no testimony of being the principle. Sompong and Samak were sentenced to life imprisonment because they pleaded guilty to the police in the investigation and arrest process while Somjai died before the case was brought to the Supreme Court's decision (Isranews Agency, 2012).

When considering statistics of financial assistance for the scapegoats provided by the Rights and Liberties Protection Department, Ministry of Justice, there were 97 financial assistance to the scapegoats, amounting to 17.94 million Baht in the fiscal year 2015. In the fiscal year 2016, there were 91 aid payments, totaling 17.48 million Baht. The number of scapegoats applying for help each year is large. In 2015, 679 cases of scapegoats have been filed and increased to 702 in 2016, representing an increase of 6% (Liberties Protection Department, Ministry of Justice, 2017a). The above information can reflect that the "scapegoat" problem in the Thai judicial process is still a problem that affects the rights and freedoms of many innocent people and is an urgent matter that the government must hurry to solve.

Antecedents of "scapegoats"

The problem of "scapegoat" occurring in the judicial process is mainly related to the judicial process of the police, prosecutors, and courts. The author will explain the root causes of problems occurring in each level of the justice process as follows:

Police

Police is considered as the first part of the judicial process to find out the truth in a criminal case since the police officers are the persons responsible for arresting the suspects, searching for evidence, and investigating whether the suspect was actually guilty or not. Therefore, the work process of the police officers must have careful and fair operation. In practice, the investigation officers have a lot of cases in hand coupled with being pressured by the supervisor in the performance resulting in the need to rush to close the case. Otherwise, they will be labeled as "incompetent" and may face disciplinary action. Therefore, they quickly close the case by finding a "scapegoat" to receive the sin for the true culprit. This is consistent with the opinion of Kotruang (2001) who said that the "scapegoat" problem in the police level is caused by many factors. Factors include, pressure from the supervisor, the need to create an image of how to work effectively and can quickly arrest the suspect, lack of prudence, carelessness, lack of consciousness including pressure from society and various forms of mass media. The most obvious example of an innocent arrest by a police officer were the security cases in the 3 southern provinces of Thailand. During 2004-2014, there were a total of 2,184 cases. The court had a judgment of only 685 cases while 421 cases were dismissed amounting for 70% of the cases. There were only 264 cases that the court found guilty (Cross Cultural Foundation, 2015). These indicated that the police carried out the arrest without carefulness and prudence. It is also suspected that the cases that the court has found guilty may include "scapegoats" mixed up or not.

From the author's point of view, "discretion" is a major problem in the defect and wrongful law enforcement. Police task in Thailand requires quite high discretion because Thai police officers have the power and duty to enforce the law widely. Each case is quite different in details and it is the duty of the police to bring the facts that occur in each case to adapt to the law. In addition, there are many laws issued by the legislature resulting in the police officers unable to study and monitor the changes thoroughly. This leads to mistakes in law enforcement. Finally, police officers need to use discretion when enforcing the law whereas the working environment is dangerous to the life and property of the police themselves including the impact on the persons involved, whether the suspects or victims (Sukhothai Thammathirat Open University, 2013). The pressure from their superiors or other "dark powers" leads to discretion that does not follow the rule of law. According to the rule of law, police officers must enforce the law equally and fairly to all parties involved. The issue of discretion influenced by the said factors results in the police discretion in enforcing the law that is inclined to the party with high bargaining power, especially powerful groups with a superior economic status. They use such discretion in order to survive and be able to continue their duties without being punished or transferred to an unwanted police station. When looking at different perspectives, police officers have to manipulate things

in order to survive the pressure of commanders and various forms of influence due to lack of protection mechanisms both in the matter of regulations and to satisfy the supervisors. They also lack protection from society. These factors, therefore, has led to the prevalence of a "scapegoat" in the Thai justice system.

Another root cause of the problem is the collection of evidence to prove the guilty of the suspects. This is a breach of the justice process in the police level. According to this system, other evidence indicating that the suspects had not committed the offense will not be brought into the investigation report. In addition, witnesses who provide information conflicting with witnesses indicating that the suspect committed the crime will not be included in the investigation. This shows that investigation of a witness that provides abenefit to the accuse has been neglected. If there is an investigation, it is often conducted in preparation to refute the testimony of the said witness. This cause the accused to lack the opportunity to present the facts leading to the prosecution and wrong decision. When considering the authority of the investigating officers as stated in Section 131 of the Criminal Code, it clearly states that the inquirer must gather all kinds of evidence that can be obtained in order to find the facts and circumstances relating to the case as well as to find the true culprit. The law does not specify that evidence is to be collected specifically disadvantage parts for the accused (Sukhothai Thammathirat Open University, 2013). This indicates that the investigating officers do not use their own authorities to perform their duties correctly and completely. Therefore, there is a loophole that leads to the occurrence of "scapegoats" in the judicial process. Purikupt & Ketthes (2015) state that the inquirer must also gather evidence in order to prove the innocence of the accused because it will enable the true offender to be punished according to the law. If the police are able to proceed with the said steps with fairness, justice, and comprehensive evidence, it would help reduce the amounts of "scapegoats" in the Thai judicial process.

Finally, it is a problem that is not directly related to the duties of the police, but of the situation that occurres during the police investigation. It relates to the attitudes and views of lawyers who advise the accused not to testify during the investigation because he is afraid that he will lose the case. Such behavior will give the accused no opportunity to explain in order to protect himself resulting in the investigation report leaning in a direction that is harmful to the accused (Bunlue, 2017). Hence, modification of the attitudes of lawyers in these cases should be done urgently for the benefit of the accused directly.

Prosecutors

The prosecutors will scrutinize the investigation report submitted by the investigating officers by checking the completeness, quality, and accuracy of the report before considering filing a lawsuit or not. The problem is associated with the enormous amount of investigation reports to be considered by the prosecutors. This leads to careless and completely ignorance of the investigation reports. Most prosecutors tend to consider the reports sent by the investigating officer and do not search for additional evidence by themselves (Kotruang, 2001). Therefore, there is a miscarriage which led to the prosecution of the "scapegoat" accused in the case. The prosecutor's system provides opportunities for all parties, whether the victims or the accused can request justice to the prosecutor's office if there are problems in the process of justice or if there is an injustice occurring. This will be a warning sign to prosecutors to realize that the case is not a simple case but seems to be a complex case that requires careful consideration.

The main problem in the prosecutor level is the lack of legal authority to participate in the collection of evidence. This authority belongs to the inquirer or investigating officer while the prosecutor only serves to receive the inquiry file from the inquiry official after the investigation has been completed as appears in Article 140 of the Criminal Code. Therefore, if there is a defect of the inquiry official, the person accused in that case will immediately become a "scapegoat" in the judicial process because the prosecutor considers the order of prosecution or non-prosecution according to the evidence collected by the inquiry official (Purikupt & Ketthes, 2015).

Another important issue at the prosecutor's level is a principle of prosecution. It can be said that the principle of international criminal prosecution consists of two principles which are (1) Lawsuit principle; when the prosecutor has read and considered the evidence obtained from the collection of the investigating officers and then there are reasonable grounds to believe that the accused has committed an offense, the prosecutor will be responsible for filing lawsuit to the court in all cases. Once the order has been filed, it cannot be withdrawn (2) The principle of discretion; when the prosecutor has read and considered the evidence obtained from the collection of the investigating officers and then there are reasonable

grounds to believe that the accused has committed an offense, the prosecutors has the power to exercise discretion whether or not to sue the accused. In the case where the order has been filed and there are reasonable grounds, the prosecutors may withdraw the case, but it must be done before the judgment of the Civil Court (Sukhothai Thammathirat Open University, 2013). For Thailand, prosecutors will use the principle of prosecution at their discretion which may lead to a lawsuit against "scapegoat" in criminal justice process. Because the prosecutor does not consider the case carefully, it inevitably leads to the lack of important information or evidence to prove that the "scapegoat" is innocent.

Courts

The court is the last part of the judicial process causing "scapegoats". According to the law, the court has the power to demand additional relevant evidence. However, the amount of cases that come to court each year is enormous causing the court to not favor the use of its power but will mainly consider the evidence of the plaintiff and the defendant. This may result in the lack of determination to find out the truth. In practice, they perform the duty according to the law even though the issue of the case may not be true. Kotruang (2001) states that miscarriages occurring in the court are caused by the judicial discretion to judge offenses based on evidence collected by the police and have been scrutinized by the prosecutor.

The court has an important role in judging the case or to decide whether the defendant is guilty or not guilty. If considered that the defendant is actually guilty, the court will impose the penalty to the defendant. Therefore, the judgment of the case consists of two main points which are (1) Adjudication refers to judgment of whether the defendant is guilty or not and (2) Imposition; the court may use its discretion to determine six types of punishments which are capital punishment, imprisonment, confinement, fine, forfeiture of property, awaiting punishment or awaiting imprisonment (Sukhothai Thammathirat Open University, 2013). In practice, the court will consider evidence collected from the police. In the case of "scapegoats", most of the scapegoats denied wrongdoing if they are not intimidated and forced to confess to the police. Therefore, hearing witness of both parties is necessary. Although according to the law, the accused or defendant will benefit from the legal presumption "in a criminal case, it must be presumed that the accused or defendant is not guilty," but in reality it could have a mistake in the judgment because of creating evidence by the police and the screening of the prosecutor might lack of purity and justice from the beginning.

There are many criminal cases going to court each year causing the trial to be conducted in a hurry and lack of thorough consideration in the content of the case. According to the annual case statistics report 2016 (The Office of the Courts of Justice, 2017), there were 647,664 cases (new and pending cases) in the civil court in 2015. The number of cases slightly decreased in 2016 accounting for 634,796 cases. Although each year the Civil Court is able to proceed with the verdict of more than 93% but focusing too much on the target numbers may lead to neglect of the quality of the trial. As for the criminal cases in the Court of Appeal found that there were up to 39,113 and 36,821 cases in 2015 and 2016 while the capacity to judge the cases excesses 88%. According to the criminal cases in the Supreme Court, the number of cases in 2015 was 6,784, while in 2016 it was reduced to 6,313 in which the Supreme Court is able to complete the verdict by 75.75%. The situation illustrates the work burden the court must take which may affect the efficiency of the judgment of the case correctly and fairly. Hence, there is a chance that the "scapegoat" will be convicted of a crime since there is a lack of good monitoring due to time constraints and the amount of work.

Impacts on the "scapegoats"

The fact that a person is a "scapegoat" even though he has not committed a criminal offense but has to be punished on behalf of the real culprit affects the lifestyle of the "scapegoats" very much. The author summarizes several aspects of the impact as follows:

First, loss of freedom. Being a "scapegoat" causes a person to lose freedom in carrying out their daily activities because he is imprisoned in the correctional facilities. The opportunity to interact with people in society especially the family is greatly reduced. Pisit Suwanpim's words reflect the pain of losing freedom. He gave an interview to the media after having been proven innocent in a case of stealing diamonds worth over 15 million Baht and was held in prison for up to 7 months. He said it was .."like death and being reborn, throughout the period of 7 months and 10 days in prison, I believed that I had not committed a crime and must be judged with justice, I was in the prison with other criminals so it took more than 2 months to accept it" (Workpointnews, 2017).

Second, loss of reputation. Thai society is a society that is quick to judge other people without careful consideration. Although the various cases have not yet been finalized, a person who is accused or is a scapegoat has no opportunity to protect his dignity and reputation. This results in loss of his reputation which will ultimately lead to problems in daily life. For example, Bunleng Huatcharoen, the scapegoat in the case of the rape of a Danish tourist in Chonburi. He was imprisoned for up to 19 days. The police or government agencies did not disclose that he was not an offender. Then, the society labeled him as a bad person causing him to be unable to find work or to make a living. He said in an interview with the media that "on the day I was released, no one corrected the truth for me but the day they arrested me, they made a big statement. I am the victim of the media. When walking to the market, people always ask how I got out of jail? Have you escaped? Today I have been faced with a very difficult life without work, and no money to raise children. When applying to a job, no one acceptsmy applications because I was condemned as bad person. The most important thing is I would like a press release telling the truth to the society" (PPTV News, 2017).

Third, family relationship problems. The innocent has been accused and imprisoned resulting in problems of separation or relationships of family members that are worse until leading to dissociation in the family. For example, the case of Sombat Khunarsa, a 41 years old taxi driver, who was accused of jointly robbing a motorcycle in Pak Kret district Nonthaburi province. According to the actual situation, he himself was threatened and robbed by the real perpetrator on that day. Later, the Civil Court sentenced him to 15 years in prison and to indemnify for 42,000 baht. He was imprisoned to 2 years 3 months and 20 days while appealing the case. On 31 August 2010, the Court of Appeals therefore considered and dismissed the case. The prosecutor filed an appeal with the supreme court. Therefore, he had to fight the case again. Until February 21, 2012, the Supreme Court ruled in favor of the Court of Appeal. The case of Sombat Khunarsa resulted in a separation of his intimate relationship. He said to the media that "I have been in jail for more than 2 years without doing anything wrong. In the same period, I was also robbed by the robbers. However, I have gone through a bad time. Today, I have been working as a taxi driver with the hope that one day I will receive justice, fairness, and compensation from related government agencies. Previously, I haven't received any Baht to compensate what happened to me. I was imprisoned, separated, and my daughter had to move to a new school (Manager Online, 2014)." According to a study in Canada, miscarriages in justice process resulted in deteriorating family relationships (Campbell & Denov, 2004). This was also consistent with the study of Westervelt & Cook (2008) who found poor relationship among family members.

Fourth, economic problem. Becoming a "scapegoat" results in disrespect and is labeled as a bad person in the society. This causes many "scapegoats" victims to have a great economic impact. For instances, the cost of fighting to prove their innocence, travel expenses related to the case, including the lack of work opportunities to earn income to look after the family. Bunleng Huatcharoen' case has clearly reflected that the loss of freedom and being labelled bad by society obstructs an opportunity to get a job because the innocent victims of the judicial process have already been judged by society. Research on "scapegoats" in the United States also reflects the problem because after the "scapegoat" is released from prison, he will face problems in finding accommodation and job (Westervelt & Cook, 2010).

Fifth, safety issues of family members. In the case that a family leader has become a "scapegoat" in the judicial process, the family members lack strong leaders to protect themselves from social disorder, especially in the urban society. The Cherry Anne Duncan case is also a reflection of this problem. Krasae Ploykum, a scapegoat in this case, lost his wife while the daughter was raped and murdered. In addition, his son disappeared. This shows that the loss of freedom of Krasae caused him to be unable to fully protect his wife. He had no opportunity to protect his daughter from rape and was unable to look after his son to live happily in the society. The disappearance of Krasae's son may be related to the safety of life and property which Krasae didn't even have the opportunity to look after and protect him since he was imprisoned.

Sixth, physical health problems. The incarceration in a correctional facility where there is over-crowding, lack of basic utilities, unclean water, and poor air flow have a direct impact on the health of the inmates. In addition, the prisoners are unable to receive the basic rights that humans should receive. At the same time, the government budget shortage results in sick prisoners or scapegoats receiving insufficient care (Archavanitkul & Vajanasara, 2017). For example, the group of

"scapegoats" in the murder of Cherry Anne Duncan faced health problems. Chalerm died in prison due to a heart attack. Pitak and Phichai died of a deadly disease caught in prison while Krasae became disabled due to a fractured spine. These physical health problems were partly caused by the police investigation since the defendant or "scapegoat" was abused by the police to confess including being fettered for 24 hours (Isranews Agency, 2012). The case of Viroj Suwanee is another case of the "scapegoat" that was coerced by police officers to confess to the murder of the Chief Executive of Bang Rin Subdistrict Administrative Organization, Ranong Province. He was tortured with electric shock batons resulting in being unable to walk and having poor health (AmarinTV, 2017).

Finally, mental health problems. According to the case of Krasae, how he can live lonely in the society since he lost his wife, daughter, and son. How he can adapt himself to the changing social conditions. These are problems related to the mental condition of "scapegoats" that are severely affected and may cause some "scapegoats" unable to live life in society happily. A research in England on the impact of miscarriages in justice process toward "scapegoats" found that people who are "scapegoats" are affected with mental disorders. Staying in the prison for a long time causes the scapegoat to become familiar with the environment in the prison. When proven to be innocent and released back into society, these people will experience posttraumatic stress disorder ("PTSD"). They also had personality changes, depression, worry, antisocial, and using liquor or alcohol (Tan, 2011).

Human rights and the "scapegoats"

Under Article 3 of the Universal Declaration of Human Rights 1948 (UN, 2020), "everyone has the right to life, liberty and security of person." Article 10 of this declaration also states that "everyone is entitled in full equality to a fair and public hearing by an independent and impartial tribunal, in the determination of his rights and obligations and of any criminal charge against him." The International Covenant on Civil and Political Rights 1976 (UNHCR, 2020) also place importance on individual rights as follows:

1. Everyone has the right to liberty and security of person. No one shall be subjected to arbitrary arrest or detention. No one shall be deprived of his liberty except on such grounds and in accordance with such procedure as are established by law.

2. Anyone who is arrested shall be informed, at the time of arrest, of the reasons for his arrest and shall be promptly informed of any charges against him.

3. Anyone arrested or detained on a criminal charge shall be brought promptly before a judge or other officer authorized by law to exercise judicial power and shall be entitled to trial within a reasonable time or to release. It shall not be the general rule that persons awaiting trial shall be detained in custody, but release may be subject to guarantees to appear for trial, at any other stage of the judicial proceedings, and, should occasion arise, for execution of the judgement.

4. Anyone who is deprived of his liberty by arrest or detention shall be entitled to take proceedings before a court, in order that that court may decide without delay on the lawfulness of his detention and order his release if the detention is not lawful.

5. Anyone who has been the victim of unlawful arrest or detention shall have an enforceable right to compensation.

Thailand is a country that adheres to the universal declaration and the international covenant mentioned above. Therefore, the laws relating to criminal cases in Thailand are clearly defined basic rights of the accused. Firstly, the right to be presumed not to be the offender until there is a final judgment showing that the said person has committed an offense. Therefore, during the process of being accused in a case, he or she cannot be treated like an offender. Secondly, fundamental rights in the consideration process which is based on an open, accurate, speedy, and fair trial. Finally, fundamental rights to obtain protection and assistance from the government such as provision of attorneys to assist in the case.

Although the law provides basic principles for protecting the rights of the accused but in practice there are still problems causing the accused or "scapegoat" to not be treated and protected by the government with equality, fairly, accurately, and speedy in accordance with the established principles (The Office of the Constitutional Court, 2014). The mentioned problems are as follows:

1. Discrimination: In the case that the accused or suspects are poor, lacking educational opportunities, and having little legal knowledge, they will be discriminated by government officials and society in an unequal manner. These people cannot fully access or rely on the judicial process because the criminal justice process is complex, formal, and high cost. People need to know the legal process and procedures very well. Persons with

limited social status and knowledge are discriminated and their human rights are easily violated. For example, detention, intimidation, torture to confess guilty.

2. The criminal case being used as a political tool in the form of making an example of someone, such as the case of Pai Dao Din, a young political activist who was imprisoned for two years and six months for lese majeste and computer crime. However, the others who also share a biography of the King posted by BBC Thai on their Facebook accounts were not convicted or brought into the criminal justice. Therefore, it is considered the use of "scapegoat" as a tool to create fear in society. This indicates dehumanization which is against the human rights principles that considers every human being is self-worthy and has dignity. Hence, no one should be the "scapegoat" used as a political tool (Thaweesak, 2017).

3. Lawyer assistance issues. Although the law requires the government to provide lawyers to assist the defendants or the accused but the lawyers that government organizations provide for the accused are often new lawyers who lack experience, knowledge, and skills. As the government organizations lack sufficient budget, the government cannot provide knowledgeable, high caliber, and experienced lawyer to help the accused. This is different from providing a lawyer for the accused in the United States that the lawyer does not act on behalf of the individual but is acting on behalf of a government organization. Also, the lawyer in the USA has status and profession which are not different from prosecutors. Therefore, lawyers are highly skilled and experienced. They work to retain true justice for the people (Thailand Institute of Justice, 2015).

4. Media. Presentation of mainstream media and online social media has a great influence on the attitudes and thoughts of the recipients resulting in an urgent conclusion that the accused was actually the offender and quickly condemning the accused through various media. In addition, the accused then was unfairly discriminated against. The accused or "scapegoat" in the said case almost never has the opportunity to prove his innocence. However, making crime headlines to get more readers' attention will make people focused on the crime news. In addition, journalists and police will have a closer and more complex relationship because journalist need to have a good relationship with the police in order to benefit from obtaining information for their job. On the other hand, police have to rely on journalists to publicize to the public that police have been working on the case seriously (Lim, 2016). Sometimes, some police officers may use the media to distort the information of the case to benefit someone who have financial power.

The above problems reflect the fact that the accused or "scapegoats" in the judicial process were clearly violated of the fundamental human rights in the process of criminal justice. It is a problem that the government and related agencies of the judicial process must pay attention and take urgent action to solve the problem.

Reviving the "scapegoat" cases

The promulgation of the Resurrect Criminal Case for Reconsideration Act B.E. 2526 is considered a new phenomenon in the Thai judicial process. According to this law, the scapegoats will have the opportunity to prove their innocence. However, there are details and requirements to be followed (Liberties Protection Department, Ministry of Justice, 2017b):

Firstly, the case to be revived and reconsidered must be the case where the court has finally given the verdict to the "scapegoat" to receive criminal punishment. The punishment includes capital punishment, imprisonment, confinement, fine, or forfeiture of property. Hence, any cases under consideration of the judicial process cannot be brought to resurrect and reconsideration.

Secondly, the case that will be revived for reconsideration must meet one of the 3 conditions as follows:

1. The witnesses in the case to be resurrected were judged by a final judgment that the testimony of the witnesses was false or inaccurate. This means that the witness must be prosecuted for false or inaccurate testimony first which requires considerable time in the trial.

2. Evidence other than personal witnesses has been sentenced that it is a fake or inaccurate evidence. In this case, it is quite similar to the first case as that there must be a prosecution in the former case whether the abduction of evidence is false and the court has ruled that the evidence in the case is fake and not consistent with the fact.

3. There are new witness, evidence, or any other material evidence. However, the said evidence must not be referred to or be a witness examination of the same case. The new evidence must not be evidence that exists before. For example, relatives, siblings, and neighbors who have not come to the evidence examination of the same case. Most importantly, the new evidence must be

important enough to change the previous sentence.

Thirdly, the person who has the right to request a resurrection of a criminal case consists of:

1. Persons subject to criminal penalties by final judgment.

2. Legal representative in the case that the person who is subject to criminal penalties is a minor or an incompetent person.

3. Manager or other representatives of the legal entity.

4. Parents (parents, grandparents), descendants (children, grandchildren, great-grandchildren,), husband or wife that have a legal registration of marriage for cases where a person died before the petition is submitted.

5. The prosecutor who is not the plaintiff in the original case.

Finally, the period for requesting to renew the criminal case must be completed within 1 year from the date of facts appearing or within 10 years from the date of the final judgment of the original case. In the case of the lapse of 1 year and 10 years, it is up to the discretion of the court to accept the request and the request can be submitted only once. This is different from other foreign justice systems that the request can be submitted more than 1 time.

Thailand has the law that allows judges to file petitions to revive criminal cases but the complaint or request can be submitted only once as well as having quite a number of practical problems. For example, the rules for consideration of requests are strict, and the judge must rely on himself to find a lawyer and new evidence. Although government agencies will provide lawyers, the lawyers provided by the government are mostly lawyers who lack experience in litigation. In addition, the majority of the offenders or scapegoats are people with low incomes and poor status. Therefore, they lack understanding of the details of the law causing most of the court to dismiss the petition (Dittharoen & Amornsilsawat, 2017). After the said law came into effective in 1983, a total of 29 cases had been requested for resurrect and reconsideration. However, the court dismissed all petitions (Wichitwejakarn, 1984).

Another practical problem is related to article 6 (2) of the Resurrect Criminal Case for Reconsideration Act B.E. 2526. It clearly specifies protection for the minor and the incompetent and gives power to the representatives of the minor and the incompetent to file a petition to revive the criminal case. However, in the case of a quasi-incompetent person, that person will have to file a complaint in person or may request the prosecutor to file the case instead. The person is not able to have his own representative to submit the request resulting in inconvenience to such person. Article 6(4) of the law also causes practical problems and is still inconsistent with the changing social and economic conditions of the country. The said section states that in the case that a sentenced person has passed away, the person who will be responsible for filing a petition to renew the criminal case must be parents, descendants, husbands or wives of the convicted person only. However, in the case of a single person whose parents have died, no person or representative can file a complaint. Hence, reviving the case cannot be proceeded to preserve the image or reputation of other people who are affected by the judgement of the court (Leungrattanacharoen, 2005). The Bangkok Business Newspaper (2014) also stated that the Resurrect Criminal Case for Reconsideration Act B.E. 2526, enforced for more than 30 years, cannot actually be enforced.

In the author's perspective, the court dismissed all the petition filing to revive a criminal case for reconsideration results from conflict of thought between implementation of the justice process with purity, fairness, and equality and the court image. If many cases are resurrected and clearly proves that the verdict is truly innocent, these will have a severe impact on the credibility of the court and the justice system as a whole. Reviving the case to prove the innocence of the "scapegoat", therefore, is quite difficult under the laws and customs of the Thai justice process.

Compensation for the "scapegoats"

Compensation provided for the "scapegoats" which have been proven innocent in Thailand is considered as "less than it should be" as compared to general international standards. According to the Damages for the Injured Person and Compensation and Expense for the Accused in Criminal Case Act, B.E. 2544, it specifies the compensation as follows:

1. General cases: For general cases, the financial compensation includes the payment of 200 or 500 baht per day that is calculated from the date of detention at the rate stipulated by law, medical expenses resulting from legal proceedings as actually paid but not more than 40,000 Baht, the cost of physical and mental rehabilitation as actually paid but not more than 50,000 Baht, the lack of benefit from the date of inability to

work will be paid by the minimum wage in the area where the defendant lives, the attorney fees actually paid depend on the type of case that the law requires, other expenses in litigation that are actually paid but not more than 30,000 Baht, and room and food expenses during the medical treatment which are not more than 1,000 Baht per day.

2. In case the defendant has died, the compensation includes financial compensation of 100,000 Baht, funeral expenses 20,000 Baht, maintenance expenses not more than 40,000 Baht including other damages, such as compensation for mental rehabilitation of descendants not more than 40,000 Baht.

According to the compensation statistics during 2014-2016, there were over 200 payments for "scapegoat" remedies totaling over 40 million Baht. In 2014, 110 cases were paid (23.5 million Baht), 45 cases (7.7 million Baht) of 2015, and 60 cases of 2016 (10.3 million Baht). Even though the government has paid a certain level of compensation but what the defendant received in cash was considered very small and no one wanted to face this kind of situation since he was imprisoned, lacked independence to be with children and wife, lost income, lost reputation and image which finally may lead to the failure of that person's life (Sudsao, 2017).

Policy recommendations

The situation of the "scapegoat" problem in the justice process has resulted in a "crisis of faith" to the Thai justice system. Therefore, it is very important that the government, including relevant government agencies, to find ways to solve problems in order to maintain fairness for people in society equally and equitably. In this article, the author suggests several ways to solve the "scapegoat" problem in the Thai judicial process as follows:

First, the concept of alternative justice should be applied in the judicial process. This concept places importance on the role of communities to participate in the criminal justice system. Nowadays, the mainstream justice process has encountered many problems causing the people to lack confidence in the judicial process, and finally becomes a "faith crisis" against the criminal justice system. Asawanon (2012) said that applying these principles will help "scapegoats" in the judicial process to receive fairness. In addition, this will help in reducing the amounts of offenders in correctional facilities. It also helps to reduce the "over-crowded prison" problem that Thailand is experiencing.

Second, the introduction of modern technology in the justice process. For example, using modern technology to record testimony that shows both images and sounds. Adopting audio-visual technology can help in solving problems of human errors which will directly benefit the accused. Normally, the police record the testimony by themselves so there may be a discrepancy in the message. Although the audio-visual technology has been employed in the Bankruptcy Court for over 10 years, but the technology has not been widely used in the Criminal Court. Using video in recording the testimony helps to reduce staff mistakes very well. Most importantly, the prosecutors and judges can see emotional images and listen to the voice of the accused which are more realistic compared to just reading the report.

Third, the structural reform of the Royal Thai Police which allows investigative officers to have an independent role from the interventions of political parties and high ranking supervisors who have a close relationship with the real offender. In addition, career development plans should be established for these investigative staff to have more opportunities for career advancement than they currently do. This will create job motivation among investigators and recover the dignity of those who really want to work for social justice. However, if unable to do so, establishing the Investigation Bureau as an independent department should be considered in order to have roles and duties which show professionalism. Furthermore, there should be capacity development of those investigative officers to be experts without transferring to other areas of work.

Fourth, modification of the lagging law to be more modern by providing the authority for prosecutors to participate in investigations in order to obtain accurate evidence. It will encourage the collaboration between the two agencies which will help prevent the creation of false evidence to condone "scapegoats." It is like working together, but there is check and balance of each party's actions to not proceed in an unlawful manner.

Fifth, the use of forensic evidence to help prove the facts. The problem in the murder of Cherry Anne Duncan is a major turning point in the performance of the police since it results in prudence in the mapping of the incident, more systematic evidence collection at the scene, and the use of forensic evidence used to prove the wrongdoing of a person.

Sixth, changing the policy regarding “scapegoat” remedies without focusing on money but should focus on the mental rehabilitation of the "scapegoats" that are released into society. These people who have been in prisons for a long time may be socialized by the environmental conditions in the prison. This will shape their personality, thinking, as well as attitude towards society, government officials, including people in the community. In addition, professional skills should be promoted so that these people can have work to earn their own living to support their family members. At the same time, monetary compensation or remedy should be adjusted in line with current economic and social conditions.

Finally, there should be intense punishment for officials performing their duties with a lack of prudence, morals, and work ethics. This is to prevent these officials from performing their duties regardless of the impact on the lives of innocent people and to eliminate bad officials from Thai society. Hence, the image of the Thai judicial process can be restored.

Conclusion

The problem of “scapegoats” in the Thai justice system has been deeply rooted in Thai society for a long time. The Cherry Anne Duncan murder is a turning point in Thailand. The police, prosecutors, and the court nowadays have to focus on making investigation report, screening the report, and judging the case with prudence. However, there are still “dark influences” or other factors that cause the “scapegoat” problem to be seen in Thai society. This problem has a severe impact on the mental, physical, economic, and social conditions of the “scapegoats”. Therefore, government agencies should turn their attention to these problems urgently because it is a problem that affects the fundamental human rights of the people which Thailand is one of the countries that have to comply with the Universal Declaration and the relevant international agreements. People who are involved in driving the policy, should pay more attention to this problem and put this as an urgent agenda to reform the Thai justice system. Then, the credibility and image of the Thai justice system could be restored by treating all people equally, equitably and fairly.

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Logistics and Supply Chain Management of Water Chestnut Farmer Group in Suphanburi Province

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Abstract

This study focused on the development and community participation to improve farmers' ability and utilization principle. Effective integration of logistics and supply chain management, Supply chain among farmers, products were collected in Wang yang District, Siprachan District, Suphanburi Province. The purpose of this study was to study the relationship of supply chain, middlemen, and supplier. According to the requirements of customers, the factory provided high-quality raw materials, timely delivery and safety. Problems and obstacles in the supply chain are noted. This study used qualitative method - in-depth interviews and observation methods to study the correlation of the chain. The supply chain is the raw material supplier, middlemen, and the collection of products delivered to the factory based on demand. SCOR model is the theoretical model of the supply chain operation reference model in order to ensure high-quality raw materials, on-time delivery and safe use. The qualitative data were employed to develop questionnaires in order to determine the form of communication to create awareness about of identity water chestnuts in Suphanburi Province.The 400 samples were obtained by female, 250 representing 62.50%, Male 150 representing 37.50% of age range 21-30 years, 144 people representing 36.00% of the profession, trade, or employed 108 people, representing 27.00% of the graduate. BA 152 people, representing 38% and have been known to communicate frustration. Plants identity of the offense 250 percent from 62.50% a form of communication that creates awareness about frustration. Plants identity of the province as a whole is at the highest level ($\overline{X}$= 3.86, SD = 0.75) the findings show the need for the water chestnut to be recognized through internet/social media and is ranked No.1 method to create awareness. The second method to create awareness is through the mascot.

Introduction

Regarding to non-cycle dynamic of the current economic and social volatility, new things developed rapidly that destroy our mundane habits. The human is rushed by external environments which impact on the industries sector and SMEs business, including manufacturer and consumer. In each business activity, it is a chain reaction. For example, when impacting a loop,

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it affects the whole system. Thailand's economy is based on the directions of the National economic and social development plan No. 12 (B.E.2560-2564), a continuity with the original vision of development plan No.11 framework for planning that embraces the philosophy of sufficiency economy. Sufficiency economy philosophy is focused on people as the center of participatory and balancing the development and sustainability. The vision of the development plan in No.12 has an emphasis on development orientation towards transition of Thailand from a middle income country to a higher income country (4.0), leads to long-term plans (20 years) "Stable, Prosperous, Sustainable" which focus on valve-driven and innovation digital.The development must focus on agriculture in order to make people in the agriculture sector gain higher income.

Thailand is an agriculture country (with 70 % of the land being) used to grow agricultural products. The major occupation or 79% of population are employed in the agriculture sector. Suphanburi Province is well known in producing water chestnuts. The farmers are mostly located in the Tum bon Wang Yang and Mod Dang Districts. Suphanburi Province is located in the central region of Thailand where the Tar-Chin River flows through from north to south. The total area of Suphanburi is about 3,348,755 rai which are mostly flatland, and used for agricultural 2,315,389 rai, (Office of agriculture Economics 2016). The soil condition is suitable for farming such as rice farming, plants and fruits. Suphanburi requires the natural water used in agriculture including Tar Chin river,Kra Saungcannal, KlongJarakae-Samphan and other water sources. The 5 major economic plants are rice, sugar cane, mango, water chestnut and cassava (Suphanburi Province Agricultural and Cooperative Office, 2009)

Figure 1 below shows the supply chain structure for this study of water chestnut farmers and processors citation It can be noted in figure 1 the flow of data from farmers to consumers and that 80% of harvest yield is sent to middlemen with a quota system. Middlemen will buy raw water chestnut, hire peeling workers then deliver to the canned factory, small boiler and then deliver to Bangkok and elsewhere. The 15% harvest yield belongs to the processing group including community enterprise group, Wang Yang Cornflakes group with 5% delivered to retailers and local shops. From the current crop about 2,000 rai estimated yield 5 tons per rai, purchase price of raw water chestnut is 160 Baht/15 Kilogram the value is estimated at 42,666.67 Baht/rai, production by season 2,000 rai the value is pre season about 85,333,340 Baht.

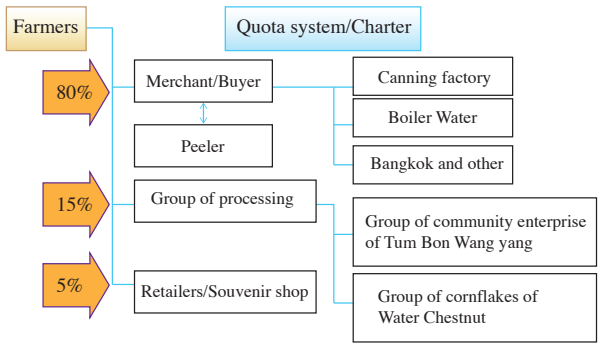

Figure 1 Supply chain structure of water chestnut by the production group

In addition, the research results from the field and in-depth interviews found the cost of each activity of the process is about 30,000 Baht/rai and important issues for farmers is the need to gain knowledge regarding reduction of chemicals used in order not to destroy the environment and farmers want support in processing including the distribution channels from the government.

Head waters: The farmers need support for plant species from the original plant species to buy seeds from China. Currently there is no support in Thailand. The source of funds is sought from informal funds because farmers do not qualify for loans from financial institutions.

Middle water: The knowledge of reducing non-destructive chemicals. The farmers are well aware of the impact of chemical fertilizers but there is no knowledge of how much organic fertilizer is used to produce the same quality as the chemical fertilizer and the head of fresh is not worth the cost. The farmers want higher prices when costs rise or the price insurance is similar to rice farmers.

End waters: The knowledge of processing is still small including distribution channels is limited to 2-3 merchants and to the area 3-5 times, it was found that the water chestnut is not widely known as a kind of plant. That is the identity of Suphanburi Province, with Geographical indication (GI).

However, considering the problems of the farmers and the processing group found that the price is the main issue. Acknowledging the competitive advantage there is only one source in Am Phoe Sriprachan, Suphanburi Province. By comparing planting in other areas such as

Kanchanaburi, Uthaithani the yield and quality are not as good as Suphanburi. This is due to Suphanburi Province having a suitable soil layer for growing water chestnut in terms of increasing the market value. There is a need to create awareness for customers to accept the brand and pay a higher price.

Objectives

1. To study the links in the supply chain between farmers raw product suppliers, and processed manufacturers in Wang Yang, Phoe Sriprachan District, Suphanburi Province.

2. To study the relationship in the supply chain of raw material and middlemen who supply the selected raw water chestnut to the factory according to customer needs in order to deliver the best quality raw materials, on time and safely.

3. To study the problems and difficulties of the water chestnut supply chain in Wang Yang, Phoe Sriprachan District, and Suphanburi Province.

4. To determine the form of communication for increasing awareness of water chestnut identity in Suphanburi Province.

Conceptual framework

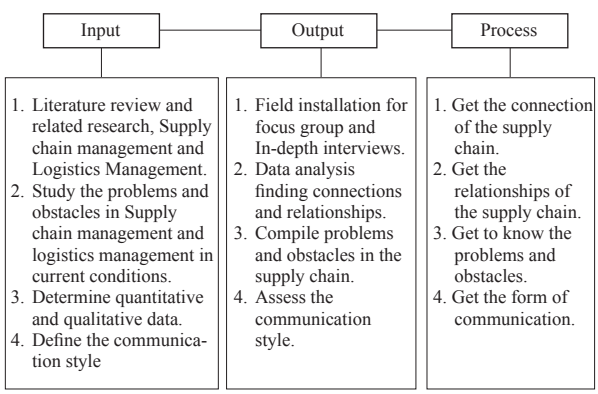

Figure 2 Conceptual framework

Research methodology

Population and samples

1. Qualitative research was conducted in order to explore the overall processes of the supply chain. Informants were selected only 1 person from each agricultural group in order to understand their experience and knowledge in regard to water chestnut production. In total, 34 people in Wang Yang, Sri Prachan District, Suphanburi Province were included in this study.

2. Quantitative research was also employed to understand how the identity of water chestnut in Suphanburi Province can increase awareness with consumers. The sample size used for this study was calculated by using a Hakone-based formula offering a confidence level of 95 percent. The data was collected by 400 questionnaires in order to determine the form of communication to increase to awareness about the identity of water chestnut in Suphanburi Province.

Research instrument

1. In-depth interview: the researcher collected the data of the growers, producers, entrepreneur and stakeholders using in-depth interview technique. The use of open-ended questions along with the telling story, the interviewees were relax and a friendly feeling with researcher was developed. The data from the interview consist of information about the input, process and output, and also, the problem and barrier within the supply chain.

2. Participated observation: the researcher closely observed the process of water chestnut seeding, planting, maintenance, harvesting, delivering, and peeling additionally, the study also explored the linkages in the supply chain between farmers group, processor to the entrepreneur.

3. Taking note: the researcher recorded all interviews carefully in order to get the data ready and reliability for analyzing the whole process of the supply chain. This also included suggestions and notices which the farmer required. The data were employed to synthesize systematically and carefully.

Collection of data

1. The researcher coordinated with Sergeant Anan Suankuhrap, the chairman of the board of Water Chestnut Production Group, for permissions and cooperation in collecting data with the farmers, entrepreneur and stakeholder of this research. Sergeant Anan Suankuhrap gave advice, knowledge of academic principles and integrated development concepts for trainees.

2. The researcher coordinated with farmer groups in Wang Yang, Phoe Sriprachan District, Suphanburi Province for clarifying the purpose, operating procedures and cooperation in this study.

3. Field data collection was conducted by in-depth interview and participated observation to meet objectives of this study. Quantitative research was also employed to discover the awareness process of consumers toward the identity of the water chestnut,

Suphanburi Province.

Data Analysis

In this qualitative analysis is a process of data analysis.The questionnaire, recording, interviews and participated observation were implemented. By implementing the data to follow the steps of qualitative analysis of farmer groups and entrepreneur in Wang Yang, Phoe Sriprachin District, Suphanburi Province, the researcher studied the supply chain process of water chestnut from the farmers groups who are related with the products from seeding to delivering to customer.

In this study, the researcher selected the area Wang Yang, Sriprachin District, Suphanburi Province as a place to study the logistic and supply chain management of the water chestnut farmer group, Suphanburi Province. Because it is the area where most farmers can cultivate more effectiveness than other sources in Suphanburi Province. The researcher took the data from in-depth interviews and participated observation, and also questionnaires to analyze in order to answer the 4 objectives.

Results

Objective 1: The links in the supply chain between farmers group, collectors to processor of water chestnut in Wang Yang, Sriprachan District, Suphanburi Province. The beginning in the supply chain of water chestnut has been changed from the traditional Supply Chain to a Modern Supply Chain as shown in Figure 3 below.

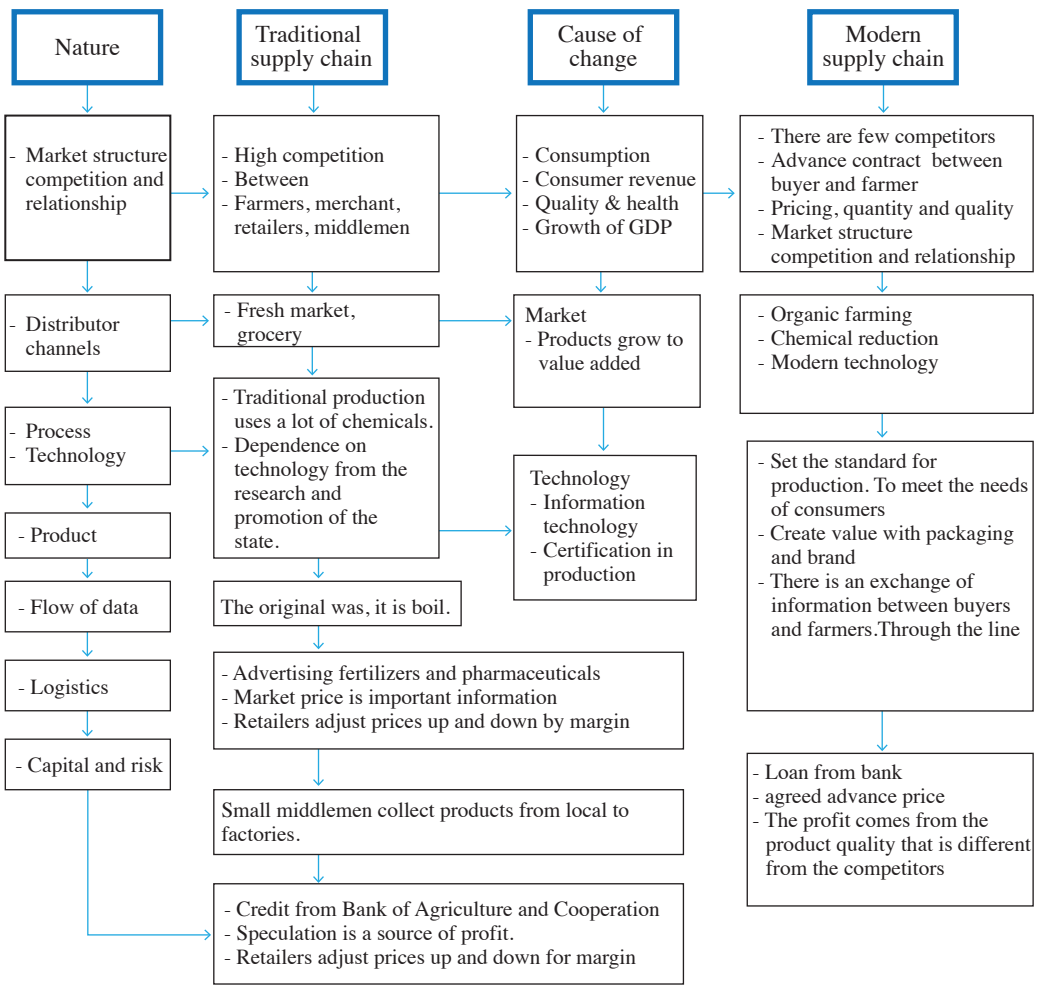

Figure 3 Changing the supply chain of water chestnut

In Figure 3, it is shown that traditional farmers focus on supply side. Farmers plant without knowing the market demand, how much does the market need? Mostly, they face problems with oversupply of products which they cannot sell. From the modern supply chain, farmers focus on demand, and their productions are based on market demand or intermediators'plan. From traditional marketing structure, processed products are highly competitive both for middlemen and for merchants. Within the modern supply chain, there are plans to sell products in advance between buyers and farmers. The quantity and quality are determined as well as the price. Because the growth of the market and information is important to the market mechanism. When the factory is planning the demand for raw materials in the long run, it is necessary for the collectors to find enough raw materials for meeting the production requirement. The collectors need to make relationship and contact with farmers in order to make a contract with the farmers in terms of quantity of annual raw materials. The systematic planning of all activities in the supply chain begins from the factory demand forecast that is communicated to the collector and it is finally informed to the farmers. When the farmers know the quantity of requirements and the inputs, questions are raised in this situation such as; Is there enough land to plant water chestnuts? If there is not enough land, where can they rent cropping area? How much can they increase its volume? Are there enough workers? If not, where can they find workers? Is there enough funding if not, where can they access a source of funding? The concerns also include tools and equipment used in the production process. In part of the production process: Is there enough water to grow? Amount of fertilizer and care throughout the plant lifecycle. The last concern is whether the output is enough to make a pre-contract with the collector. If not, to meet the requirement, how should they manage the risk?

The input: Farmer factor: Most have their own growing area and learn from the elders allowing the water chestnut farmer to create outstanding water chestnut produce and to become expert in water chestnut farming.

- Raw material factor: The cultivars are from China and the seedling and planting method is similar to rice farming. The Sriprachan District soil condition is suitable for planting water chestnut. When planted, it will be combined in the ground which is convenient to harvest and the source of water used for cultivation comes from an irrigation system.

- Investment factors: Most farmers use the revenues from the previous year to invest in production for the current year. However, some farmers who have insufficient funds will seek loans from non-financial institutions with high interest rates, because only a small number of farmers are qualified to apply for a loan from the Bank for Agriculture and Agricultural Cooperatives, the government financial institution.

- Production tools factor: There are tools for general agriculture such as hoe, swarm, pump, lawn mower, insecticide, pushcart, etc. A machine was used to drop seeding in the planting area. The harvesting process is only done by labors.

- Operation management factor: The farmers have a management plan. They are experienced in adjusting crop time and harvest to suit the climate.

In process: Cultivating crops requires water at all times after planting 7 days. After 1 month, the insect and fungus are pesticide every 10 days. After 2 months, farmers apply fertilize by using the fertilizer mixes of 13-13-21 50 kg/rai. At the end of 2 months, farmers will spray fungi and insect pesticide and add hormone every 7 days. This process lasts for another 5 months. After 3 months, farmers will use fertilizer which mixes 13-13-21 and 0-0-60 intergraded 2/1 rai of 200 kg, every 15-20 days for 3 months.Insecticide is applied on the ground once a month. After 6-7 months, farmers will start harvesting.

Output: The water chestnut harvest period is 6-8 months after planting. If more time is allowed the output will be rotten.The harvesting method can be done by stepping into a lump, using the hands to the base of the water chestnut plant, putting in the basket, and soaking for 1 night.The harvesting method is done by hiring workers for 70 baht a bucket. Middlemen will buy the water chestnut in the quantity, quality and price as stated in the signed contract.

In the field work for this study, the collaboration between researcher and the collector group designed a modern supply chain that is related to all production activities from upstream to downstream and internal performance in the supply chain.

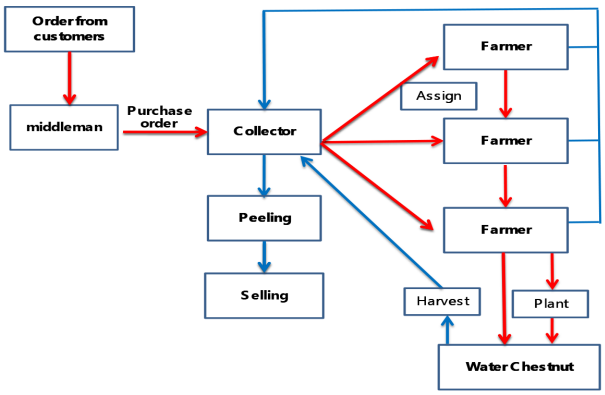

Figure 4 Operations in the modern supply chain

In regards to figure 4, the researchers found that the stakeholders in the process of operation in the supply chain; from the customer demand toward products, followed by issuing purchase orders to the middlemen. The middlemen have to plan production, and send the purchasing order to the collector. The collectors have 2 duties: Firstly, the collectors go to many farmers to get the orders from customer and to make a pre-contract with the farmers. The farmers have to plan from planting to harvest. The farmers plant water chestnuts according to standard and quantity agreed to with the collector. Secondly, when the collector receives the water chestnuts from the farmers, all of them will be sent to the peeling stage before selling to the market. Any water chestnuts left will be delivered to the middlemen. However, we can see that the stakeholders in this picture lack the delivery, which is the key. However, the delivery is a flow of data that begins with placing the purchase order from the customer to growers. The delivery process uses the arrow signs as a flow of inputs, production process and output.

Table 1 Qualitative changes from traditional supply chain to modern supply chain

Traditional Supply Chain	Modern Supply Chain
1. Farmers do different things.	Farmers are sharing with each other.
2. The middlemen are the pricing.	Price is negotiable.
3. Use Chemicals.	Reduce the use of chemicals
4. The process is the same.	Reduce the work process.
5. High risk.	Risk management.
6. Growth by the environment.	Sustainable growth.
7. Lack of trust.	Trust.
8. Overproduction, produce less.	Manufacture according to market demand.
9. Source of fund out of the system.	Source of fund in the system.

Table 1 presents what the researcher has discovered as qualitative changes from traditional supply chain to modern supply chain and is discussed as follows:

1. The traditional model is also different people follow their elders. The modern model is sharing information exchanges with each other in order to receive new knowledge of models used in production.

2. The traditional price was determined by the middlemen. When the modern change is made the price is based on the market mechanism with future contract.

3. When the yield decreases, the fertilizer is added to the chemical. The modern organic fertilizer is mixed in the cultivation.

4. Steps to produce the same as the inheritance. The modern data flow in the production factor reduces the down time.

5. The traditional planting is risky due to the climate change and flood that can cause the product to be unavailable. The modern planting needs to incorporate risk management in terms of price and crop insurance.

6. The growth of business is based on the economic environment. The modern growth from sharing allows for higher sustainable.

7. In the traditional, there was a lack of trust among stakeholders. In the modern trust is important to accumulate for long term relationships.

8. The traditional planting was planted along the same steps with uncertainty; sometimes large harvest and sometime less. The modern planting is based on customer orders, then produce according to the market demand.

9. The traditional source of capital is from high interest loans. The modern is produced by orders; therefore, they can be guaranteed by the government financial institution.

Objective 2: To study the relationship in the supply chain of water chestnuts to supplier of raw material, middlemen and collectors. The selection of water chestnuts delivered to the factory, according to customer requirements for producing the best quality raw materials on time and safely.The researcher has collected data from in-depth interviews of the supplier according to customer's order that causes the operation to be effective in supply chain management. The farmers create systematic plans to solve operation problems in the supply chain with Supply Chain Operation Reference or SCOR Model. This is a tool to help in the development of a supply chain, because the SCOR model was developed in order to describe characteristics and

The Supply Chain Management is important to the flow of raw materials and the data related to business operations in terms of efficiency and effectiveness. The Supply Chain Operation Reference or SCOR model is a tool for production management to balance the work process. In this process, it focuses on the production process of farmers in Wang Yang, Sriprachan District, Suphanburi Province. The SCOR model is composed of 6 activities. (1) Plan (2) source (3) Make (4) Delivery (5) Return (6) Enable.The SCOR model can describe the relationship in the supply chain of farmers as follows: (1) Plan, it is a plan to balance between demands and supply according to the need. It is a plan for farmers to plan factor inputs such as; planning to buy fertilizer, process planning, treatment, water source and output planning; (2) Source, procurement of raw materials used in cultivation to meet the needs of the plan. It also needs to maintain the relationship of the procurement process with other parts in the supply chain. The procurement must be accurate for example, do not wait for raw materials to run out ensure to buy sufficient amount of water chestnuts, the land lease is suitable for cultivation, the ability to buy standard quality fertilizers that is certified by a reliable agency; (3) make: the process of changing raw materials into products. In this definition it is the head of Water Chestnut Group ability to plant more crops. At this stage it is an important step to ensure the quantity and quality according to market demand. That is, farmer must have a new production understanding of how to change their behavior; (4) Delivery, the process of product delivery to the collector passed to the middleman based on the order from customer who has the contract that has been agreed upon in advance and delivery time is clear; (5) Return: the process that involves activity in each step to ensure there are no return of goods due to unacceptable quality.It is important that information should be recorded regarding returns and to note what caused the returns in order to ensure it does not happen again. And (6) Enable: it is smooth running processes include related activities beginning from input, process and output as well as risk management.

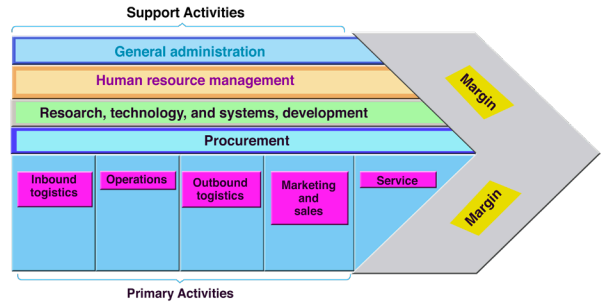

Figure 5 Supply chain management

In Figure 5 a theory of Supply Chain Management is shown. The division serves as a support and main line. The support line consists of (1) The management and planning strategies; (2) Human Resource Management HRM and HRD are important factors in the work; (3) Technology is dominated over competitors by digital information which helps to facilitate smooth operation; (4) Procurement is the procurement of correct and right material. The main line consists of (1) Raw materials procured for production (2) Process (3) Finished goods are kept in a warehouse; (4) Marketing and Sales: The selling of finished goods; and (5) Service, The product requires after sales service, it must be monitored and establish relationships with customer continuously. These concepts are derived from theory, and researcher has adopted the form of SCOR model as a tool to analyze the relationship in the supply chain of water chestnuts to supplier of raw material, middlemen and collectors' selection of water chestnuts delivered to the factory, according to customer requirements for the best quality raw materials on time and safely.This process focused on planning and logistics management in all relevant activities for developing excellence throughout the supply chain.

Although SCOR Model is referring to operations in the supply chain of water chestnuts, it is an administrative tool used to improve the efficiency of the supply chain. To bring SCOR Model to use for the water chestnut farmers in Wang Yang, Sriprachan District, Suphanburi Province successfully, there are important factors such as risk management, ability to make decisions and solve problems and discipline of agricultural group in Wang Yang. The process begins with farmers, supplier, entrepreneurs and transporters that need to adjust for growth and importantly to meet the needs of the consumer.

Objective 3: To study the problems and barriers in the supply chain of water chestnuts in Wang Yang, Sriprachan District, Suphanburi Province is discussed as follows:

Production factor: (Input)

1. The funding investment must come from non-financial sources system because famers are not qualified for loans from the financial institution; therefore, the interest rate is at a high rate.

2. Lack of workers on the farm; therefore, farmers need to hire foreign workers, but this is a problem of new labor law the farmers have no management fee.

3. The changes of traditional to the modern system are gradually, there is no quick change because the behaviors of traditional farmers are conservative.

Production process: The maintenance care is mainly about plant diseases and pests. Water is not a problem in planting water chestnuts because there are many sources of water in Sriprachan District.

Harvesting (output): When harvesting, the middlemen will buy volume and price agreed in advance based on the contract. If products are not sold within the end of the day, it must be soaked in the field to maintain quality or inventory. It will not be stored more than 3 months because it will not qualify for the market. Another issue in the problem of middlemen who are influential in the area and have created a monopoly among a few groups.

Objective 4: For determining the form of communication to create awareness about the identity of the water chestnuts from Suphanburi Province.The results of the data were analyzed from questionnaires in order to define communication to create awareness about Water Chestnuts identity of Suphanburi Province. Under research "Logistics and Supply Chain Management of Water Chestnut farmer group" in Wang Yang, Sriprachan District, Suphanburi Province" The result of the data analysis is divide into 2 parts.

Part 1: The results of general data analysis of the individual factors of the respondents.

Part 2: The results of satisfaction of the formulation of communication to create awareness about water chestnut identity of Suphanburi Province.

Part 1: The results of general data analysis of the individual factors of the respondents.

Table 2 General information of the respondents.

Personal Information	Volume	Percent
Sex		
Male	150	37.50
Female	250	62.50
Total	**400**	**100.00**
Age		
Lower 20 y	90	22.50
21-30 y	144	36.00
31-40 y	110	27.50
41-50 y	30	7.50
51-60 y	26	6.50
60 y Over	0	0.00
Total	**400**	**100.00**
Career		
Government employee	36	9.00
Trading	108	27.00
Agriculture	0	0.00
Employees	98	24.50
Hire	50	12.50
Student	90	22.50
Not working	18	4.50
Etc.	0	0.00
Total	**400**	**100.00**
Education		
Lower secondary school	54	13.50
High school	95	23.75
Vocational education	69	17.25
Bachelor	152	38.00
Master/Dr.	30	7.50
Total	**400**	**100.00**
Have you ever heard of communication of water chestnut identity of Suphanburi Province?		
Know	250	62.50
Unknown	150	37.50
Total	**400**	**100.00**

Table 2: The results found that most respondents were 250 women (62.50%), 150 men (37.50%). Most aged in 20-30 years 144 persons (36.00%). Most engaged in trading 108 persons (27.00%). Most are graduates are 152 persons (38.00%) and they were aware of the communication of water chestnut identity of Suphanburi Province 250 persons (62.50%).

Part 2: The results of the satisfaction of the formulation of communication to create awareness about water chestnut identity of Suphanburi Province.

Table 3 The results found that communication to create awareness about water chestnut identity of Suphanburi Province

List what do you think the formulation of communication through which media to create awareness about water chestnut identity of Suphanburi Province?	Average	Standard deviation	Translate	Rating
1. Brochures	3.76	0.95	Very much	4
2. Mascot	3.94	1.15	Most	2
3. Newspaper/Magazine	3.67	1.10	Very much	5
4. Internet/social media	4.53	0.72	Most	1
5. TV/Radio	3.35	1.02	Very much	6
6. AD/PR in travel Suphanburi	3.90	1.03	Most	3
Included	**3.86**	**0.75**	**Most**	

Table 3: The results found that communication to create awareness about water chestnut identity of Suphanburi Province in the highest level (X = 3.86 S.D= 0.75) and when considering the item, it was found the internet/social network has the highest and the next is mascot.

From objective 4 for determining the form of communication to create awareness about the identity water chestnut in Suphanburi Province, as mentioned in table 1 it found that most were aged at no more than 30 years, the new generation (57%) are a student and trading (50%). They do not know the water chestnut as an identity of Suphanburi Province and from the questionnaire, there are know the Water Chestnut is an identity plant, up to 62%. This is show that the new generation is well recognized. The result in table 2 shows the need for the water chestnut to be recognized through internet/social media and is ranked No. 1 method to create awareness, 4.53 from the average.The need for internet/social media is reflected in the high rate because in the present day the Smartphone can be viewed anywhere, anytime. It is major venue of creating awareness for the water chestnut. The second method to create awareness is through the mascot 3.94 from the average.

In addition to the formulation of communication to create awareness about water chestnut identity of Suphanburi Province, the researcher wrote a letter to the District Administration of Wang Yang, Sriprachan District, Suphanburi Province to inform that the public needs to see the water chestnut on internet/social media in order to create awareness.

Discussion

Research on "Management of Logistics and Supply Chain of farmers in Suphanburi Province" is discussed as follows:

1. To learn about links in the supply chain among farmers. The manufacturer has gone to the process of frustration in Wang Yang, Siprachan District, Suphanburi Province. The results of the research found the new supply chain model in connection with all production activities from the beginning of planting .The internal performance of the supply chain, begins when an order is made from a customer, the middlemen will send both the quantity and quality orders to the production collector. Farmers are required to develop production plans to be produced according to Tuangsuwan (2010), the needs of the logistics system and Thai rice supply chain, divided into three groups: water, water and downstream. The concept of studying logistics and supply chains using a model reference to supply chain operations (SCOR Model) of rice in Nakhon Ratchasima, is in line with the research in other types of agricultural production such as the supply chain management of the pineapple industry (Wasusri, 2007) and analysis of the supply chain management of fresh Longan Trader (Machimanon, 2008)

2. To study the relationship in the supply chain of the material supplier's frustration, the trader of the middle-producers selected yield raw frustration to deliver to the factory according to the customer's requirements in order to provide good quality of raw material supply, on time and good condition. The results of the research showed that (1) the original format is different, unlike their own ancestors, but the new model has shared the same data exchange. Learn new styles to use as a production template; (2) the original price is determined by the middlemen. When a new change is made, the price is based on the market mechanisms in which the contract is signed in advance; (3) When the yield is reduced, it adds to the increase of chemical fertilizer, but a new organic fertilizer has been taken with ingredients in cultivation; (4) the process of production is the same. The new flow of data in the production factor makes it a lower production flow; (5) the original planting is the risk of both climate and flood, the output is not as expected. The new cultivation is the risk management of the price and the crop insurance; (6) growth of business grows according to economic conditions. The new forms grow from collaboration, growing together with a lasting trust; (7) from the original, we can see stakeholders, but the new style of trust is important for a long time; (8) the original cultivation was planted in the same process. The resulting output is less effective, but the new form of production is planned from

the customer's order, and then produced according to the market demand. The original funding source is the loan from the interest-paid capital, but the new form can lead the order of guarantee to the financial institution of the public sector in compliance with Thoucharee & Pitakaso (2012) as well as Suchato, Bunyasiri & Kuldilok (2012) to analyze the supply chain of Thai rice to analyses the link and efficiency of the supply chain. Jasmine rice Bags

3. To study the problems and obstacles those occur in the supply chain of frustration, in Wang Yang, Sriprachan District, SuphanBuri province. The results of the research were found-aspects of the production factor; (Input) (1) Investments must be issued outside the system due to the borrowing in the system. Interest at a high rate; (2) The labor in rare areas is to hire foreign workers. There is a problem with the New Lab our Act. Farmers do not have money for management fees; (3) Changes to the original transplant system are rarely a sudden change. As the behavior of farmers made the same is still attached to the old -The manufacturing process (process) maintenance is largely about plant diseases and insect pests. Water is not a problem for cultivation because in Sri Prachan district, there is a general irrigation-harvesting side (Output) when the output is harvested. The middle merchant will be able to receive the purchase in quantity and agreed price according to the contract in advance, but if products cannot be sold within a day, farmers have to soak them. In a way to maintain the quality or the inventory, it will be within 3 months, because it will not be the preferred quality of the market. Another issue of a middle-person trader is to be influential in a monopoly area, just 2-3 groups in according with and Traisilanun & Thuannadee (2013) that there is a link in the higher supply chain.

4. To define communication patterns to create awareness of the frustration of the province of Suphan Buri, the findings showed that most respondents were female. 250 people think of 62.50% males, 150 people think of 37.50%, most of them are in the past 19-25 years. Each 36.30% of the majority of the professional trading or private business. 108 people think of 27.00%, most of the end of The bachelor's degree, which would have been a percentage of 38.00% and ever known to communicate frustration. 152 The national identity of the Suphan Buri province is 250 percent, with 62.50% in addition to the form of communication, which creates the perception of the natural frustration of the identity plant. of Suphan Buri province. The researchers have made a letter to the prime Minister, Wang Yang, Sriprachan District, Suphan Buri province to inform them that the general public would like to acknowledge communication (advertising, PR) through digital media first, that is through Internet/ Social Network. Consistent with the research of Kongkit (2007) studied the logistic analysis of the rubber trade through the Thai border to China, found that the application of SCOR Model in the process of the primary processing plant can Take the SCOR Model at the Configuration Level (Process Categories) and the Process Element Level (Decompose Process) and use the supply chain performance metrics. By gauges according to the SCOR Model that will be used to evaluate the operational efficiency of the rubber processing plants Found that the sample factory evaluated has a similar performance in each area. This is because the rubber processing process is not complicated. Because it is easy to transport this is because the procurement process must be conducted with suppliers in many ways, both the people and middlemen.

Suggestions

From the study, there are suggestions for improving the supply chain of farmers in Wang Yang, Sriprachan District, Suphan buri Province as follows;

1. Input: the matter of raw materials should support the issue of plant species that are resistant to disease and insects. The government should go into land reform in marking large plots and modern tools to reduce production costs.

2. Process: from planting process to harvesting a need to reduce chemicals to preserve the environment and create sustainability.

3. Output: it should be grouped in the form of community enterprise as a bargaining power with entrepreneurs to create value added.

4. A written a business plan is needed: Is planning cultivation worth the investment? Starting from planning and implementing the plan including monitoring and evaluation every step.

Suggestion for further research

The recommendation for further research should be improved in the supply chain of the water growers in Wang Yang, Siprachan District, Suphan Buri Province, which is as follows; 1. Production factor (Input) should support the subject of a disease-resistant and insect tolerant species. The local government should arrange the land in a large conversion and modern tools to reduce the cost in the production factor. 2. Manufacturing process

(process) from cultivation process to harvesting process should reduce the use of chemicals to preserve the environment and create sustainability. 3. The output (Output) should be a group of farmers in a community enterprise form to use as a competent authority to create value-added (Value added) 4. Writing Business plan is writing a plan for cultivation of investment. It starts from planning and includes tracking and processing in each step.

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Improving Food Waste Management in the School Canteen Utilizing Facility Management Principles

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Abstract

Bang Lamung School in Thailand is a large secondary school with a total of 2,534 people that daily dine at the school's canteen. The amount of food waste is about 180 liters per day, or 900 liters per week, which creates problems for the school in terms of unpleased scenery and smell. In addition, the school's mission is to be a "Lab School Project or "One District, One School of Dreams." Therefore, the school should be hygienic in terms of its waste management. This paper presents a food waste management analysis based on the concept of facility management (FM): people, place, and process. The paper has 3 objectives: (1) to study the existing problems of food waste in the school; (2) to compare the 3 methods of food waste management (composting, microorganisms, and biogas); and (3) to propose guidelines for the food waste management in the school. The methodology of the paper was interviews with related peoples—teachers, students, and the canteen's traders. The results revealed that composting was the most appropriate way to solve the problems for Bang Lamung School because the process is basic and can generate maximum revenue. Moreover, the rear area of building number 9 is suggested for carrying out the composting process. This paper will benefit the school director in terms of managing the food waste in a proper way and increasing awareness of food waste for the students and other related people.

Introduction

The food waste is a global concern. Based on data from the Food and Agriculture Organization of the United Nations (FAO), it is estimated that approximately 1/3 of food produced each year is leftovers, and this has a huge negative impact in terms of the economy, society, and environmental problems for countries. The food that is not consumed becomes leftovers and this represents exploited resources (Sucharitthanon, 1991). The over-produced food using large amounts of resources in one area creates scarcity for other areas. It is statistically true that many people in the world are facing a food shortage situation. Moreover, the waste contaminating the environment causes various kinds of disease. In addition, food disposal causes methane to destroy the atmosphere and is a cause of global warming. Again based on data from FAO, it is estimated that the carbon dioxide produced from food waste in the world is equivalent to 3,300 million tons per year. In Thailand there are more than 26.77 million tons of garbage, of which 64% is food

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waste (Ganghair, 2014). For Bangkok, around 50% of the total garbage of 9,000 tons per day is food waste (Ckaewprasert, 2017).

Bang Lamung School in Thailand, a governor secondary school under the authorization of the Office of the Basic Education Commission (OBEC), is located in Na Kluea, Bang La Mung, Chon Buri province. There are approximately 2,534 students, teachers, and staff members at the school, and the school's canteen has 11 shops. At present, the school's canteen manages food waste by hiring outsourcers to scrape out the food at the cost of 20 baht per day (400 baht per month). Due to the fact that the school has entered the "Lab School Project," or "One District, One School of Dreams," as it is sometimes called, it is highly desirable for it to be a school that can efficiently handle such problems (Department of Environmental Quality Promotion, 2015).

This paper presents a discussion of food waste management based on the concept of facility management (FM). At present, the school manages the food waste by hiring outsourced organizations to collect the waste daily at the expense of 20 baht per day (Monday - Friday), equal to 400 baht per month. The paper will benefit the school director in terms of managing food waste in a proper way and increasing awareness of food waste on the part of students and other related people.

Objectives

This paper presents a discussion of food waste management based on the concept of Facility Management (FM). The paper has 3 objectives:

1. to study the existing problems of food waste in the school
2. to compare the patterns of food waste management
3. to propose guidelines for food waste management in the school

Conceptual framework

The conceptual framework of the present paper compares the proper and improper means of managing the food waste. Finally, the proper means of choosing the most beneficial method for the school and to serve the mission of the school being a "One District, One School of Dreams" are discussed.

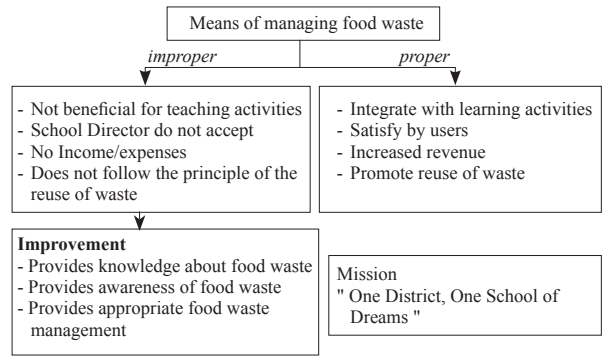

Figure 1 Conceptual framework

Research methodology

The methodology of the paper is interviewing related people: teachers, students, and the canteen's traders. In addition, comparing the effectiveness of well-known approaches toward food waste management was conducted.

1. Population and samples

As of February 23, 2018, there were 2,534 people in the school, consisting of 2,400 of students, 130 teachers, and 4 officers.

2. Research instrument

Bang Lamung School is located on 4 Moo 2, Sukhumvit Road, Na Kluea, Bang La Mung District, Chon Buri province. In the school's canteen, most of the food waste is from the students' consumption process. Based on the concept of Facility Management (FM) which consists of 3 main issues (3P)—people, place, and process (Sikhao, 2018), the food waste management of the school can be analyzed as follows.

(1) In the school people that use the canteen consist of students and teachers, and related people, i.e. parents.

(2) The places that are related to food waste management in the school include the canteen, the school buildings, the school street, etc.

(3) The process of managing food waste in the school is hiring private organizations to discard the food waste in the afternoon.

3. Collection of data

Information about the amount of food waste and the condition of the food waste collected was obtained through observation and interviewing. The observation time was between 12.00 - 13.30 o'clock from Monday to Friday (5 days) for one week. The teachers and students were interviewed about their concern about the food waste problems.

4. Data analysis

According to the school's layout, as shown in Figure 2, there are 15 areas within the school's boundary: 6 school buildings, a soccer field, a basketball court, a volleyball court, a gymnasium, a cafeteria, a teacher's house, a Buddha statue, a teacher's duty room, a water supply building, and a men's and women's restroom..

The cafeteria is located on the 1st floor of building. 6. There are 11 shops that serve 4 types of food, including 5 rice curry shops, 4 noodles, 1 fruit shop, and 1 dessert shop, including the dining area for the dining tables.

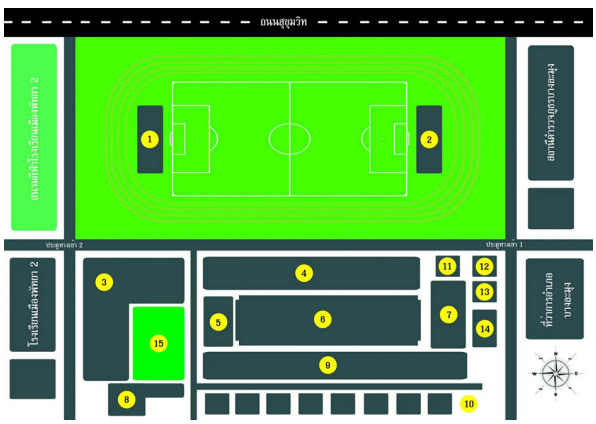

Figure 2 Bang Lamung School's Layout

Results

1. The amount of food waste

From collecting the amount of food waste from Bang Lamung school, it was found that the average daily food waste amount in the school was 180 liters/day (900 liters/week).

2. The condition of the food waste

The food garbage at the garbage point is comprised of the mixing of various kinds of plastic, i.e. tubes, mugs, and plastic bags, including the meat ball sticks and leaves, as shown in Figure 3.

Figure 3 The condition of the garbage

3. The Management of Food Waste

At present the school has set up a large garbage point for food waste at the end of the canteen area. This waste is sold daily to private organizations for destruction. At this point there are buckets for leftovers and the students throw their leftovers into them. Finally the canteen sellers clean their plates. The leftovers that are put into the buckets are picked up in the afternoon by an organization. The cost of managing the food waste is 20 baht per day (Monday - Friday) and 400 baht per month, as seen in Figure 4.

Figure 4 School's lunch atmosphere and the food waste point

4. Interviews

For this research the interviewees comprised the students, teachers, and food sellers in the school. The questionnaire had 3 topics: (1) problems concerning food waste; (2) solving the problem of food waste management; and (3) other methods of food waste management.

(1) Current problems of food waste at Bang Lamung School

There are a lot of food leftovers from the students, and there is no food and water separation so food waste and food garbage such as plastic are combined. In addition, the waste creates a bad smell that disturbs the people in the school. Today the school uses a basic way of managing the waste. First, the canteen sellers leave the food debris in the tank, and then in the evening a private organization comes to collect it daily.

(2) Solving the problem of food waste management

In order to avoid wasting food, in the school, before the students order food, the seller asks them if they want to eat less, and they will then serves less food. At present, this method of food delivery is used seriously. The interviewees stated that they would like

the school director to take care of this issue seriously and practically.

(3) Based on other researches, there are many methods of food waste management, such as composting, using microorganisms, and biogas.

The interviewees give the opinion that using composting, microorganisms, and biogas are practical methods of managing food waste.

5. Comparative analysis of management approaches and patterns of food waste utilization

Based on academic research, three means of food management—composting, microbial water treatment, and the use of biogas (Srijuntrapun, 2016) -—are analyzed in the present paper. The 900 liters of food waste are analyzed in terms of the methods and procedures each management. According to the study, it was found that composting was the most beneficial method for solving the problems, followed by biogas and the use of microorganisms, as seen in Table 1.

Table 1 Comparing the cost, materials and the duration of waste utilization using each approach

List	Compost	Microorganisms	Biogas
Volume of food waste	900 kg.	900 kg.	900 kg.
Period of time	21 days	30 days	25-30 days
Amount of product	1,125 kg.	4,500 liters	-
Amount of dung	225 kg. Amount of 675 baht	-	50 kg. Amount of 150 baht
Microbes or fertilizer	5.625 kg. Amount of 393.75 baht	300 kg. Amount of 21,000 baht	-
Molasses	-	300 kg. Amount of 6,600 baht	-
200 liters of plastic lids	-	23 units Amount of 13,800 baht	2 units Amount of 1,200 baht
120 liters of plastic lids	-	-	1 unit Amount of 380 baht
Equipment for biogas fermentation: PVC pipes of various sizes. Lengths depend on size and location, gas valves, gas transmission, joints, different pipes styles, strapping, pipe covers, cement glue, adhesives, tape and other materials.	-	-	≈ 2,100 baht
All costs	≈ 1,069 baht	≈ 41,400 baht	≈ 3,440 baht
price	5 – 10 baht per kg. Amount of 5,625 baht	10 – 20 baht per kg. Amount of 45,000 baht	N/C
Earnings	4,556 baht	3,600 baht	N/C

Discussion

For solving the existing problems, the management is separated into 3 parts—people, place, and process—based on the analysis of the principle of FM. For further development of food waste management, it can be carried out in the following ways.

People

As indicated above, there are 2,534 people, i.e. students, teachers, and staff, at the school. In the school's canteen, there are 11 shops. The first step to avoid food waste is to make people aware of their food waste by providing information on waste prevention.

Place

Due to the fact that doing composting is considered to be the most beneficial method, it is necessary to prepare the areas and activities for this. The area behind building 9 that is near the canteen was chosen because it is close to the canteen so that the waste can be transported there easily, as shown in Figure 5.

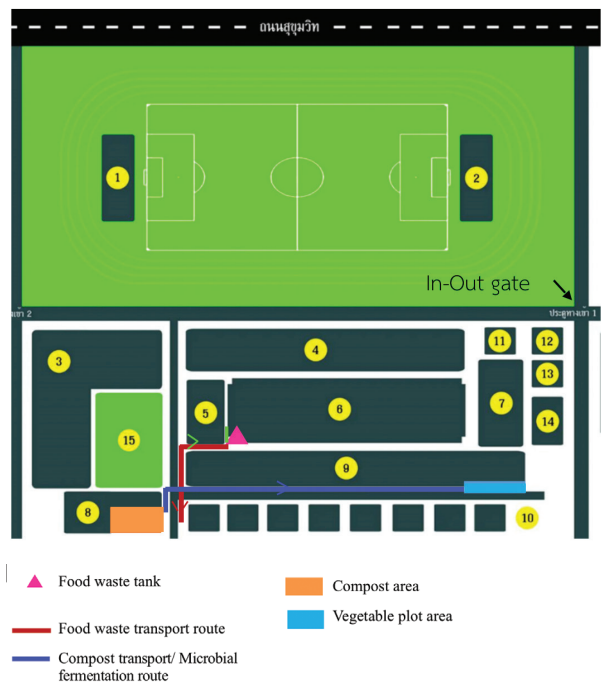

Figure 5 Areas for composting activities

In addition, the area is used for the fermentation process can be cultivated, such as vegetables, for selling back to the canteen shops, thus helping to generate revenue for the school. Growing vegetables should be included as a part of the learning activities.

(a) Examples of vegetable plots
Source: https://40plus.posttoday.com/lifestyle/325/

(b) Examples of various vegetable growing locations
Source: http://www.thaihealth.or.th/Content/35578

Figure 6 (a) and (b) Areas and activities for composting method

(a) Example of food waste bucket
Source: http://wessenware.weloveshopping.com

(b) Example of food waste cabinet
Source: https://www.gotoknow.org/posts/95237 /

Figure 7 (a) and (b) Separation of food waste

Process

1. From the study, it was found that composting was the most beneficial method for solving the problems. Therefore, the separation of food waste benefits the ferment process. The canteen's officers should separate food particles by using filters, can be seen in Figure 7 (a) and (b).

A grease trap is set up at a sink to trap food particles before being drained into the sanitary system, as shown in Figure 8.

(a) Examples of grease traps
Source: https://pantip.com/topic/35866812

(b) Examples of food waste separation containers
Source::http://topicstock.pantip.com/home/topicstock/2009/02/R7573682/R7573682.html

Figure 8 (a) and (b) Setting traps for food waste separation

2. The process of composting

In the compost process, a pound of fertilizer is made from the daily food waste. In one week (5 days), there are 5 pounds of fertilizer. In one month, the fermentation is done 3 weeks, and therefore there are 15 pounds of fertilizer per month. Finally, the compost is used for cultivating vegetables. The transport route of the food waste and the compost is shown in Figure 9. The process of composting is according to the following steps (Greenpeace, 2017).

(1) Prepare a canvas for composting into the compost areas, at the rear of building number 8. In addition, composting should be labeled as follows: Mon 1-Fri 1, Mon- Fri. 2, Mon- Fri 3.

(2) Transport the food waste to the compost areas.

(3) Prepare raw materials; i.e. (1) organic fertilizer and (2) clean water.

(4) Mix the water with the microorganisms.

(5) Use the canvas cover and stick the label number to the compost pile and leave it for 3 weeks.

(6) Put it in the shade to decrease heat.

(7) Cultivate vegetables.

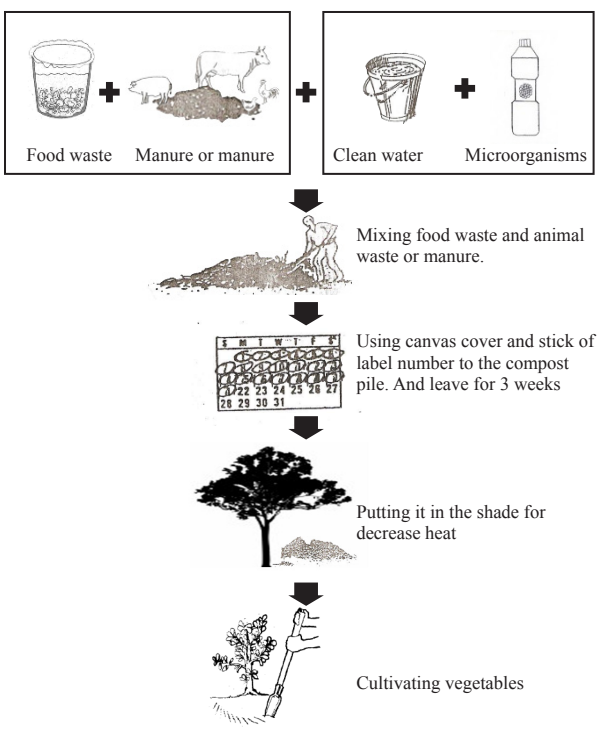

Figure 9 Display of the composting process
Source: Modified from http://www.google.com

To conclude this discussion, the food waste management at the Bang Lamung School canteen can be separated into 3 interesting issues, as follows.

(1) The existing problems of food waste in the school

Bang Lamung School is a large secondary school with a total of 2,534 people that daily dine at the school's canteen. The amount of food waste is about 180 liters per day, or 900 liters per week. The food garbage can be found everywhere in the school. In addition, the food garbage is a mixture of various kinds of plastic, i.e. tubes, mugs, and plastic bags, including the meat ball sticks and leaves. There is no separation of the garbage. At present, the school manages the food waste by hiring an outsourced organization to collect the waste daily at the expense of 20 baht per day (Monday - Friday), equal to 400 baht per month.

(2) Comparing the patterns of food waste management

Based on the reviewed literature, the paper compares 3 methods of food waste management, composting, biogas, and microorganisms. Using 900 liters of food waste, it was found that the composting uses fewer raw materials and equipment that can be found easily. It takes 21 days for the production process and costs only 1,069 baht. The output can be sold for 5 to 10 baht per kilogram, equivalent to 5,625 baht. The profit of this is 4,556 baht, followed by making biogas, which takes 30 days to complete and costs approximately 3,362 baht.

(3) Guidelines of the food waste management in school

The present paper introduces guidelines for waste management at the school as follows: (1) setting up the rear area of building number 9 for doing the composting activities; (2) separating the food waste by using filters; and (3) producing fertilizer with the daily food waste.

Suggestions

Some other aspects of managing the food waste in the canteen at Bang Lamung School are as follows:

1. In order to avoid wasting food, students should be asked by the food sellers how much food they want. If students want less, they will serve less food.

2. In order to achieve practical management, the food waste should be separated by types of waste.

3. In order to create maximum benefit, each approach is appropriate for the school at different levels. Besides choosing the composting approaches, the two

other approaches, microbial water and biogas, should be used together.

4. In order to achieve a sustainable environment, teachers should integrate the discussed activities into the lessons in the class, for example, agriculture activity classes and workgroups.

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Integration of Anthropological Surveying Tools, Walking Maps with the Geographic Information System to develop the Historical Map of Pak Phraek Community, Muang District, Kanchanaburi

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Abstract

The objectives of this research is to survey and collect the data for Pak Phraek Community historical sites and to create the historical maps of Pak Phraek Community, Kanchanaburi Province. The population and key informants included; villagers, philosopher of the Pak Phraek Community, 3 historical scholars, and the government agencies. There are four steps of data collection which are; Community Coordination, Observation and Survey, Interviews and Lesson Learned. This research used the geo-informatics concept, Participatory Geographic Information System concept (PGIS), and the walking map concept as the main concepts for this study. The research results are as follows:

(1) the surveyed data for the historical map making of Pak Phraek Community has concluded two issues as follows; the first issue, Pak Phraek community economy map, from the walking map to the completed map and importing into the geographic information system (GIS), found that there were 97 stores with 22 types of shops. The second issue, the map of Pak Phraek community historical houses/sites from the walking map surveying, to the complete map and imported into the geographic information system (GIS), found that there are 40 learning resources. (2) The historical map making of Pak Phraek Community implemented the geographic information system in the production and development of the Pak Phraek Community map which included; field work, data input, data edit, data management, data manipulation, data analysis and data display. In this way, the Participatory Geographic Information System (PGIS) concept has been adopted to be one of the work processes by free program software, for mapping. The results show that the information obtained from the PGIS process, the community and researchers were able to create a new map obtained from real/living information and to create community ownership of the data.

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Introduction

The policy of Thailand 4.0 encourages research that incorporates science, technology, and innovation. This research located a community that has the potential and readiness to conduct a science, technology and innovative research to help develop the community into a sustainable community by adopting to a Smart City concept. The Pak Phraek Community, is located in the urban area of Kanchanaburi. The Pak Phraek community is a commercial districtas well as a tourist attraction and learning center for Thai ancient history and architecture located on Pak Phraek Road, the area that intersects between Wat Nue (Devasangkharam Temple) and Wat Tai (Chaichumphon Chanasongkhram Temple). Pak Phraek Community is a multi-cultural community containing religious learning resources, ancient architecture and historical learning resources, as well as a tourism learning resources. The community is supported as a tourist community by Kanchanaburi Province. (Department of Tourism and Sports of Kanchanaburi, 2016). Based on researched data, Pak Phraek Community has sufficient potential to develop into a Smart Community. Pak Phraek community was founded since the reign of King Rama III and has a history related to the early Rattanakosin period; it was the location to build a new city to replace the old town of Kanchanaburi during the reign of King Rama III. During World War II the area was the operation center for Japanese soldiers and prisoners of war.

The Smart Community Concept is a presentation of digital economy and social drive by applying the digital technology to effectively develop the community. However, the important topic for community development should be to understand the problems and needs of people in the community and to ensure a participatory design that is most suitable for the properties of that community to provide people with a better quality of life and sustainable growth. (Ministry of Digital Economy and Society, 2016). The research was conducted to develop the community's tourism by creating an innovative map using Geographic Information Systems: GIS, which is an innovation that can be used to develop communities. The innovative maps can develop the community tourism through surveying and developing a historical map to offer information about the history of Pak Phraek Community and as a guide to the historical attractions of the community.

As an introduction, the researcher became interested in the research and development of the Integration of Anthropological Surveying tools, Walking Maps with the Geographic Information System to develop the Historical Map of Pak Phraek Community, Kanchanaburi in order to survey data for the historical map of Pak Phraek Community, Mueang Kanchanaburi District, Kanchanaburi to be a Smart Community Map (Smart Map) that can be used as a tool in the area of community development and tourism management. The two research questions proposed are: (1) What does it look like? and (2) how does it look as a tool to aid the development of the Pak Phraek community to be ready and develop as a Smart Community model in Kanchanaburi?

Objectives

1. To survey the data for Pak Phraek Community historical mapping.
2. To create historical maps of Pak Phraek Community, Kanchanaburi.

Conceptual framework

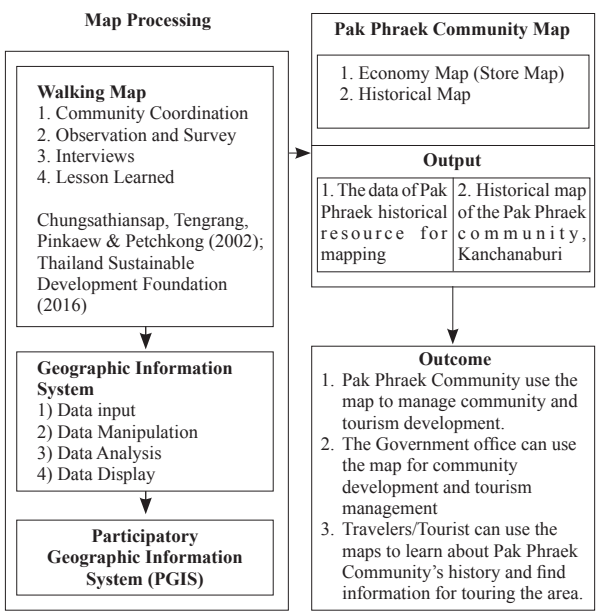

Figure 1 Conceptual framework

This research used anthropological tools to survey the community including walking maps. (Chungsathiansap, Tengrang, Pinkaew, & Petchkong, 2002; Thailand Sustainable Development Foundation, 2016) The process of surveying the Pak Phraek Community included the location, physical, economic

characteristics, architectural features and the settlement of the community by using a participatory action research process (PAR). The PAR process allowed villagers and groups of historic homeowners to jointly create the map, interview, joint surveying and lesson learned. Once the survey information was collected of the walking map it was then used to manage the geographic information system (GIS) preparing to the map processing by using the Participatory Geographic Information Systems (PGIS) conceptual process as the way to join the Historical Map processing according to Figure 1.

Research methodology

1. Population and key informants

Population and key informants included; 30 villagers of the Pak Phraek Community, 1 Philosopher of the Pak Phraek Community, 2 Local historical scholars and government agencies including 1 person from Muang Kanchanaburi Municipality and 1 person form the Department of Tourism and Sport, Kanchanaburi.

Figure 2 Key Informants: Supatra Tantivanich

Key informants are villagers in Pak Phraek community who were asked to provide information about the context of Pak Phraek Community, key informants include; Mrs.Supatra Tantivanich providing information about the history of Pak Phraek Community, information checking and providing the historical map data. Kanchanaburi history academics provided historical information on Pak Phraek Community and historical map data such as; Assistant Professor Monthon Kongtawthong and Kraingkrai Thongsri. The government agencies included Muang Kanchanaburi Municipality; Mrs.Kamolmas Premprayool (Chief of the Administrator of the Kanchanaburi Municipality) and 1 person from the Department of Tourism and Sport, Kanchanaburi.

2. Research instrument

This research used research instruments that included; research interview forms, walking map paper survey, community map (map scale 1:4,000), lesson learned instrument, the free source software; Geographic Information System (GIS) and Global Navigation Satellite System (GPS tool).

3. Collection of data

Survey of Pak Phraek Community map by the walking map concept. The walking map processes is discussed below:

3.1 Community Coordinate was the first process of the community survey by coordinating with community leaders, community philosopher and government sector leaders including The Muang Kanchanaburi Municipality for surveying the Pak Phraek Community map through the walking mapping survey tool. This process led the cooperation between researchers and villagers including group leaders, abbot (Tevasunkharama Temple and Chaichumphon Chanasongkhram Temple), groups of historic homeowners and staff of the Muang Kanchanaburi Municipality.

3.2 Observation and Survey, to survey the occupational characteristics, social characteristics, culture and the environment of the community. The researcher used participatory observation techniques to obtain complete information. By observation along with analyzing the data and using other methods in field work; the survey tools were of value, such as community maps, the surveys paper, and Global Positioning System (GPS) to create the community map and historical map.

3.3 Interview, to query and interview information about community maps and historical maps of Pak Phraek Community with the key informants including Pak Phraek Community philosopher, Chairman of Walking Street, Leader of Ban Nue and Leader of Ban Tai

3.4 Lesson Learned, Researcher used the Participatory Geographic Information Systems (PGIS). (Orban-Ferauge, 2011) The PGIS process implements the ground map and paper map and the Participatory Mapping invokes the communication, understanding and the participatory representation of spatial knowledge easier for the community with 5 steps; Identification of the problems, Building of the partnership, Data gathering, Data processing and Scenarios towards alternative (Figure 2) by the Meeting of villagers in Pak Phraek

Community, Pak Phraek Community philosopher, Kanchanaburi history academics, The government agencies included Muang Kanchanaburi Municipalityand the department of Tourism and Sport, Kanchanaburi.

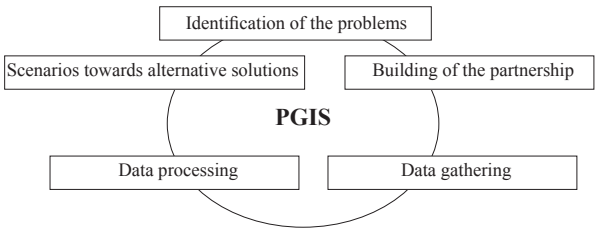

Figure 3 Process of participatory Geographic Information Systems (Orban-Ferauge, 2011)

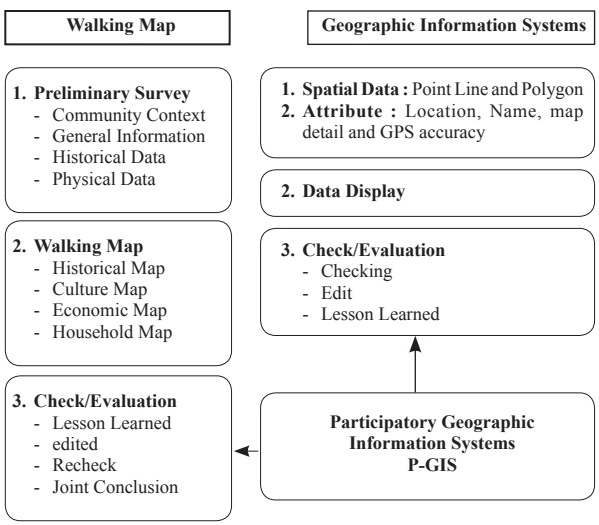

Figure 4 Research processing

4. Data analysis

In analyzing process, researcher analyzed two levels; Community level and household level (historic homeowners). The analysis in the community level had the analysis unit which is the household level and divide the method of data analysis as follows;

4.1 The qualitative analysis; the first process was textual analyzed and summary of results from inquiries, interviews, surveys and observations and synthesize it to the meaning of the text and the interpretation or the debate from what was observed in the study area. The second process was a data check to find credibility by the triangulation method and then analyzed with the theoretical concept. And the third process was to summarize the data, validation of the research results contained a summary of the results and participatory check from villagers and community.

4.2 The Historical Map of Pak Phraek Community was analyzed by the geographic information source with satellite data and aerial photographs, using geographic information systems programs such as; Quantum GIS programs and Google Earth programs. An example of the process is as follows:

1) Data input : Input field work data using the process of working map, the data in the form of points, lines and polygon.

2) Data Manipulation : Consist of information management by classifying the area line and point that shows the learning sources in the Pak Phraek Community.

3) Data Analysis : Geometric coordinate transformation of the historical houses/sites based on the coordinates that are collected from the Global Positioning System (GPS).

4) Data Display : Map display that was managed and analyzed via paper map and online map.

Results

1. The data for Pak Phraek community historical mapping.

1.1 The Economy of Pak Phraek community map

The Economy of Pak Phraek community map is a map that shows the location of 97 stores with 22 types of shops on Pak Phraek Road, Song Kwai Road and Sang Chu To Road. The economic map was developed by a survey that was conducted by researchers, research assistants, community philosophers and villagers involved with the participatory survey. When the information was completed, he researchers developed a map in geographic information system to be the image and map file with the following details; a sketch with the walking map process on the sheet work and by walking around Pak Phraek Community and interviewing the shop owners. In the second process the focus was on lessons learned and a check of the walking map data together with the community. The researchers then developed a map in the form of image files via geographic information system using a satellite image database that was developed from the walking map data survey along with the use of data from Global Positioning System (GPS) for the accuracy of map data.

1.2 Historical Map of Pak Phraek community

Historical Map of Pak Phraek community shows the location of historical resources in Pak Phraek Road,

Song Kwai Road and Sang Chu To Road developed by a survey of researchers, research assistants, community philosophers and villagers who were involved in the participatory survey. The researcher developed a map in geographic information system to be the image and map file with the following details;

The Historical Mapping was conducted by sketching using the walking map process on the sheet work and by walking around Pak Phraek Community and interviewing historic homeowners, The Pak Phraek Community philosophers and villagers (Participatory Mapping and GIS) along with capturing the coordinates on the Global Positioning System (GPS). To capture the coordinates of historical houses and sites in Pak Phraek Community was conducted by surveying 40 historical sites which include the following sites: Wat Thavornwararam (Vietnamese temple), The Supreme Patriarch Palace Tevasunkharama Temple (Wat Nue), History Hall of His Holiness the Supreme Patriarch "Somdet Phra Yana Sangworn", ChinPinKliao Home (The last Vietnamese home of Pak Preak Community), Japanese military Police Station during World War II, Chinese School, Kotchawat Home, Kulasuwan Home, Amnuai Home, Niwas SaenSuk Home, Merchant House of Japanese Spy, Suthee Home, RattanaKusum Home, Boonchai Panich Home, Kanchanamas Home (Hiding place for the Allied prisoners), Tamthong Home, Sri Jamnong Home, Siwapha Home, Hua Hong Home, Kanchanaburi Hotel, Prostitutes Section, Chuan Panich Store, Siri Choomsaeng Home, Boonyiam Jiaranai Home (Khoom Chantsiri), Boonpong and Brothers Home (Siri Osoth), Thai Seri Home, Sumitrakarn Hotel, Chao Mae Guan-im Shrine, Sitti-sung Home, Sahakul Panich Home, Somchit Setaphun Home, The City Gate, Na Muang Post Office, King Rama III Museum, City Pillar Shrine, Governor's Resident, Kanchanaburi Paper Factory, The JEATH war museum and Chaiya Chumpol Chana Songkram temple. In the second process the focus was on lessons learned and a check of the walking map data together with the community. The researchers then developed a map in the form of image files via geographic information system using a satellite image database that was developed from the walking map data survey along with the use of data from Global Positioning System (GPS) for the accuracy of map data.

2. Geometric coordinate transformation of the historical houses/sites

From the validation of the shape file location coordinates in the place of community and the data in the table data on the Street View function in the google earth program, it appears that there are multiple locations that don't match the actual location. Therefore, the researcher has corrected the information as well as adding the necessary information and creating a new shape file.

Figure 5 Mapping survey and capturing the coordinates on the Global Positioning System (GPS)

Figure 6 The walking map with history of Pak Phraek community

Geometric coordinate transformation of the historical houses/sites because the coordinates that are collected from the Global Positioning System (GPS) was wrong from the actual coordinates on the earth. The Researcher used the Ground Control Point (GCP) in the Image to Image concept (Dontree, 1999; Khunrattanasiri, 2019) is to adjust the coordinates from other satellite images (United States Geological Survey, 2019) that have the correct coordinates and are comparable with satellite images in Google Earth. (Figure 7 and 8)

	เรา	เรา	X	Y	เรา	เรา
59	60	60	556992	1550754	ร้านหมอเส็ง	ร้านค้า
60	61	61	556939	1550748	ร้าน ช.การช่าง	ร้านบริการ
61	62	62	556827	1550592	Like Club	ร้านอาหาร/เครื่...
62	62	62	556829	1550600	ครัวบ้านแหม่	ร้านอาหาร/เครื่...
63	63	63	556839	1550574	Dis	ร้านอาหาร/เครื่...
64	64	64	556853	1550483	ร้านเรพคารา โอ...	ร้านอาหาร/เครื่...
65	65	65	556855	1550466	ร้านบ้านตัวกลม	ร้านอาหาร/เครื่...
66	66	66	556873	1550407	ร้านจุ๊กกรู	ร้านอาหาร/เครื่...
67	67	67	556875	1550393	ร้านทับทิมกาญจน์	ร้านค้า
68	68	68	556887	1550380	ร้านรี แล็กซ์ เพล์	ร้านอาหาร/เครื่...
69	69	69	556889	1550347	แพปรีชา-พักลุง	ที่พัก
70	70	70	556900	1550338	บาเลนไทน์	ร้านอาหาร/เครื่...
71	71	71	556926	1550186	ร้านแก้วบริการ	ร้านค้า

id	Name_Th	Name_En	Type	Sub_Type	Sub_En	UTM_X	UTM_Y
59	ร้านหมอเส็ง		ร้านขายยา	ร้านขายยา	Drug Store	14.026801000...	99.527803000...
60	ร้าน ช.การช่าง		ร้านบริการ	ร้านซ่อมรถ	Garage	14.026683999...	99.527338000...
61	ร้าน Like Club		ร้านอาหาร/เครื่...	ร้านนวดแผนไทย	Massage Shop	14.025211000...	99.526402000...
62	ร้านครัวบ้านแห...		ร้านอาหาร/เครื่...	ร้านอาหาร	Restaurant	14.025471000...	99.526196000...
63	ร้าน Discovery		ร้านอาหาร/เครื่...	สถานบันเทิง	Bar	14.025093000...	99.526439999...
64	ร้านต้นเรพคาร...		ร้านอาหาร/เครื่...	สถานบันเทิง	Bar	14.024396000...	99.526587000...
65	ร้านบ้านตัวกลม		ร้านอาหาร/เครื่...	ร้านกาแฟ	Coffee Cafe	14.024224000...	99.526630999...
66	ร้านจุ๊กกรู		ร้านอาหาร/เครื่...	ร้านอาหาร	Restaurant	14.023[illegible]7000...	99.526792000...
67	ร้านทับทิมกาญจน์		ร้านอาหาร/เครื่...	ร้านอาหาร	Restaurant	14.023619000...	99.526821999...
68	ร้านรี แล็กซ์ เพล์		ร้านอาหาร/เครื่...	สถานบันเทิง	Bar	14.023436000...	99.526883999...
69	แพปรีชา-พักลุง		ที่พัก	ที่พัก	Motel	14.023189000...	99.526937000...
70	บาเลนไทน์		ร้านอาหาร/เครื่...	สถานบันเทิง	Bar	14.023026000...	99.526831000...
71	ร้านแก้วบริการ		ร้านค้า	ร้านค้า	Store	14.021502999...	99.527304999...

Figure 7 Example of coordinate correction data

Figure 8 Geometric coordinate transformation of historical houses/sites

3. The historical maps of Pak Phraek community, Kanchanaburi.

The researcher developed and designed the map. By using the process from the concept of geographic information system in producing and developing Pak Phraek Community map that included Field work, input data, manipulation, management data, query and analysis and visualization with Participation Geographic Information System concept. The creation of the historical map of the Pak Phraek RoadCommunity with the Open Source Software included; Quantum GIS and Google Earth with the following process;

3.1 To test import data with Open source software

Testing and editing data for the display of the map data in the QGIS program by dividing the data into 4 data layers included; the historical houses/sites, stores, temples and others places.

3.2 Map Displays

The researcher developed the data obtained from walking map into a map in the form of an image file from a computer via the Geographic Information System (QGIS program) using a database from satellite images and topographic maps from the Royal Thai Survey Department together with the surveying mapping data. As well as using data from the Geographic Information System (GPS).

3.3 The Infographic Map

The researcher made an online map on the website www.pakpraekmap.com and created an infographic map for tourism benefits of the community and government agencies in tourism management. (Figure 10)

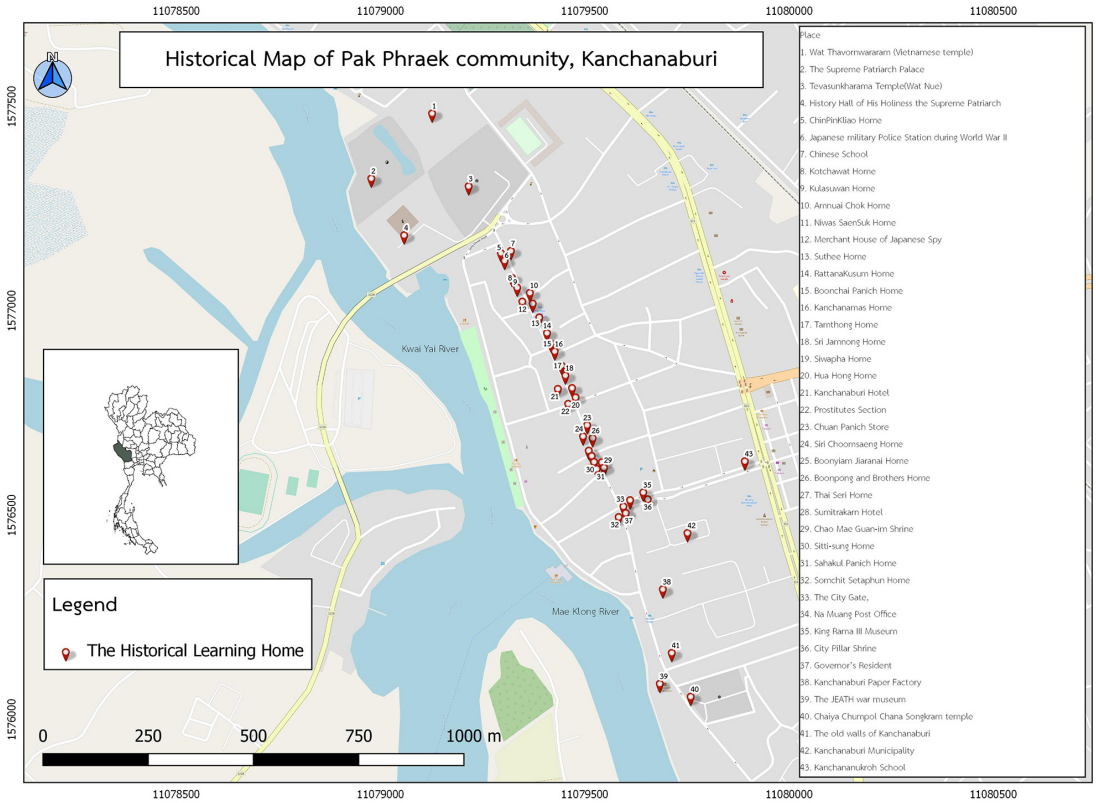

Figure 9 Historical map of Pak Phraek community

Figure 10 The infographic map

Discussion

In creating the historical mapping of Pak Phraek Community, key issues include the following ; first, the benefits of participatory GIS, the people in the community were able to participate to summarize the information of the historical map and the information received can be used for community development and tourism planning, consistent with the research of Fagerholm, Eilola, Kisanga, Arki, & Käyhkö (2019). who studied the place-based landscape services and potential of participatory spatial planning in multifunctional rural landscapes in Southern highlands in Tanzania and found that the data-scarce context common in the Global South, the participatory mapping of landscape services has the potential to advance understanding of the benefits that the landscape has for the local communities and how this information, when mapped spatially, can be integrated with local-level planning practices. The second issue, is the walking map process, which is the mapping process of historical houses/site process; (1) Community Coordinate (2) Observation and Survey (3) Interview and (4) Lesson Learned and using the Participatory Geographic Information Systems (PGIS) conceptual process for the field work which has different result from the research of Ratanopad (2015) who studied the web site mapping in archaeological site "KU" Tung Gula Ronghai area, Roi Et. Ratanopad (2015) does not have a working process for the walking map before exporting data as maps and online maps can be wrong because they may not be accurate with the participatory field work survey. This study has a different result from the research of Sriboonruang & Krumkrua (2017) in Community way of life Research Process for the Thung- Samo Relation re-Building in Walking Map and Community Calendar Concept, which did not have the process of the geometric coordinate transformation and GPS accuracy issue.

Suggestions

1. Should develop the map data in other historical communities in Kanchanaburi and linking information between historical communities to the route of tourism in Kanchanaburi.

2. The Participatory Geographic Information Systems (PGIS) conceptual process used the Ground Map data from the participatory lessons learned and the Paper Map that connects with the Geographic Information Systems (GIS). This concept can be used in the study of community resource management, water management mapping, community disaster management or a cultural map.

3. The Walking Map is a tool of anthropological study for location survey, the physical community can be successful with a collaborative process with community owners and Geographers who adopt this approach to develop into The Participatory Geographic Information Systems (PGIS) and The Participatory Mapping (Pmapping).

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"Social justice" Measuring Fairness for Understanding the Balance of Fairness in Thai society

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Abstract

Social justice measurement is reflected in the views and opinions of the public to the social justice issue in Thailand. This research aims to measure social justice based on the values of justice. The researcher used the questionnaire as a tool for collecting survey data by in-depth interview with 8,116 samples. This study tests different calculation methods that are according to main component analysis. The result of the calculation is not equal.

The first social justice index result, calculated by average of dimensions and aspects, found that the average is 62.55 percent. The second result, calculated by average of dimensions and weight of aspects, found that the justice index is 65.33 percent. The third result, calculated by weight of dimensions and average of aspects, found that the justice index is 54.30 percent.

According to the results of 3 methods. The justice index from the second method has the highest level. The data distribution is the source of weighted dimensions and aspects. If the data is distributed, it has a direct effect on the main component analysis. This method is suitable method. Therefore, social justice and measurement adapt to reliable concrete object that depends on the user.

Introduction

"Justice" is a complex issue, hiding various conditions. Every social context is therefore linked to fairness, both open and hidden in various dimensions of society. Consciousness Social Relations Social structure as well as cultural products in society. All of this has to do with fairness issues. Fairness issues are complex and difficult to define.

"In today's society there is a fine line between justice and fairness that is not clear in which justice is related to rules and regulations of government and related agencies. There are many dimensions of complexity". More comprehensive (Techapira, 2014).

Therefore, it is absolutely necessary to understand the situation of justice through various perspectives, not to be trapped in the sense of fairness only under the rules of legal justice system.

Methodology for indexing and data analysis, calculation of social justice index is important to adhere to the technical indexing principles. Paying attention to the set of data and the properties of the index data and understanding what they mean is important. Therefore, we should not take the data to average and find the index directly. This will result in discrepancies and cannot

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truly reflect social justice. The concept of such indexing is consistent with the opinion of (OECD, 2008 as cited in Lounkaew, 2016), which sees that combining the data and finding the index directly is not the correct method.

Therefore, we have to classify the data and determine methods for finding the correct index values in 2 steps with statistical methods as follows.

Step 1 Grouping data so that it is appropriate and consistent for indexing using the Principal Component Analysis (PCA) method by weighting the data set according to the main dimensions and in the sub dimensions. This will give an indication of the weight or score of each factor which will affect the index created.

Step 2 Index calculation by finding mean value. The researcher focus on creating an index by giving value by the weight of the dimension and how much in each dimension or factor should be determined. By considering the frequency and the value that the person must choose to answer that item the most. These reflect value and weight in each main dimension and in different sub dimensions.

To calculate the index is between 0-100. At the same time, the weight of the scores in each dimension is in the range 1-100 as well. In order to average each of the main dimensions, the sub-dimensions are performed in the same way. These methods allows reflections on the weight of each of the sub dimensions that informers give the most importance to the matter and how much the index reflects the indicators and social justice. It can reflect the value and the weighting of social justice in each subject as well.

By developing social justice indicators, social justice values can be collected in areas collected from the population sampling process. It will be able to reflect the perspective and public opinion on the issue of justice in Thai society, which has a complex of concepts in the midst of changing economic, social and political conditions. Therefore, it is in line with the knowledge creation process.

The survey examines the phenomena that occur in society as well as issues of thinking systems and learning processes through the research process in order to lead to an efficient research process. It can be explained, create understanding of social phenomena, and create new knowledge which will be very beneficial to society.

Objective

This study uses social justice measures to determine social justice values. By using 3 measurement methods which are:

Method 1 Calculated by average of dimensions and aspects.

Method 2 Calculated by average of dimensions and weight of aspects.

Method 3 Calculated by weight of dimensions and average of aspects.

Conceptual framework

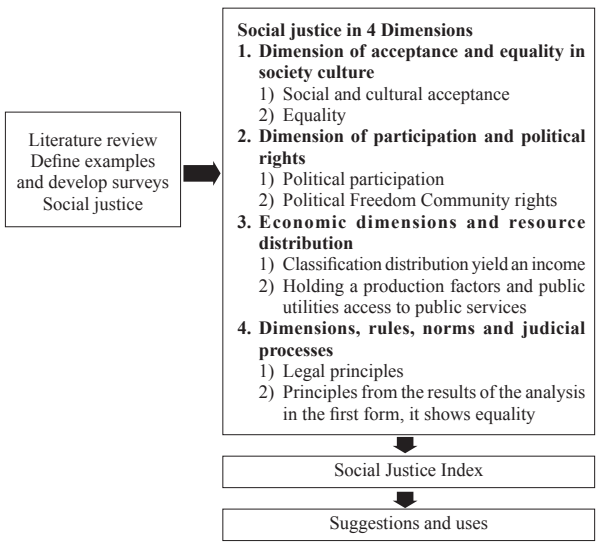

Figure 1 Conceptual framework

Research methodology

1. Content scope

When talking about the process of developing. All indicator are linked to social science research, referring to research related to society, culture and human behavior. Social science research cannot be directly measured and difficult to control.

Therefore, it must be measured using indirect tools, for example; using tests, questionnaires, index indicators etc. The use of scientific methods to assist in research, allows the research results to be more reliable and to focus on the explanation of social phenomena that can be used to generally explain such phenomena. The meaning of the above "fairness" represents a diverse, fluid flow depending on the context used. The basis of fairness is generally given with a tie to justice; but when talking about social justice, the only legal justice

dimension cannot guarantee complex social justice issues. It can be said that Norms will be used to measure social justice management therefore it needs to be linked in order to cover the dimensions of justice in a wider social context.

In addition, social justice components were mentioned and discussed in the academic seminars. "Social Justice in Thai" Tuesday the 25th February 2014. By the Center for Contemporary Social and Cultural Studies, Faculty of Sociology and Anthropology, Thammasat University, (Sindecharak, Unno, & Pothisombat, 2016) which were divided into 4 dimensions which lead to the study as follows:

1.1 Dimension of acceptance and social justice

Social justice issue is more comprehensive than people. It includes fairness, equality, fairness of the whole society. As well as, setting the norms of fairness to protect the underprivileged. The objective of social justice is to create equality for people in society (Phenphinan, 2014). In this regard, social justice in terms of acceptance dimension, it gives importance to rights, freedom, equality, acceptance of value to solve the problem of social inequality. The disadvantaged groups have to sacrifice for the well-being of some groups in society. It is also the basis of the rules that everyone participates. Giving people in the society a chance to live a good life, the justice is a matter of social infrastructure. The issue being discussed is fair, therefore it must not be limited to managing solutions to gain equal access to resources. However, it should be a focus on awareness, acknowledgment of cultural rights. It must enable people in the society to live together. This means the area of democracy which everyone can define and design a lifestyle. Having your own lifestyle, acceptance of various social patterns should be based on rules that everyone participates through activities in the area of democracy.

1.2 Participation dimensions and social justice

In addition, social justice was born under the dimension of acceptance of various social patterns. The dimension of participation is based on rules through activities in the area of democracy. Considering another issue that is consistent with each other, namely the acceptance of rights. The freedom of personal lifestyles, which means the ability for a person to define their own way of life. These are caused by participation through activities in the area of democracy. In which people can choose government institutions that will represent the interests of society. Through the basis of the rules that everyone participates in. As well as providing realistic opportunities for groups to protect their own interests, communities and the public, including opportunities to examine the exercise of state power, critique, and participation through rights in resources such as community rights and civil rights. In this sense, the dimension of participation with social justice therefore connects with the rules of democracy. The definition is a system of equality. The power comes from numbers (Techapira, 2014). Social justice can only occur when the area of participation provides equal opportunities for all groups of society under the rules that are recognized and accepted. In a democratic society, freedom is not just an opportunity to do as you please. It means the opportunity to create alternatives and to discuss optionsas well as having the opportunity to choose (Mills, 1956)

1.3 Resource Distribution Dimension and social justice

Social justice in the dimension of resource distribution is an aspect of fair resource allocation. Difficulty or ease of access towards resources is based on the rules and conditions of fair rules for distributing resources. On the one hand, it is to protect the disadvantaged which should give the underprivileged equal opportunities in society. By allocating resources fairly should lead to the laying of rules and regulations of fair rules for distributing resources. It can create opportunities for well-being both in terms of education and public health. In addition, the distribution of resources and social justice also includes the distribution of power and wealth. Both in the protection of the disadvantaged or disadvantaged in accessing local resources allowing for equal access.

1.4 Normative dimensions, norms and social justice

Rules, norms in the form of a legal system are considered one of the social mechanisms which can be used as a reference to fairness. However, legal justice may have limitations on some social justice indicators. "Justice is just one of the values that the law must maintain but not all the values of the law. The law must maintain the stability of civil rights and duties" (Pakeerut, 2014).

However, if looking at social justice and legal justice in development, it is found that there is a great connection between them. It means that the development of the law relates to traditional moral rules, all of which are the norms that form the legal system. Under the structure of a modern state, which often claims

legitimacy with the power to manage justice. It refers to the use of legal power. This reflects that the issue of fairness has been transformed by social processes into a form of law norms. It has a system for management and enforce more efficiently than other types of social rules.

However, even though the concept of justice in the legal system shows that the law can lead to justice, but it is not just a single legal system that can be a measure of justice. It is because actually the law needs to be linked to various subsystems in the society. An effective justice system in the law for fairness management depends on the integration of existing social systems into the legal system, such as customary community justice systems. Including traditions in the use of land, forests, water resources, as well as the ability to adapt the justice system to be flexible and able to accommodate changes in various fields.

2. Spatial scope

This study uses survey research and in-depth interviews from public agencies / organizations that work relate to social justice. The researcher uses samplings that represent different areas to give different opinions. The researcher uses the probability sampling method in order to receive a representative sample that can reflect "Social justice" especially, on the study area, which will reflect the differences between opinions, perceptions, and attitudes of residents in both urban and rural areas. Therefore, sampling and data collection is equally distributed in both urban and rural areas Begin with the selection of large urban areas in each region and small cities that are not close to large cities. The goal is to choose the city area and districts other than cities based on sampling to select an area, Sub-districts and villages including the size and type of governing forms. This is to achieve good representation and reflect a wide range of opinions and fairness as well.

3. Determination of sample size

The data are collected from across the country which include 5 regions, 10 provinces, 80 communities in total of 8,116 samples.

The calculation of the sample is done by the calculation of the exact number of households and a random method by using = RANDBETWEEN (1,...) in Microsoft Excel. The columns are specified by the number of households in each district as the running number. All of the processes aim to get the perfect ratio which is the district with more number are more likely to get pick than the district with less number. From the above, it can be found that the first column is a random number but in the next column is the number from the first column that has been translated by "if" formula

4. Tools for data collection

This study uses questionnaires as a tool for collecting data in surveys. The questionnaire consists of questions in 4 dimensions as follows. (1) Dimension of acceptance and social justice (2) Participation dimensions and social justice (3) Resource Distribution Dimension and social justice (4) Normative dimensions, norms and social justice

5. Methodology for indexing and data analysis

It is important to adhere to the technical indexing principles during the data analysis calculation of the social justice index. This is achieved by focusing on the set of data and the characteristics of the index data. Therefore, we should not take the data to average and find the index directly. This will result in discrepancies and cannot truly reflect social justice. The concept of such indexing is consistent with the opinion of OCED (OECD, 2008 as cited in Lounkaew, 2016) which that combining the data and evaluating the index directly is not the correct method. Therefore, we have to classify the data and specify methods for finding the correct index in 2 steps with statistical methods as follows.

Step 1: Grouping data, it is appropriate and consistent for indexing by using the Principal Component Analysis (PCA) method by weighting the data set according to the main dimensions and sub dimensions which will give an indication of the weight or score of each factor. It will affect the index created.

Step 2: Calculation of index values by creating data as a mean value. The researcher focused on creating the index by providing value through weight of the dimension. It should be a dimension of the index for how much each value or factor is determined. By considering the frequency and the value that the person must choose to answer the most, which reflects the value and weight in each main dimension in different sub dimensions and then calculate the index. The said index is between 0-100. At the same time, the weight of the scores in each dimension is in the range 1-100 in order to average each of the main dimensions. The sub-dimensions are performed in the same way.

Prior research was conducted on the creation of the Justice Index by Bach (2011) which considers 3 important components: public safety, fairness, and accuracy and fiscal responsibility by focusing on evaluating the ability of the court and developing the fair legal service by calculating the Justice Index. The

index was created by the state to design the type of data collection. There is categorized index for each state. All indexes are calculated from scale of 0 to 100 with 0 representing less ability to access the justice and 100 representing the most ability to access to justice.

When it comes to the method of calculating the Justice Index, there are many steps from weighting by multiplying the question weight by the response weight (Yes = 1, No = 0). Weighting by using the raw score and divided by the maximum weighted score possible, multiplied by 100 to determine the index Temple (as shown in table 1)

Table 1 Calculation Justice Index Method

Question	Reaction	Weight
number 1	Yes	10
number 2	No	5
number 3	No	1

As shown in table 1, the substitution of the response value from the test results "(1 x10) + (0 x 5) + (0 x1) = 10"using the weight of the question multiplied by the weight of the response, but considering the maximum possibility of weighting is the equation "(1 x10) + (1 x 5) + (1 x1) = 16" So when using the raw score divided by the maximum weight that can be multiplied by 100, the equation will be "(10/16) x 100 = 62.5". This is the result of the question of the component before the component is considered in different ratio. Since the questionnaire collection has classified people using the status of the questionnaire before assembling the same result. (The Composite Index)

6. Data analysis

The data analysis for this research through the use of statistics that are called principal component analysis, also known as the "Factor Analysis". This statistic also contains other statistical values within its structure. There are certain conditions. For example, if a question has a form of an answer that does not have enough distribution characteristics, the results will not be obvious if the KMO and Bartlett's Test values are between 0 and 1. That the said statistical value is less than 0.4, will cause research with primary component analysis techniques to be incomplete. The use of key component analysis techniques has 3 special features as follows.

6.1 Analysis of key components are used to create indicators and generate numbers that represent the collected data used in the analysis of the study. The results refer to the population and information presentation. The application of the method must concerns the division of questions in the questionnaire and weigh or how many questions can be substituted for the whole question. Once the weight of each group has been obtained, next process is weighting the questions according to the weighted values of each group. One thing that researchers should consider when the value of the weight is out is what is the percentage of total weight values of all groups? How accurate is the research result?

6.2 Analysis of key components are used to check measuring tools to confirm the position accuracy and questions within various groups. Once the information has been received by considering from the Rotated Component Matrix which has a value between - 1 to + 1, which is considered in terms of numbers. Excluding the consideration of the direction of the numbers which means the question is both positive and negative. The negative can be on the same point, If the value appears closer to the number 1 inside the question. But if the value is closer to 1 than other groups, it shows that the question cannot be on the same side. There are two options for this problem. The first option is to exclude that question from the questionnaire or the second option is not to use the question in result analysis. The question can be in the questionnaire but it is necessary to move to the group that has the closest value to number 1. The decision is made by the judgment of the researcher.

6.3 Used to test the Multi-Colinearity in regression analysis if the variables within the group are related in the test. The variable must be excluded from the study in order to prevent the regression of multiple regression analysis from the variables that are related to each other.

Use of key component analysis techniques is a method that can be used only for questions with levels which are measured in intervals and ratios only. This means that the choice of educational methods must first depend on the level of the measure of the question.

Results

Method 1 Calculated by average of dimensions and aspects

When considering the analysis results obtained from taking all questions into consideration by giving the same weight in both dimensions and each side. The calculationshows an average of 100 points. It is found that the Social Justice Index has an average value of 62.55 which is considered to be fair at a moderate level. On the other hand, when considered by dimension, it was found

that the dimension of acceptance and social equality. Culture has an average more than other dimensions at an average of 76.26 and also found that societal and cultural acceptance is the aspect that the sample group views as being fairer in terms of equality in the same dimension. The other aspects are the dimension of participation and political rights. The economic dimension and resource distribution are similar. What surprising is that when considered a whole of the dimensions, rules, norms and judicial processes are the least fair with an average of 45.83, especially in the field of justice. The respondents commented that the justice process was less than half fair. The justice was least in every aspect. (as shown in table 2)

Table 2 The weight and average value of the question through the calculation method on all sides with the same mean value

Variable name	Weight	Average
Social justice index	**100.00**	**62.55**
1. Dimension of acceptance and equality in society culture	25.00	76.26
1.1 Social and cultural acceptance	50.00	86.28
1.2 Equality	50.00	66.24
2. Dimension of participation and political rights	25.00	65.18
2.1 Political participation	50.00	59.14
2.2 Political Freedom Community rights	50.00	71.62
3. Economic dimensions and resource distribution	25.00	64.08
3.1 Classification distribution yield an income	50.00	56.01
3.2 Holding a production factors and public utilities access to public services	50.00	72.28
4. Dimensions, rules, norms and judicial processes	25.00	45.83
4.1 Legal principles	50.00	47.28
4.2 Principles from the results of the analysis in the first form, it shows equality. And the equality of questions makes research of Justice	50.00	44.95

The development of a fairness index has characteristics of fairness and justice that are included in the research. But social justice and justice are not the same thing. Receiving equal things can sometimes reinforce social inequality. Therefore, receiving equal rights may not be sufficient for fairness. Such as in the long-standing case study about 3 children and 3 boxes that will help children see a sporting event. It is because each child is not the same height. Some people are so tall that they don't have to rely on a box in order to see the competition. It's called the handicap. While another person needs only one box to be able to see the competition. The last person needs more than 1 box in order to see the competition. Therefore, giving a box to every child is not an expression of social justice but rather an expression of justice like choosing the data analysis method. Although, the questions contained in each side are not equal in number and are equalized later. It is only a relatively sparse alternative. When considering the details that each question still has different weights, it also affects the calculation of dimensions. Of course, it must change the analysis results.

Method 2 Calculated by average of dimensions and weight of aspects

It is necessary to use the weighting to make each side questions have unequal averages. Before adding to the dimension to make the mean equal, in this way, some numbers in the dimensions and indicators of social justice change. As a result of changing the mean method from each side, the result of the data analysis shows that the Social Justice Index has increased from the first way of thinking. The average value of 65.33 when considered by dimension, it is found that the dimension of acceptance of social and cultural equality is still the dimension that the sample receives the most justice. Only the numbers of this dimension increase. Until it is considered to be fair at a high level with an average of 80.62. The reason that makes this dimension more social justice is the acceptance of society and culture. It has a score of 86.28 with a higher weight. In terms of equality, a lot of people make the average of the dimensions of acceptance in social and cultural equality. The average value increased from the first method. At the same time, other dimensions are weighted according to the results of the main component analysis. Resulting in the mean is different from the previous one. When considering the dimensions of the sample group, it received the least fairness instead. It is found that the average of the regulatory dimension is less. Norms and justice due to the regulatory dimension has less weight than the main dimensions of the judicial process. It is causing the score to drop from the first method of analysis (as in table 3)

Table 3 Showing the weight of an average value of the question through the calculation method for all aspects with the average value not equal but the multiple Diamond Channel average is compatible.

Variable name	Weight	Average
Social justice index	**100.00**	**65.33**
1. Dimension of acceptance and equality in society culture	25.00	80.62
1.1 Social and cultural acceptance	71.73	86.28
1.2 Equality	28.27	66.24
2. Dimension of participation and political rights	25.00	67.98
2.1 Political participation	71.95	59.14
2.2 Political Freedom Community rights	28.05	71.62
3. Economic dimensions and resource distribution	25.00	68.89
3.1 Classification distribution yield an income	79.58	56.01

Table 3 Continued

Variable name	Weight	Average
3.2 Holding a production factors and public utilities access to public services	20.42	72.28
4. Dimensions, rules, norms and judicial processes	25.00	45.01
4.1 Legal principles	14.17	47.28
4.2 Principles of Justice	85.83	44.95

Method 3 Calculated by weighted of dimensions and average of aspects

The analysis found that the average of Social Justice Index has decease from the two methods above even though it is the same dimension from the two methods above. The cause of the dropping average is the consequence of not calculating in each aspect according to weight like the second method but equaling the two questions like the first method and then, weight in each dimension at once. The reason that decrease the average is the weight from component analysis 64.11 percent drop to the regulatory, norms and judicial process that has average at 45.8. When consider the dimensions that once increased the average of the justice index such as acceptance dimension and social and cultural equality dimension that has average at 76.26, the weight when analyze the main component just 18.11 percent (as shown in table 4) The analysis found that the average of Social Justice Index has decease from the two methods above even though it is the same dimension from the two methods above. The cause of the dropping average is the consequence of not calculating in each aspect according to weight like the second method but equaling the two questions like the first method and then, weight in each dimension at once. The reason that decrease the average is the weight from component analysis 64.11 percent drop to the regulatory, norms and judicial process that has average at 45.8. When consider the dimensions that once increased the average of the justice index such as acceptance dimension and social and cultural equality dimension that has average at 76.26, the weight when analyze the main component just 18.11 percent (as shown in table 4)

Table 4 Showing the weight of an average value of the question for the calcu lation method on all sides with the same average value but the average value of the dimension is not equal

Variable name	Weight	Average
Social justice index	**100.00**	**54.30**
1. Dimension of acceptance and equality in society culture	18.11	76.26
1.1 Social and cultural acceptance	50.00	86.28
1.2 Equality	50.00	66.24
2. Dimension of participation and political rights	7.55	65.18
2.1 Political participation	50.00	59.14
2.2 Political Freedom Community rights	50.00	71.62
3. Economic dimensions and resource distribution	10.22	64.08
3.1 Classification distribution yield an income	50.00	56.01
3.2 Holding a production factors and public utilities access to public services	50.00	72.28
4. Dimensions, rules, norms and judicial processes	64.11	45.83
4.1 Legal principles	50.00	47.28
4.2 Principles of Justice	50.00	44.95

Discussion

The result of the study of social fairness measurement using 3 methods of measurement; Method 1, calculated by average of dimensions and aspects. Method 2, calculated by average of dimensions and weight of aspects. And Method 3, calculated by weight of dimensions and average of aspects. Method 1 found that the Social Justice Index has an average at 62.55 which is considered to be moderate to rather high. But when considered by dimension, it was found that the dimension of acceptance and social equality. Culture has an average more than other dimensions at an average of 76.26 and also found that societal and cultural acceptance. It is the aspect of the sample group views as being fairer in terms of equality in the same dimension as a whole. The dimensions, rules, norms and justice process are the least fair with an average of 45.83. Method 2 found that the Social Justice Index has increased from the first method. With the average value of 65.33 when considered by dimension, it is found that the dimension of acceptance of social and cultural equality is still the dimension that the sample receives the most justice but the numbers of this dimension increase and has the high level of fair with an average of 80.62. The reason this dimension has more social justice is the acceptance of society, culture, which has a score of 86.28 with a higher weight than equality dimensions making the average value of accept ance and social and cultural equality increased from Method 1. Method 3 found that the weight from the analysis of the main components 64.11 percent fall to the regulatory dimension. Norms and justice process have an average of 45.83, when considering the dimensions that used to make the average of the fairness index higher: acceptance dimention and social and cultural equality dimension that has average value at 76.26, has weight value only 18.11 percent when analyze the main component. When comparing all 3 methods, it is obvious that the mean and in each aspect and dimension in method 2 has increased and considered fair at a high level. When referring to the origin of the weight of the dimensions and aspects

used in data analysis to find the social justice index which give more an explanation than using the statistical program to analyze the data. It is the weight received caused by the nature of data distribution. The more information is distributed will have a direct effect on the analysis of key components. This method is considered the most appropriate method when considering the issues in order to study social justice through statistical methods. For example, dimensions, rules, norms, and judicial processes are given more weight than acceptance and social and cultural equality dimension with higher mean values. When arrange the raw data, it is found that the frequency of choosing the answer of the dimension of acceptance of social and cultural equality will be in one big group and the other group will be only small group while the dimension, Rules, norms, and justice process have more distribution of information. When put them together, they will not be much different in ratio and distribution. It is just one of the main reasons why non distribution data is unsuccessful in analyzing key components. In general, information distribution has been important since the beginning. Without the distribution of data, researchers may have to go back and consider the questions again. The conditions and formulas for analyzing key components are complex and require many calculations. Before leading to the result which leads to the main problem of the researchers. Use of key component analysis techniques is a method that can be used only for questions with levels which are measured in intervals and ratios only. This means that the choice of educational methods must first depend on the level of the measure of the question.

In addition, the study results are in line with the literature review. (Lounkaew, 2016). Methodology for indexing and data analysis, calculation of social justice Index is important to adhere to the technical indexing principles by paying attention to the set of data and the properties of the index data and what they mean. Therefor we should average the data and find the index directly because it will cause an error to the result and we cannot truly reflect social justice.

The researchers' decisions also creates both positive and negative result. During the decision making it may cause the conflict between the reason and the possibility of implementation options. Like the two paths of decision making, if choosing any path without justification what follows is the criticism of methods that are not highly reliable. Research that explains data does not cover all groups of people. It can also explain the data obtained from sampling samples and give reasons for work. Research that has errors in the methodology causes the research to lose its credibility regarding the data. In addition, there are many cases involving errors of research, such as copying without reference to sources as well as selection of abnormal data and acquisition of information without honest methods, etc.

The important point in the research is not just the paper showing the results of the analysis; the research analysis should refer to the ideas and decisions of the researcher about the method of study and to be accurate and reliable. Many times, researchers need to close their eyes and open their minds to the academic opinions of other researchers. In order to promote quality work in a broad way, and to be able to meet the needs of the research completely. Including going to social responsibility at all levels in order to become a researcher, you need to have a sense of dedication and intelligence for the advancement of academic and nation.

Recommendations

1. The development of the social justice index should be continuously explored in order to see changes in social justice through the index numbers.

2. At least 4 dimensions of importance should be considered, as have been studied and other dimensions can be added later as appropriate for each context of the study.

3. The results of this research can be used in practice for various departments related to creating fairness and reducing social inequality. Both government agencies or Non-governmental organization such as the Institute of Civil Society Media Education or Local government organization such as the Office of the National Economics and Social Development Council, Ministry of Social Development and Human Security, Ministry of Justice, Ministry of Social Development and Human Security.

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An Automotive Part Management Methods of Plant Managers in Managing Thai-Oversea Manufacturing Parts: A Case Study of Effectiveness and Efficiency of Organizational structure Instruction Management.

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Abstract

This article presents the study result of organization structure instructs to efficient and effective establish in an Automotive Part Management Method for Plant Manager to manage Thai-Oversea Manufacturing plants. The research methodology using Delphi with Triangulation techniques of 19 Plant managers, and experts confirmed the prototype organization structure. The study objective to find the prototype for efficiency and effectiveness of organization structure instructs and application on two or more automotive parts manufacturer plants in Thai and Oversea. Finding the prototype organization structure in automotive part management plants which are more efficient and effective by a mix of 4 theoretical organization structure forms namely Function organizational structure, Production process organization structure, Matrix organizational structure, and Line & Staff Organization Structure. The suggestions and limitations of the prototype organizational structure are specific for manufacturing plants, starting up manufacturing plant, and the operation tasks also take responsibility from the master plant to control during start-up period.

Introduction

Kasikorn Research Center (2017) presented a report about the shrinking Thai auto-parts export due to increased foreign investment in the main importing countries like Mexico, Malaysia, Indonesia and South Africa, along with management of supply chain which saw the designing of production base relocation and creation of international business network. Vinodk (2016) found that the current trend of international production networks tended to move their production base as close to the final consumers as possible with focus on transportation/cost reduction as part of the change in international business strategy. Marcel & Sergej (2016) found that expansion or relocation of production base stems from three reasons: (1) increase and expand the company's opportunity and capability in foreign countries, (2) reduce the original production base due to decreased opportunity and (3) build a new business space for better business activities. The National Institute of Development Administration (2018) found that auto-parts industry is another community continuously expanding its investment abroad. Munkongtum, Piakson, &

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Phonvut (2017) found that government support for Thai entrepreneurs capable of investment abroad became an opportunity for Thai entrepreneurs in foreign countries. Reasons above inevitably impacted management of production plants both in Thailand and abroad by Thai managers, and represent new challenges that necessitate searching of new capabilities for successful management of international manufacturing plants and studying on a model for multiple plants management in Thailand and abroad as a guideline for aspirants looking for successful opportunities abroad. In addition, Stephen, DeCenzo, & Coulter (2011) found that the key in organizational management is a good organizational structure that is conducive for effectiveness. Therefore, study on structuring in auto-parts plants with multiple-plant management in both Thailand and abroad is the first priority.

Objective

Study effective and efficient organizational structure instruction based on the main study of finding a model for multiple plant management in Thailand and abroad.

Conceptual framework

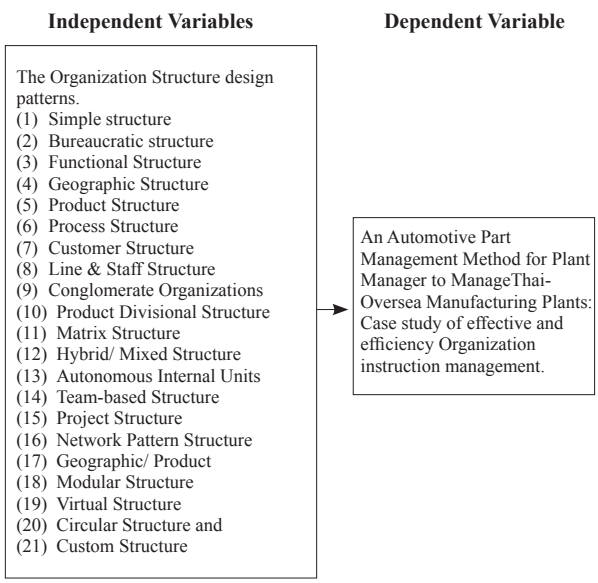

Figure 1 Conceptual framework

Research scope

1. This study is part of the research to find a model for multiple plant management in Thailand and abroad as done from March to September 2019.

2. Studied samples were managers of auto-parts or supporting plants in Thailand with at least five years of experience, are in charge of more than two plants in Thailand and abroad, and covering all plant sizes.

Research methodology

This study is of hybrid method using Delphi Technique on 19 sampled managers in charge of more than two plants in Thailand and abroad with more than five years of experience in effective and efficient management of plants in Thailand and foreign countries. The study also covers 20 theoretical organization designs, job positions under the managers' supervision, and causes and guidelines for organization design. The model structure is confirmed and by consensus of seven experts, and its validity and reliability are checked by Delphi process and triangulation.

Results

1. Recruitment of managers in charge of more than two plants: because there was no information source explicitly stating expertise and qualifications as managers in charge of over two plants in Thailand and abroad. According to the concept of sample limitations, selection of suitable samples as proposed by Suriyapiwat (2018) was to draw a sample group from experts on LinkedIn as studied by Van Dijck (2016). As a result, sample selection are shown in table 1.

Table 1 Sample information from LinkedIn (accessible at https://www.linkedin.com, accessed, 1 March 2019)

Number of automobile managers on LinkedIn	Number (Person)	Percentage
Total	51,186	-
Automobile plant managers	8,765	-
Automobile plant managers based in Thailand	1,598	100
Automobile plant managers who are Thai and eligible for sampling	121	7.57
Experts that stay until the end of Delphi process	19	1.13

According to table 1, the researcher studied each sample group member's profile by using keywords like "Plant/ Plant General Manager" "Operation/ Manufacturing Manager" and "Director of Operations" for persons based in Thailand along with the word "automotive" on LinkedIn. It could be summarized that 121 managers (7.57%) were eligible for sampling, 19 (1.13%) accepted the invitation and all of them stayed until the end of Delphi process. According to Figure 1 that shows the experts' classification based on plants they

manage, 11 managers (61.1%) were in Tier I group, five (22.2%) in Tier II, one (5.5%) in Tier III and two (11.1%) in support.

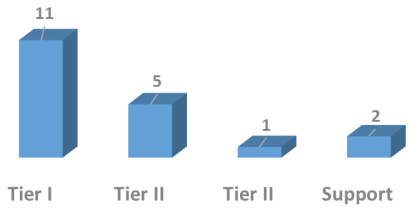

Figure 2 Types of plants the sample group manages.

According to Figure 3 which shows the number of plants in various countries under care of all 19 experts. In total there are 79 plants in 12 countries. It was found that the highest number of plants directly under a single manager is five and the lowest is two. There are 45 plants in Thailand (59.96%), seven in Indonesia and Japan (8.86%), five in India (6.33%), four in Vietnam (5.06%), three in Malaysia and South Korea (3.8%) and one in Laos, Turkey, China and the Philippines (1.9%), respectively.

2. Effective and efficient design for multiple auto-parts plants.

It is found that 20 different theoretical designs are applied to multiple auto-parts plants per table 2.

Figure 3 Number of plants in various countries under care of all 19 experts.

Table 2 Auto-parts plant managers' use of theoretical design based on Delphi techniques

Organization type and connection	Application (N = 18)						
	Modeling		Validation			Confirmation	
	Frequency	Percentage	Median	I.R.	Consistency	Percentage	Result
1. Simple	12	66.7	3.00	2.50	High	-	Unconfirmed
2. Bureaucratic	17	94.4	3.00	1.75	High	-	Unconfirmed
3. Functional	18	100.0	5.00	1.00	Highest	100	Confirmed
4. Geographic	14	77.8	2.50	1.75	Highest	-	Unconfirmed
5. Product	15	83.3	2.50	1.00	Highest	-	Unconfirmed
6. Process	13	72.2	4.00	1.50	High	88.9	Confirmed
7. Customer	12	66.7	2.00	2.00	High	-	Unconfirmed
8. Line & Staff	14	77.8	4.00	1.50	High	77.2	Confirmed
9. Product Divisional	11	61.1	3.00	2.00	High	-	Unconfirmed
10. Team-based	14	77.8	3.00	2.50	Highest	-	Unconfirmed
11. Project	8	44.4	2.00	1.00	Highest	-	Unconfirmed
12. Autonomous Internal Units	11	61.1	2.00	1.00	Highest	-	Unconfirmed
13. Line and Advisor	10	55.6	2.00	2.00	High	-	Unconfirmed
14. Conglomerate	11	61.1	3.00	2.00	High	-	Unconfirmed
15. Network Pattern	11	61.1	2.00	2.25	Highest	-	Unconfirmed
16. Matrix	16	88.9	4.00	1.50	Highest	77.8	Confirmed
17. Geographic/ Product	11	61.1	3.00	2.50	High	-	Unconfirmed
18. Modular	6	33.3	2.50	1.75	Highest	-	Unconfirmed
19. Virtual	6	33.3	2.00	1.50	Highest	-	Unconfirmed
20. Circular	10	55.6	2.50	1.75	Highest	-	Unconfirmed
21. Custom	1	5.6	1.00	-	Highest	-	Unconfirmed

Table 2 shows that through study and statistical analysis, four main theoretical organization types were confirmed by the experts as being in use: (1) Functional, (2) Process, (3) Matrix and (4) Line and Staff respectively. There are also single and mixed designs in use.

were managed by the central organization like finance, human resources, sales and marketing.

3. Organization design based on the model of effective multiple plant management in Thailand and abroad. Result from the study to build a suitable

Table 3 Job positions directly under the plant manager per Delphi study (N = 19)

Managers in charge of multiple plants in Thailand and abroad						Central organization	
Thai		Foreign		Joint			
Direct report	Percentage of expert	Direct report	Percentage of expert	In charge of multiple plants and report directly to manager	Percentage of expert	Global report	Percentage of expert
Production	100	Production	57.9	EHS	21.1	Financial	68.4
M&L, Planner	94.7	Maintenance	57.9	Procurement/ Purchasing	21.1	HR/HRD	63.2
Maintenance	94.7	Engineering (Technical/ Process)	57.9	Quality	15.8	Sales & Marketing	57.9
Quality	89.5	Quality	52.6	M&L, Planner	10.5	Procurement/ Purchasing	21.1
Engineering (Technical/ Process)	89.5	M&L, Planner	52.6	Engineering & Maintenance	10.5	M&L, Planner	21.1
Delivery, Logistics and Warehouse	84.2	Delivery, Logistics and Warehouse	47.4	IT	10.5	Strategy	21.1
Product / R&D Engineer	84.2	Product / R&D Engineer	42.1			EHS	10.5
EHS	73.7	EHS	36.8			Commercial	5.3
Customer Service	42.1	HR/HRD	26.3				
HR/HRD	26.3	Finance and Cost Control	21.1				
Finance and Cost Control	26.3	Customer Service	15.8				
Continuous improvement	26.3	Continuous improvement	10.5				
Sales & Marketing	26.3	Sales & Marketing	10.5				
Laboratory	5.3	IT	5.3				
IT	5.3						

Additional studies on works under the plant manager's responsibility (both Thai and foreign plants) yielded information per table 3. All 19 experts have work departments or positions that report directly to the plant manager in Thailand such as production, M&L/planner, maintenance, quality, engineering, delivery-logistic-warehouse, production/R&D engineer, EHS, and customer service. On foreign plants, positions that report directly to the plant manager are production, engineering & maintenance, M&L/ planner, delivery-logistic-warehouse, product / R&D engineer, and EHS. Departments jointly used by both Thai and foreign plants had no confirmation but there were some processes and departments jointly used between plants like EHS, procurement, quality, M&L/ planner, engineering & maintenance and IT. In addition, some work departments

organization model for the main research question using Delphi technique, triangulation and consensus from the seven experts can be concluded and shown in Figure 4.

3.1 Regarding organization structure instructs characteristics based on the model for management of multiple auto-parts plants in Thailand and abroad, hybridization if four different theoretical structures could be confirmed. The process was done mainly in the first plant and then copied to the other plants.

3.2 The advantage mixed of organizational structure's efficiency and effectiveness of 4 theoretical organization structure forms as Function organizational structure to effectiveness from clearly defined the job responsibility. Production process organization structure with cost and production's availability efficiency and

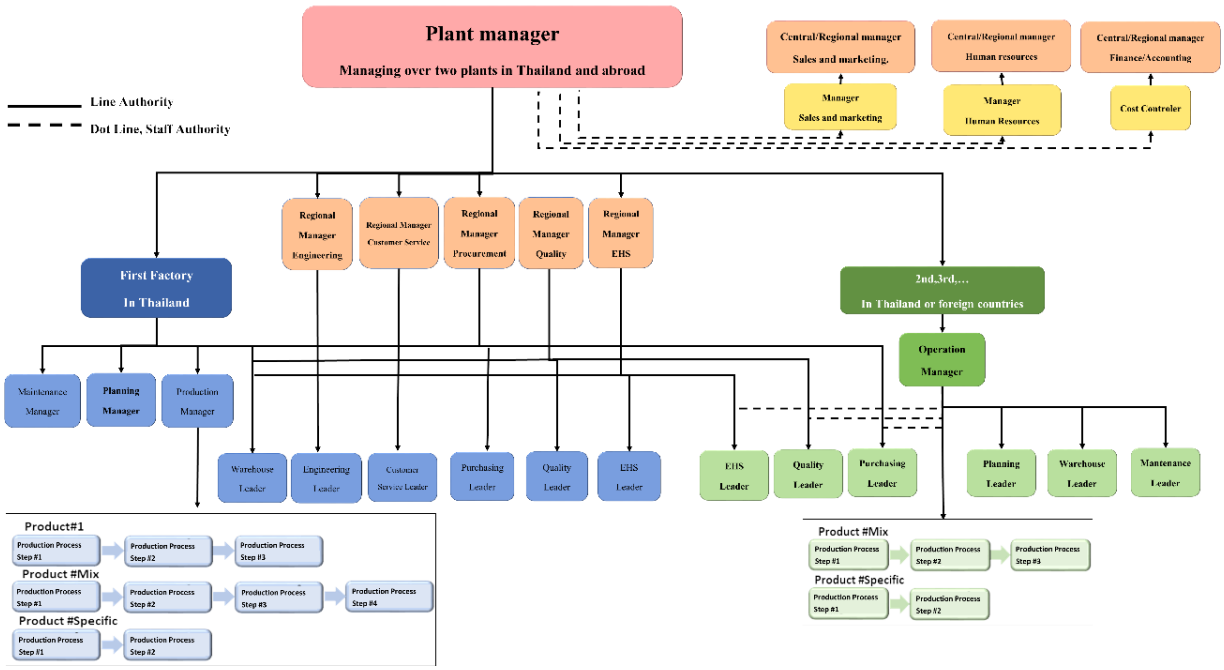

Figure 4 Effective and efficient orgarnization structure model for management of multiple auto-parts plants in thailand and abroad.

effectiveness from mixing products and specifying products production line. Matrix organizational structure and Line & Staff organization structure are more advance for cost efficient and effectiveness to manage manufacturing plants and/or oversea plant.

3.3 Regarding job descriptions in the model for management of multiple auto-parts plants in Thailand and abroad, duties and responsibilities are as follow:

Plant manager or regional plant manager is in charge of more than two manufacturing plants in Thailand and abroad, along with various managerial responsibilities.

Regional department Manager is in charge of a department of a group of two plants or more in Thailand and abroad, and report to the Plant manager.

Department Manager is in charge of a department within a single plant.

Section/Department Leader is subordinated to the department manager and reports to the department manager, regional department manager or the plant manager.

Production staff reports directly to the manager or production chief. Production is divided into lines

4. Rationale to use the current organization design and future restructuring trend.

- The sample experts use the current organization design and it is found that:

1. Restructuring to accommodate cost-cutting measures.
2. Restructuring to better suit the business type, focusing on agility and shallowness.
3. Emphasis on efficiency, clarity of duty, reduction of department, and reduction of confusions in duty.
4. Retention or application of the structure laid out by the organization's policy and
5. Restructuring for future expansion or work.

- About main opinions and guidelines for future restructuring, it is found that the organization:

1. Focus on restructuring to improve efficiency, change duties and reduce confusion.
2. Restructure itself according to business strategy or to prepare for management of new plants or products.
3. Emphasizes structural agility, reducing depth and cost.
4. Restructure itself in accordance with central policy or direction and
5. Merge international positions or duties.

Discussion

1. Organization design management per the research objective found that in the study hybrid design was used, which was derived from functional, production, matrix and line & staff. Real-life application of mixed theoretical design could be confirmed, agreeing with (Barraza, 2018; Lewis, 2011; Joseph, 2011; Homan, 2015; Roberson, 2016).

2. The model for management of multiple auto-parts plants in Thailand and abroad as actually used by the organization is similar to the Hybrid design theoretical structure which is formed by mixing various theoretical designs together. Difference from the theoretical design, however, was that hybridization focused on production process rather than business duty, which concurred with Yomjinda & Yomjinda (2018). Functional design grouped staff members based on their specialized assignments but their responsibilities were expanded to cover both Thai and foreign plants. Line & staff design has primary and secondary chain of command to accommodate future expansion in agreement with Schiefen (2010). Geographic design has expansion of some duties' coverage in both Thai and foreign plants, with some differences as the theoretical design focuses more on sales and marketing (Stephen & Timothy, 2007), while being more similar to Chucheep (2016). Modular design structures the organization like border expansion with a parent company or main plant supervising child companies/plants. Also, the Virtual design is built on internal and external networks, probably for establishing a new plant. This design is usually temporary and will be restructured after plant establishment is complete.

Suggestions

1. Suggestions on main objectives and theories:

The study found that suggestions for main objectives and theories are:

1.1 The organization design confirmed that competence of the leader in managing the organization design has an impact on efficient and effectiveness of the organization structure.

1.2 The organizational structuring design confirmes the mixing of theory organizational structuring forms.

1.3 An automotive part management methods of plant managers to manage Thai-Oversea manufacturing parts found the forming from 4 theories of organization structure namely Function organizational structure, Production process organization structure, Matrix organizational structure, and Line & Staff organization structure are more advance in efficient and effectiveness.

2. Suggestions on application for auto-parts plants restructuring:

The study found that suggestions for organizational management of over two plants in Thailand and abroad are:

2.1 Organization design from the research process might have issues with Thai organizations that are unfamiliar with, as they have similar structure with the first factory with the merging of some job positions, and complexity in the second or expanded plant.

2.2 This organization guideline can be used as a guideline or model but some adaptation must be made to fit the design with policy, management, goal and target of each organization.

2.3 There might be changes like creating a position above the plant manager, like director or regional plant manager.

2.4 Dot line or staff authority management style remains effective for cost-saving and resource sharing between plants or departments such as procurement, quality and safety.

2.5 Organizations with regional structure is more complex and requires readiness in capabilities and skills, along with clear direction setting, reporting, communication. All procedure must be clear and systematic.

2.6 Limitations and warnings: the model structure put forth in this study has some limitations and warnings for some issues like use of Dot line, as despite its increasingly common use, Dot line approach has some problems and is inconsistent with the principle of having only one superior. In addition, organizational structure in the second or third plants is more temporary and thus some managers or departments are not ready to procure or hire new resources for those new positions.

3. Research suggestions

3.1 This study is a part of the main research on a model for management of multiple auto-parts plants in Thailand and abroad with effectiveness and efficiency.

3.2 The model is based on an application guideline which more trial is needed.

3.3 Hybridization of any of the mentioned 20 theoretical designs still have issues about effective integration/hybridization, which warrants further studies.

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Values and Potentials of Living Heritage Sites: Case Studies of Buddhist Stupa in Thailand for Listing as UNESCO World Heritage Sites

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Cultural heritage, World heritage, Buddhist stupas, World heritage list nomination

Abstract

Thailand has various tourist attractions with both natural and cultural heritage sites, along with five properties on the World Heritage List. In order to explore the nomination strategies to nominate properties to UNESCO's World Heritage List, this case study focuses on four Buddhist stupas in four eminent cases in four regions of Thailand which are registered as historic sites by the Fine Arts Department of Thailand: 1. Wat Phra That Hariphunchai Woramahawihan in Lamphun Province; 2. Wat Phra That Phanom Woramahawihan in Nakhon Phanom Province; 3. Wat Phra Pathommachedi Ratcha Woramahawihan in Nakhon Pathom Province; and 4. Wat Phra Mahathat Woramahawihan in Nakhon Si Thammarat Province. This study applies a combination of qualitative methods in assessing cultural heritage significance, authenticity, and integrity of the sites, including a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis.

The objectives of this research are: 1) To contribute to the body of knowledge of cultural heritage significance of the Buddhist stupas in Thailand, 2) To analyze the potential significance of cultural heritage proposed to join the World Heritage List, and 3) To identify strategies to control, manage and deal with any threats for nomination to the World Heritage List effectively and appropriately. Research reveals that these Buddhist stupas have potential to be nominated as a serial nomination of cultural heritage on the World Heritage List because of cultural values for national and international levels such as historical value, aesthetic value, social value, spiritual value and the enduring respect of Thai Buddhists to Buddhism through cultural heritage practices and traditions over time. The results of this paper also offer recommendations of a new strategy for Thailand in the process of nomination.

Introduction

Many state parties[1] have tried to nominate their properties to the World Heritage List in order to make potential benefits from World Heritage status, such as providing an opportunity for the state and for the local community to celebrate the property as one of the most important natural and cultural places on Earth. Thailand has various tourist attractions with both natural and

[1] 'State parties' are countries which have adhered to the World Heritage Convention. They thereby agree to identify and nominate properties on their national territory to be considered for inscription on the World Heritage List (UNESCO, n,d).

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cultural heritage sites as well as five properties in the World Heritage List.

The present study focuses on four Buddhist stupas which are: 1. Wat Phra That Hariphunchai Woramahawihan in Lamphun Province; 2. Wat Phra That Phanom Woramahawihan in Nakhon Phanom Province; 3. Wat Phra Pathommachedi Ratcha Woramahawihan in Nakhon Pathom Province; and 4. Wat Phra Mahathat Woramahawihan in Nakhon Si Thammarat Province. The reasons why these 4 stupas were selected are: 1) They are all represented in cultural heritage sites registered by the Department of Fine Arts, Ministry of Culture of Thailand; 2) They are all related to intangible cultural heritage of four other eminent cases in four regions: Northeast, North, South, and Central Thailand; and 3) They are all living stupas where the community still continue their cultural activities. Buddhist monuments are scattered throughout Thailand, varying by age and arts, but these 4 stupas are also notably included in the book Chom Chedi ('Admire Stupas' in Thai) published by the country's (Fine Arts Department, 2000).

The study's interest is *cultural heritage values*; ultimately, however, values can only be understood in terms of cultural significance. Accordingly, the differences manifested in these four different sites and their practices will be especially interesting for cultural heritage values. This study also outlines opportunities and strategies related to their significance, proposing them onto the Tentative List of the World Heritage List, as well as dealing with associated threats effectively and appropriately via a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis.

The World Heritage List includes 1,121 properties forming part of the cultural and natural heritage which is considered as containing 'Outstanding Universal Value' by the World Heritage Committee. These include 869 cultural, 213 natural and 39 mixed properties in 167 state parties, and there are 1,720 sites from 178 state parties in the tentative lists in 2019.

International interest in World Heritage sites often provides a stimulus for international cooperation and joint efforts to ensure the protection of the property (UNESCO, ICCROM, ICOMOS, & IUCN, 2011). Being on the World Heritage List is an opportunity for every country, and Thailand is one of the state parties aiming to nominate potential properties to obtain such opportunities of long-term protection, conservation and management of the property. Thailand's seven sites on the Tentative List include: the Kaeng Krachan Forest Complex in Phimai; the ensemble of Phanom Rung, Muang Tam and Plai Bat Sanctuaries; Phuphrabat Historical Park; Wat Phra Mahathat Woramahawihan in Nakhon Si Thammarat; Phra That Phanom, its related historic buildings and associated landscape; the ancient town of Si Thep; and the monuments, sites and cultural landscape of Chiang Mai, capital of Lanna. The Kaeng Krachan Forest Complex has been nominated as natural heritage. Nominated properties of cultural heritage in tentative lists of Thailand are related to Buddhism and represent the respect of living Buddhists along with their beliefs of the past.

Thailand is situated in the heart of the Southeast Asia, sharing borders with the Lao People's Democratic Republic and Myanmar to the north, Cambodia to the east, Myanmar and the Indian Ocean to the west, and Malaysia to the south. Buddhism is the national religion and the professed faith of 95 percent of the population. Islam, Christianity, Hinduism, and others are embraced by the rest of the population (Board, 2000).

According to the processes of nomination and inscription of properties on the World Heritage List at the core of the World Heritage Convention, state parties have a critical responsibility to the Convention.These responsibilities cover three key areas: preparation of Tentative Lists, preparation of nominations, and effective management of properties that are inscribed to protect, conserve and manage their Outstanding Universal Value ('OUV' in abbreviated form) (UNESCO, ICCROM, ICOMOS, & IUCN, 2011). Thailand already has several cultural heritage properties with both 'Living Cultural' properties and 'Relic Cultural' properties with the potential to nominate to World Heritage status, however, the following key points regarding nomination and inscription of properties on the World Heritage List should be focused on to identify potential and strategies:

Kirdsiri, Muangyai, & Jitsuthiyan (2013) found that there are several cultural heritage sites that contain high multidimensional value for the communities where they are located. However, since all cultural heritage sites not only fragment in various and different locations but most are also limited in size, the direction to propose their OUV in a way that shows their 'Shared Values' can be a guideline for proposing them to the World Heritage Lists as a 'serial nomination' and accordingly their existing potential and various kinds of value will be run together, enhancing their more obvious OUV.

Furthermore, a serial nomination for the inscription of the World Heritage List will be appropriate due to the

properties being located in different areas, although with some connection, such as their same historical-cultural group, same type of property which is characteristic of the geographical zone, or same geological, geomorphological formation, or same biogeographic province which contains the series with significance (UNESCO, n, d). According to the process of nomination and inscription of properties, many state parties therefore have succeeded to list their serial properties in the World Heritage List, with the following cases as examples:

According to UNESCO (2011), the Longobards in Italy, Places of Power (568–774 A.D.) are included on the World Heritage List. These comprise seven groups of important buildings (including fortresses, churches, and monasteries) throughout the Italian Peninsula. They demonstrate the achievement of Germanic migration from northern Europe and development of their own culture in Italy in the 6th to 8th centuries.

Another example in the World Heritage List are Bursa and Cumalıkızık. These are the Birth of the Ottoman Empire, which is a serial nomination of eight component sites in the city of Bursa and the nearby village of Cumalıkızık, in the southern Marmara region of Turkey. The site reveals the establishment of an urban and rural system in the Ottoman Empire in the 14th century which represents the key functions of the social and economic structure of the new capital (UNESCO, 2014).

As mentioned previously, a comparative analysis and serial nomination may be used to apply for encouraging cultural heritage sites that share the same values, such as their historical-cultural group. This research focuses on the cultural heritage of four Buddhist stupas in four regions in Thailand where Phramahathat (The Great Stupa) and Phrathat (The Stupa) are located and their regional representative to identify their significance as they have been important sacred monuments in the past. Aksrondit (2002) states the role and symbolism of stupas in Southeast Asia that have been invented for symbolic functions based on the concept from Sri Lankan Buddhism. Theravada Buddhism is the majority of practice of Buddhists in Thailand, and Theravada derives from the conservative school of early Indian Hinayana. This tradition, as codified in ancient Sri Lanka, is still being practiced in Burma, Laos, Thailand and Cambodia.

Thailand has several stupas which expanded in every region of the country. These stupas contain key significance that relate to ongoing social interaction with the sites. Furthermore, the same or reproduced form of chedi (the Thai word for Thai stupas) was based on or imitated from Phra Borommathat Chedi, and can be found in many important chedis across many regions in Thailand (Chuvicien, 2012). This may be an example of a series related to chedi in other regions where culture becomes significant. This study will contribute to the body of knowledge of cultural heritage significance related to Buddhist stupas in four regions where Phra Mahathat (The Great Stupa) and Phra That (The Stupa) are located.

Objectives

1. To contribute to the body of knowledge of cultural heritage significance of the Buddhist stupas in Thailand
2. To analyze the potential significance of cultural heritage proposed to join the World Heritage List
3. To identify strategies to control, manage and deal with any threats for nomination to the World Heritage List effectively and appropriately

Conceptual framework

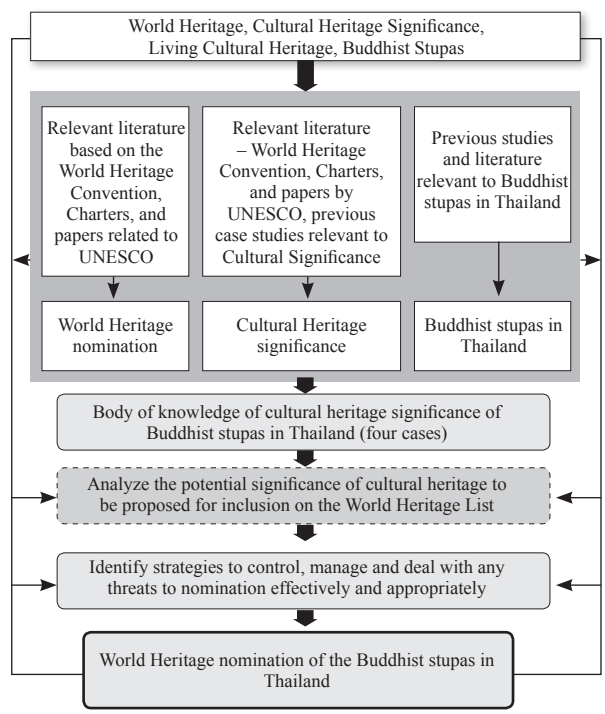

Figure 1 Conceptual framework

Research methodology

The research question is 'Do the Buddhist stupas in Thailand have potential to be nominated in the World Heritage List, and how to deal with any potential threats appropriately?' The research methods are based on a qualitative method in applying assessment of cultural heritage significance, authenticity, and integrity of the sites by reviewing heritage charters, previous research literature relevant to World Cultural Heritage, World Heritage papers by UNESCO, as well as recommendations of advisory bodies related to evaluation of world cultural heritage. In order to find out the nomination strategies to nominate properties to the World Heritage List, this case study is focused on four Buddhist stupas in four eminent cases in four regions of Thailand: the Northeast, North, South, and Central Thailand, which are registered as a historic site by the Fine Arts Department. Research dealt with data collection procedures, which covers a literature review of secondary data in the UNESCO website, public libraries and local authorities.

A documentary analysis was employed to examine secondary information such as history records, structure plans, visions and regulations, policies, issues, statistics and trends of development of World Heritage Sites. The documentary analysis is derived from statements and descriptions that were gathered from government publications, local articles, the UNESCO World Heritage Convention, Charters, related reports, journals and previous research of the case study sites. The supplementary information includes internet sources related to the conservation and legislation of World Heritage Sites and associated case studies. Site visual observations have been adopted as a tool to describe and explain the historic characteristics of the Buddhist stupas, any containing relics, and identifies the elements of character and how the history of the site is expressed in its plans and topography, archaeological potential areas and in its architectural and landscape character.

Moreover, to analyze the potential significance of cultural heritage proposed for the World Heritage List and to identify strategies, SWOT (Strength, Weaknesses, Opportunities, Threats) analysis is employed as a tool to assess the current situation, and both internal and external dimensions which includes strength, weaknesses, opportunities and threats of the Buddhist stupas. SWOT analysis is a strategic planning framework used in evaluation, with internal dimensions including organizational factors and external dimensions including environmental factors (Gürel, 2017). 'Strengths' is an internal factor of the property that will be an advantage to nominate the property, whereas 'weakness' is a disadvantage and could be a difficulty to deal with. Ideally, it should include a plan for improvement as well as a management plan. 'Opportunities' is an advantage from an external factor where the property can gain benefits of protection as well as nomination. Finally, 'threats' is an external factor that can be an obstacle for the property to gain nomination.

Both primary and secondary sources were data sources; primary sources are observation and data collection to understand the current situation such as management and activities of the site; secondary sources are derived from the National Library and National Archives of Thailand, the local libraries, internet websites, and relevant documents by UNESCO which focus on world heritage, cultural heritage significance, living cultural heritage, and Buddhist stupas.

Results

The research results are divided into two parts:

1. The body of knowledge of cultural heritage significance of the four Buddhist stupas in Thailand

Cultural heritage significance of the Buddhist stupas in Thailand have several values for national and international levels. All of the four sites have historical value, aesthetic value, social value, and spiritual value.

1.1 Wat Phra That Hariphunchai Woramahawihan in Lamphun Province is a historic site that reflects both tangible and intangible heritage, with ancient building techniques, methods, design, materials, and local wisdom of Lanna styles in Thailand. The principal stupa at Wat Phra That Hariphunchai Woramahawihan was built to house the hair of the Buddha and the present compound, founded by Hariphunchai King Athitayarai, dates from B.E. 1440 (Suthitham, 2010). The layout and setting of the cultural heritage sites reflect the concepts and traditions of ancient or local people, demonstrating their use of the land and construction methods. It represents an association between history, traditional beliefs, and the ways of life of people. Hariphunchai is the northernmost area where Buddhism influence from Lavo is demonstrated through Chamma Devi Princess, a type of area and architectural style. It was also a Buddhism center of the area in the past. *Song Nam Phra That* or *Pad Peng* traditional ceremony is an annual festival at Wat Phra That Hariphunchai Woramahawihan in order to pay respects to the Buddha on Visakha Puja Day, a day to commemorate the birth, enlightenment and death

of the Buddha.

1.2 Wat Phra That Phanom Woramahawihan, its related historic buildings and associated landscape (on the Tentative List since February 2017), is situated in Nakhon Phanom Province in the northeastern part of Thailand, west of the Mekong River. It was registered as an ancient monument by the Fine Arts Department of Thailand for conservation and protection under the *Ancient Monuments Act* in 1935 (Fine Arts Department, 2000). Wat Phra That Phanom has the most ancient Buddhist stupa in the northeast of Thailand and in the West of Mekong River basin. It contains the Buddha's breastbone relics and was first constructed as a square brick structure with intricate carvings reminiscent of the Cham or ancient Khmer style sanctuary (Saisingha, 2012). In August 1975, the high and top-heavy stupa, seated on the ancient crumbling brick base, collapsed in a week-long rainstorm. The 1975-1979 restoration was conducted under the supervision of the Prime Minister of Thailand with the full blessing of His Majesty King Rama IX, as well as the donations of Thai Buddhists. In addition, it is a historic site that reflects the layout and setting of the cultural heritage sites of the concepts and traditions of ancient or local people, representing an association between history, traditions, beliefs and ways of life of people.

1.3 Wat Phra Pathommachedi Ratcha Woramahawihan in Nakhon Pathom Province (on the Tentative list of Thailand since 2018) shows historical evidence from the Dvaravati period or about a thousand years ago as the first Buddhist settlement in Thailand. The most significant event in the current Rattanakosin era emphasizes the historical value of Wat Phra Pathommachedi Ratcha Woramahawihan, the largest stupa built in the reign of King Rama IV. It has played ongoing important roles involving Buddhist activities to this day, including worshipping the Buddha's relics and Phra Ruang Rojanarit (a large standing Budhha), Buddhist daily activities, and Buddhist Holy Day activities (Makhapucha Day, Visakha Puja Day, Asalha Puja Day, Buddhist Lent Day, End of Buddhist Lent).

1.4 Wat Phra Mahathat Woramahawihan, Nakhon Si Thammarat Province (on the Tentative List since August 2012) is located in the town center of Nakhon Si Thammarat Province in southern Thailand, where there is an ancient town situated on the main sand berm. It was registered as a historic site by the Fine Arts Department, and in 2010, the Conservation and Development of Rattanakosin and the Old Town Committee (2001) (Announcement of Nakhon Si Thammarat Old Town, B.E.2553) encouraged Nakhon Si Thammarat Old Town as a cultural heritage area that inherited great long-term cultural prosperity of the nation. It typically describes history classified into three periods: 11th Buddhist Century in the legend of Phra Borommathat Muang Nakhon Si Thammarat, 14th-15th Buddhist Century with the stupa built in the Srivijaya period, and 18th Buddhist Century influenced by Ceylon in the Polonnaruwa period, where the second-most ancient center in modern-day Sri Lanka originated.

2. The potential significance of cultural heritage characteristics to be proposed for the World Heritage List

Table 1 SWOT Analysis of four Buddhist stupas in Thailand to nominate as World Cultural Heritage

SWOT Analysis of four Buddhist stupas in Thailand to nominate as World Cultural Heritage	
1. Wat Phra That Hariphunchai Woramahawihan (Lamphun Province)	
Strengths	1. Properties are in the ancient town, and they have been registered by the Fine Arts Department and conserved by stakeholders. 2. Master of Lanna style stupa reflected into the neighboring area. 3. Record of restoration is clear.
Weakness	1. The restoration might have an effect on OUV of the site (Criteria i). 2. The growth of the city might be frozen from the nomination to become part of the World Heritage List.
Opportunities	1. Thailand has the National Commission for UNESCO[2] to support the site for nomination.
Threats	1. Many Buddhist sites on the Tentative List are increasing, and also the World Heritage List has the same OUV criteria for the properties. It may be hard to add a new one to the list in case of being a similar property.
2. Wat Phra That Phanom Woramahawihan (Nakhon Phanom Province)	
Strengths	1. Living cultural heritage site with Buddhists in the area. 2. A record of donations for continuing restorations has been beneficial to identify the living heritage site. 3. Criterion (vi) is a possibility to nominate as well as the evidence of archaeology.
Weakness	1. The ancient stupa collapsed in B.E.2518 from various factors. Architectural styles have been changing since from restorations. 2. The changing landscape of Wat Phra That Phanom at present might impact on the OUV of the site (Criteria i). The local community has built and adapted the area around the temple.
Opportunities	1. Thailand has the National Commission for UNESCO to support the site for nomination. 2. Buddhist activities as intangible heritage are an important part to encourage the site to maintain it in good condition.
Threats	1. The Operation Guidelines are concerned with authenticity, so to nominate with Criterion (i) might be an obstacle, as this site has changed and reconstructed over time, including due to natural disaster.

[2] The Thailand National Commission for UNESCO consists of key Thai government ministers and experts with the responsibility to drive implementation of the *Convention concerning the Protection of World Heritage (1972)*

Table 1 Continude

3. Wat Phra Pathommachedi Ratcha Woramahawihan (Nakhon Pathom Province)	
Strengths	1. The property is always in good condition because it was registered by the Fine Arts Department and conserved by stakeholders. 2. It illustrates continuing development of a Buddhist stupa from the Dvaravati period to the current Rattanakosin period. 3. Original heritage site from the reign of King Rama IV with Outstanding Universal Value.
Weakness	1. Phra Pathom Chedi is located in the central of Nakorn Pathom Province, so the local community may have objections to the nomination of this site. The growth of the city might be limited from the regulations of World Heritage status.
Opportunities	1. Thailand has the National Commission for UNESCO to support the site for nomination. 2. Study the community's concerns and participation of the area to increase understanding of the site by the local people.
Threats	1. Understanding of local people and stakeholders might consume a long time for the nomination progress.
4. Wat Phra Mahathat Woramahawihan (Nakhon Si Thammarat Province)	
Strengths	1. The property is always in good condition because it was registered by the Fine Arts Department and conserved by stakeholders. 2. Living Cultural Heritage site since the early 13th century CE as the center of Buddhism in the southern part of Thailand. 3. The long history of Wat Phra Mahathat Woramahawihan is significant, as well as the evidence of archaeology. 4. The record for Criterion (vi) indicates possibility to nominate, with primary (historical photos, religious context, etc.) and secondary sources (analysis of continuity use, histories and commentaries, etc.) 5. The property has a similar style with the original stupa in Sanchi Stupa, India.
Weakness	1. As a living site, restoration occurs. This may affect Criteria (i) in OUV because of the application of mixing cultures. Conservation efforts of each period brought changes to the plan and different architectural styles. 2. To clarify the buffer zone and conservation may take a long time to clear.
Opportunities	1. Buddhists have always paid respects to the stupa and they have been donating funds to maintain the site. 2. Thailand has the National Commission for UNESCO to support the site for nomination. 3. The site earned professional stakeholders in nomination to be in the World Heritage list. 4. Buddhist activities as an example of intangible heritage are an important part to encourage maintenance of the site in good condition.
Threats	1. The location is situated in the old town area and has community, private and public uses. To nominate the property, a buffer zone needs to be identified, and this may affect the local community. 2. Many tentative lists from all state parties is increasing as well as Buddhist sites. As seen from the comparative analysis of Cultural Heritage nomination related to Buddhist sites in Asia, there are a lot of stupas listed for nomination. Once the World Heritage List has a similar property, it is hard to add a new property with similar characteristics.

Discussion

According to Articles 1 and 2 in the *Convention concerning the Protection of the World Cultural and Natural Heritage* (UNESCO, 1972) heritage is defined for the purpose of the Convention as 'Cultural Heritage' which are *monuments, groups of buildings, and sites;* if the cultural property meets one or more of the following criteria, it can be nominated properties in the World Heritage Lists. Those criteria are:

(i) represent a masterpiece of human creative genius;

(ii) exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design;

(iii) bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared;

(iv) be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history;

(v) be an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change;

(vi) be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance. (The Committee considers that this criterion should preferably be used in conjunction with other criteria).

In addition, the *Operational Guidelines for Implementation* specified that all properties nominated for inscription on the World Heritage List shall satisfy the conditions of integrity and authenticity.

In terms of World Cultural Heritage nomination strategies, cultural heritage has significance for people around the world, it is inheritance from ancestors which entails a uniqueness for its descendants. World Heritage Sites create national pride and contributes possible benefits and income as well as opportunities to people in that country. The symbol of World Heritage status attracts state parties to encourage their properties to be listed in the World Heritage List, and Thailand is no different. Furthermore, other main ideas from World Heritage nomination concerns the conservation of cultural heritage value that is shown in various relevant literature as the first idea of UNESCO after WWII – to help, to encourage, to assist World Heritage sites in order to safeguard its heritage.

The research results offer opportunities and strategies related to cultural heritage significance in order to encourage them to join the Tentative List for the World Heritage List, as well as the potential to deal with any threats effectively and appropriately and additional research recommendations.

The following summary results from the research are described as follows:

Cultural heritage significance of the Buddhist stupas in Thailand has several values for national and international levels. Research reveals that the World Heritage nomination of the Buddhist stupas in Thailand have the potential to be nominated as a serial nomination of cultural heritage because of cultural values for national and international levels such as historical value, aesthetic value, social value, spiritual value, and the enduring respect of Thai Buddhists to Buddhism through cultural heritage practices and traditions. Criteria (v) can be encouraged by the continuing of Buddhism in Thailand which concerns intangible heritage.

To deal with threats, a SWOT analysis of Buddhist stupas in Thailand for nomination as UNESCO World Cultural Heritage Sites was applied for further understanding:

Strengths of Buddhist stupas in Thailand for nomination as UNESCO World Cultural Heritage Sites are that: the Buddhist activities at the site are very important to encourage the conservation of tangible heritage, as religions or belief systems are the core of life, any form of living heritage is inseparable from the framework of the religion or the belief system of its society (ICCROM, 2003). Both social and spiritual values are directly concerned with intangible heritage in the spiritual identity, or the traditional knowledge, art and practices of a cultural group. Spiritual value may also be reflected in the intensity of aesthetic and emotional responses or community associations and be expressed through cultural practices and related places. This follows Criteria (v) and (vi) of the World Heritage requirements.

Weakness

To nominate the properties to the Tentative List, all heritage properties includes monuments, groups of buildings, and sites are necessary to identify outstanding universal value which contain at least one criteria. These are directly affected to clarify both authenticity and integrity of living heritage sites. There are no surviving sites in a hundred years, if they are not restored and rebuilt because people always use it in daily life. Moreover, natural disaster has also affected some of the properties, as we can see from the case of Wat Phra That Phanom.

Threats

In nominating the four Buddhist stupas in Thailand as UNESCO World Cultural Heritage Sites, the major threats are concerned with the criteria for authenticity and integrity of properties, as they have been rebuilt and restored across various time periods, with changes to the structure and architecture. This situation might be against the criteria. Even though understanding of local people and other stakeholders might consume a long time for the nomination to progress, the optimal solution in each stage needs to be verified before moving onto further steps.

Opportunities

According to the cultural heritage significance of Buddhist stupas in Thailand, it demonstrates the origins of Buddhism in Thailand, and the importance of Buddhism for Thais, which continues to this day. Thailand is the second-highest ranking among 10 countries in Asia with the most Buddhists in 2010 (Pew Research Center, 2015) and there are 64 million Buddhists or 94.6 percent of the population (Central Intelligence Agency, 2019). Thailand is not the origin of Buddhism however, but this particular lineage and spread of Buddhism in Thailand contains a long history throughout the country until the present day.

In further exploring Criteria (v) and (vi) for these four sites in Thailand:

Criteria (v): The sites have existed for a very long time and demonstrate particular ideas and manifestations of Buddhism.

Criteria (vi): Buddhism from India to Southeast Asia was spread from point to point, and these locations are often noted along rivers.

The regular rebuilding of stupas occur many times across various styles. However, Wat Phra That Hariphunchai Woramahawihan, Wat Phra That Phanom Woramahawihan, Wat Phra Pathommachedi Ratcha Woramahawihan, and Wat Phra Mahathat Woramahawihan are the master models in different periods of time by Buddhists and indicate their beliefs, demonstrated by architectural heritage that appeared within Thailand, as well as through the donations from Buddhists, who have never ignored to rebuild the stupas across the ages.

There are various cultural heritage properties in Thailand pending to nominate onto the World Heritage List. To differentiate from other countries, the number

of Buddhists is a significant factor to Thailand, to identify and track the origins of Buddhism in Thailand and to connect the story and the way that Thais have maintained Buddhism. This is continuing to record history by the evidence from the past, such as documents and other objects.

Table 2 illustrates case studies against recommended criteria

NO.	Name of Property	Status	Year	Property Type	Intangible Heritage	Tangible Heritage	Criteria					
							(i)	(ii)	(iii)	(iv)	(v)	(vi)
1	Wat Phra Mahathat Woramahawihan, Nakhon Si Thammarat	Tentative List	2012	Cultural	Hae Pha Khuen That Festival	Phra Mahathat Woramahawihan main stupa	✓	✓				✓
2	Phra That Phanom, its related historic buildings and associated landscape	Tentative List	2017	Cultural	Phra That Phanom Festival	Phra That Phanom main stupa	✓	✓				✓
3	Phra Pathom Chedi, Nakorn Pathom Province	Tentative List of Thailand	-	Cultural	Phra Pathommachedi Festival	Phra Pathom Chedi main stupa, Kanthararat, (Buddha image from Dvaravati period)		●			●	●
4	Wat Phra That Hariphunchai Woramahavihan	-	-	Cultural	Song Nam Phra That Hariphunchai Festival	Hariphunchai main stupa, Suwan Chedi (Bagan and Polananuwa style)		●			●	●

(Legend: ● recommended and ✓ the criteria chosen in Tentative List information of the state party in UNESCO World Heritage Sites)

Moreover, due to the number of properties with potential to nominate, the process of nomination is very important to make a new strategy for Thailand:

• Establishment of a Tentative List Working Group of Thailand is necessary to find cultural heritage sites that are ready to nominate

• To review the heritage sites in the Tentative List of Thailand

• To evaluate the site with prompt effective management of properties to protect, conserve and manage.

All four Buddhist stupas in Thailand presented in this paper - Wat Phra That Hariphunchai Woramahawihan in Lamphun Province, Phra That Phanom, its related historic buildings and associated landscape in Nakhon Phanom Province, Wat Phra Pathommachedi Ratcha Woramahawihan in Nakhon Pathom Province, Wat Phra Mahathat Woramahawihan in Nakhon Si Thammarat Province-are protected and managed in accordance with the *Ancient Monuments Act* by the Fine Arts Department of Thailand and ordinances on cultural heritage protection enacted by the provincial governments where they are located. Therefore, development around the temples is strictly controlled, and there is little chance of the temples being exposed to potential threats or negative environmental factors due to activities by outsiders. All four temples have continuously conducted ceremonies and monastic practices based on the Buddhist faith but also embraced diverse Buddhist beliefs. At the temples, monks faithfully carry on the tradition of meditation practice and this is also a part of spiritual practices.

Suggestions

1. This study has contributed towards the body of knowledge about the living heritage of four Buddhist stupas in Thailand for nomination as UNESCO World Cultural Heritage Sites. Additional research in future could explore the spread of stupas in Thailand to further understand Buddhist stupas from its origin, studying both living and relic sites of stupas in Thailand and neighboring countries will clarify further the fuller body of knowledge linking history by timeline from site to site at the beginning of Buddhism in Thailand sustained until the present day.

2. The preparing for nomination process is the first important step to join the UNESCO World Heritage List, cooperating with all stakeholders such as private and public sectors, non-profit organizations, and local communities is necessary to continue the research to encourage sustainable development of all heritage sites, not only nominated properties but also other heritage properties. An appropriate management plan of heritage sites, known as the five 'C's from paragraph 26 in the Operational Guidelines will add to the effective management of properties. Strategic objectives are: 1. Strengthen the credibility of the World Heritage List;

2. Ensure the effective conservation of World Heritage properties; 3. Promote the development of effective capacity-building in state parties; 4. Increase public awareness, involvement and support for world heritage through communication; 5. Enhance the role of communities in the implementation of the World Heritage Convention. These should be actioned in parallel with three keys of the nomination process: preparation of the Tentative Lists, preparation of nominations, and effective management of properties that are inscribed to protect, conserve and manage their Outstanding Universal Value.

3. In terms of community involvement, local people must participate in all processes of listing sites as UNESCO World Heritage Sites, especially in the education process. People should be educated and understand the effects of listing sites as UNESCO World Heritage Sites. The consequence of this process is that local communities can understand how they can conserve, inherit and develop their value in cultural heritage. Afterwards, local people can decide together whether they need continuing support from UNESCO World Heritage Sites. In order to motivate sustainable development of their values on cultural heritage, further research about the study of cultural landscapes for community procedures for the purpose of educating the community to understand the cultural landscape should be done (Vessoontorntep & Dankittikul, 2014).

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Forecasting the Election Results by Applying Pavia's Method

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Abstract

This research aims to forecast the election results by applying Pavia's method. In this paper, the information of opinion toward general election, which is reflected as one of behavioural science is applied, including using applied statistics to forecast the election results before announcing the election results. The process of data collection about people opinion was proceeded by survey related to election issues. In this survey, the sample was 3,600 electorates in the general election on 24th March 2019 from 30 electoral zones in Bangkok and the questionnaire about opinion of the general election was used as the tool for data collection. The applied statistics methods in this survey are percentage, Pavia's method analysis (Mean Absolute Percent Error: MAPE). The poll revealed that five parties received major scores, 22.69% for Pheu Thai, 21.94% for Democrat, 20.39% for Palang Pracharath and 16.69% for Future Forward Party. In terms of analysis by using Pavia's Method, the poll showed different results, 23.96% for Palang Pracharath, 22.45% for Future Forward Party, 21.25% for Pheu Thai Party and 19.12% for Democrat Party. When the poll results by using Pavia's method was compared with actual election, the percent of accuracy indicated at 82.28% or 17.12% of error.

Introduction

The public opinion survey or polling has been well accepted and received popularity in the United State of America (USA). This type of survey has been proceeded in order to predict or forecast the election results or interesting public issues.

The first forecasting simulation which was designed to forecast the result of the USA presidential election was used in Econometrics class, studying of the effect of economic activity on voting. The purpose of this study was to present the voting behavior and analytical pattern from the effect of economic activity on presidential voting (Fair, 1978).

In the case of USA presidential election, forecasting with regression model was used to forecast the state's voting results by using the past record of national polls and all information of all states in the USA. This forecast revealed that leading presidential candidate in any state in September before the election seemed to be elected on election day in November. The information of pre-election polls and post-variable was together applied for data analysis. This method increased the punctuality and accuracy of the USA presidential election forecasting. (Holbrook & Desart, 1999).

In 2010, Pavia had improved the accuracy of the forecasting of election results based on the results of the

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polls from polling booths. The improvement consisted of three parts of the forecasting by using raw data from the direct surveys; Part 1was the process of using bias checking to measure improvement of the use of Nonresponse Bias. Part 2 implemented an approximation to operate after the use of bias checking of Nonresponses to aid in the forecast. In addition, Part 3 was implemented after the process in the Part 2 was completed, resulting in the integration of different variables. When forecasting, regardless of the method of forecasting results, errors can occur. In 1948, the forecasting of the USA presidential election results showed an error between Dewey's and Truman's popularity. The forecast result revealed that Dewey would win but the election results with a score of more than 5% proved that Truman was elected president. This mistake caused a crisis of faith in the polls and polling agencies. The polls have been greatly improved (Wapor Exit Poll Committee, 2006; Jounes, 2008).; and yet in the 2016 election, an error in the USA presidential election forecasting was once again wrong when the results of the polls showed that Clinton would win, however, in fact, Trump was the winner.

In terms of Thailand, a general election poll was first proceeded in 1975 and the poll has been continuously performed by many polling agencies. When the parliament election took place on 3rd July 2011, many pre-election polls were surveyed by several agencies, Ramkhamhaeng Poll, ABAC Poll and Suan Dusit Poll all showed errors. For example, the Suan Dusit Poll's result predicted 162 seats of parliament were to be taken by Democrats, a small error proved the actual resultof 165 seatsHowever, when considering the poll in each electoral zone, the forecasted number of members of parliament (MPs) from Suan Dusit Poll had a significant error. Three seats of MPs in Bangkok were forecasted to be 25 seats for Pheu Thai and 5 seats for Democrat. But, the actual election results showed dramatic figures, 27 seats for Democrats and only 9 seats for Pheu Thai. This figure gave a significant error around 44.45%

As a result of this forecasting error, investigators determined to find out a forecasting method of election poll and improve forecasting results of polling by Pavia's Method. This forecasting method specifies how to improve accuracy of election forecasting from exit poll results and also uses bias testing for improving personal bias when answering the question. However, personal information or background of the electorate was not applied in this forecasting improvement. Also, Trangucci, Ali, Gelman, & Rivers (2018) explains voting pattern in 2016, analysis of pre-election poll in 2012 and 2016. This research shows difference between voting result in each electorate group. Gender and education level play asignificant role in the different voting decision. Moreover, personal and background information of electorate was applied together with Pavia's method adjustment in order to improve the accuracy of election forecasting, when compared with the actual election result.

Objective

To forecast the results of member of parliament election in 2019 by applying Pavia's method.

Conceptual framework

Election forecasting by using opinion poll and statistical analysis creates forecasting efficiency and reduces forecasting error. The Pavia's method is also recognised as one of the developed methods which suggests the way to improve forecast accuracy

$$_{2ST}\hat{Z}_j = \sum_{b=1}^{s} \overline{\omega}_b \hat{P}_{jb}$$

by using the exit poll and past election results in election forecasting. Also, application of regression model without using other related variables, electorate, candidate and economic information is used. These variables may have an affect to election forecasting and finally may have the ability for eliminating the errors. Personal information of the electorate was not used in this analysis. Therefore, the researchers decided to adjust P-Value by using logistic regression model that includes the background information of the electorate.

From the literature review of the electorate's decision factor, personal background and individual information all have s important effects on the decision-making such as gender, age, occupation, educational level, income and racial origin (Trangucci, Ali, Gelman, & Rivers, 2018). In this paper, individual information provided by Suan Dusit Poll, gender, age, occupation, educational level, income without racial origin are used.

The conceptual framework of the study to develop forecasting election result is explained in figure1 as shown below:

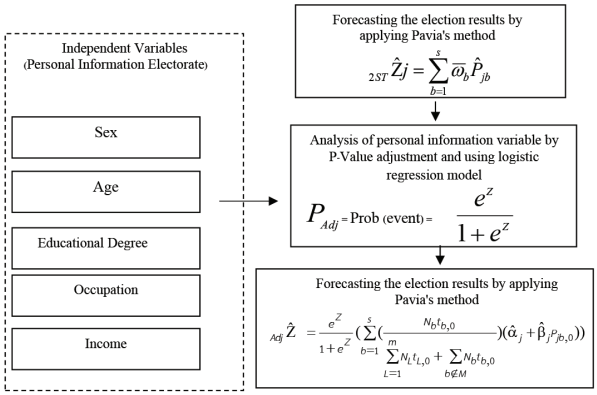

Figure 1 Conceptual framework

Research methodology

1. Population and sample

The population: electorate for members of parliament election in 2019, 51,239,638 people

The population in this survey are the electorate who are voting for members of parliament election in Bangkok, 30 electoral zones, 5,701,394 electorate (official announcement from Election Commission of Thailand).

Sample: electorate for members of parliament election in 2019. this is the primary information from an opinion poll of members of parliament election in 2019 in 30 electoral zones of Bangkok. 3,600 samples were received by random sampling with probability sampling. The random sampling process was performed by Multi Stage Random Sampling Method.

Step 1: Cluster Sampling by arranging area in Bangkok to be 30 electoral zones

Step 2: Simple Random Sampling 50% of all residential districts in each electoral zone

Step 3: Simple Random Sampling electorate in the residential districts, which is chosen in step 2

2. Instrument construction and data collection

The instrument in this research is a questionnaire about the opinion on members of parliament election in 2019

This questionnaire is divided into two sections as follows:

Section 1: Check list about general demographic information, gender, age, occupation, educational level and income

Section 2: Check list about the opinion on rights for voting members of parliament (MPs)

Construction and Efficiency of The Instrument

The questionnaire in this survey is created and designed by several procedures as follows:

1. Setting up the questionnaire objective for constructing the questionnaire about members of parliament election
2. Conducting literature reviews
3. Specifying operational specific terms about the opinion on members of parliament election to be guideline of the questionnaire construction
4. Constructing the questionnaire following operational specific terms
5. Submitting the test created for 5 experts to check the accuracy. Then calculate the internal consistency index by the IOC and select the IOC value greater than 0.5 and adjust it to be appropriate and correct along with the recommendations of experts,

Due to this questionnaire included the personal opinion about election, reliability testing is not performed after receiving recommendations from experts

6. Producing copies of the questionnaire for further data collection.

3. Data collection

The data collection process was performed by researchers as following:

1. Planning data collection by scoping electoral zone
2. Preparing the sufficient questionnaire for population in this survey
3. Explaining to populations about purpose of data collection
4. Evaluating answered questionnaire by statistical method and testing hypothesis.

4. Forecasting the election results by applying Pavia's method

After receiving information about the opinion of Bangkok governor election in 2013, Pavia's method is used to edit forecasting together with applying background information of the electorate ($_{Adj}\hat{\mathbf{Z}}_j$)

$$_{Adj}\hat{\mathbf{Z}}_j = \sum_{b=1}^{s} \overline{\omega}_b \hat{P}_{jb} P_{Adj}$$

$$\overline{\omega}_b = \frac{N_b t_{b,0}}{\sum_{L=1}^{m} N_L t_{L,0} + \sum_{b \notin M} N_b t_{b,0}}$$

$$\hat{P}_{jb} = \hat{\alpha}_j + \hat{\beta}_j P_{jb,0}$$

$$P_{Adj} = \frac{e^{Z}}{1+e^{Z}}$$

$$Z = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_p X_p$$

$\beta_0, \beta_1, \beta_2, ..., \beta_p$ = approximated coefficient from data

$X_1, X_2, ..., X_p$ = variables of background information

$P_{jb,0}$ = registration ratio of previous election

N = the number electorate in electoral zone

N_L = the number of voter in electoral zone L

N_b = the number of voter in electoral zone B

M = set of electoral zone in sample area

L = survey area

b = electoral zone

s = all electoral zone

m = the number of sample area

5. Comparison between forecasting result and actual result by using total absolute

When forecasted results are applied to the Pavia's method, the forecasting error will be calculated by using total absolute between forecasting results and actual results. The forecasting error by using the background information of the electorate must be less then the previous forecasting results.

$$E = \sum_{j=1}^{k} \left| z_j - \hat{z}_j \right|$$

k = the number of forecasted party

z_j = election result of j party

$\hat{z}_j$ = the forecasting result of j party

6. Data Analysis and Statistics

Percentage, logistic regression model and error measurement are used to forecast the result of members of parliament election in 2019 by applying Pavia's method.

Result

Comparison of forecasting error by using the Pavia's method and actual results of the members of parliament election in 2019. This election was held on 24th March 2019 and the survey was proceeded before knowing the exit -poll. In this survey, 3,600 samples are used from 30 electoral zones in Bangkok. After that, the information was evaluated and analyzed by using the Pavia's method and compared with actual election results. The information can be summarised as follows:

From 3,600 samples, 50.83% of the population are female and 49.17% is male. For ageing, 3.22 % are in the range of 18-27 years, 12.58 % for the range of 28 – 37 years, 22.51 % for the range of 38-47 years, 28.22% for the range of 48-57 years and 33.47% for the range of 57 years and over.

For information of educational degree, 71.97% of the population hold the undergraduate degree, 25.69 % received a bachelor's degree and 2.349% received a postgraduate degree. For occupational information of the population, 5.78% are students, 11.31% work as government officers, 13.78% work as full-time employees, 33.25% work as business owner, and 35.88% are self-employed.

For income information of the population, 8.69% receive less than 5,000 Baht, 21.75% receive 5,000-10,000 Baht, 36.76% receive 10,001-20,000 Baht, 21.94 % receive 20,001-30,000 Baht and 10.86% receive more than 30,000 Baht.

The opinion poll before the election date identified that 17 parties will be elected. Pheu Thai received the highest voting at 22.69%, followed by 21.95% for Democrats, 20.39% for Palang Pracgarath, 20.39% for Future Forward, 16.70% for Thai Liberal, 7.58% for Bhumjaithai, 4% for Puea Chat, 1.83% for Action Coalition for Thailand, 1.28% for Chartthai Pattana, 1% for Thai Local Power, 0.69% for Chartpattana and 0.61% for another six parties.

From the result of the members of parliament election in 2019, in 30 electoral zones of Bangkok, there were 3,101,010 voters. Future Forward Party received the highest score and accounted for 25.936%, followed by Palang Pracharath at 25.537%, Pheu Thai at 19.5% and for Democrats 15.312%. Numbers should be rounded and match the chart below

From the results of the members of parliament election in 2019, 49 parties were elected with different score and three parties were elected form a total of 30 available seats for members of parliament in Bangkok, 12 seats for Palang Pracharath, 9 seats for Future Forward and 9 seats for Pheu Thai. The percentage of election score for each party is 25.94% for Future Forward, 25.54% for Palang Pracharath, 19.5% for Pheu Thai,

15.31% for Democrats, 4.52% for New Economics (NEP), 3.09% for Thai Liberal, 1.41% for Bhumjaithai, 1% for Action Coalition for Thailand and less than 1% for the other 41 parties.

Table 1 Comparison between survey result and actual election result of member of parliament election in 2019.

Party	Percentage of actual election result	Percentage of Survey Result	Percentage of Difference
Future Forward	25.94	16.69	9.24
Palang Pracharath	25.54	20.39	5.15
Pheu Thai	19.504	22.69	3.19
Democrats	15.314	21.94	6.63
New Economics (NEP)	4.524	0.08	4.44
Thai Liberal Party	3.09	7.58	4.50
Bhumjaithai	1.41	4.00	2.60
Action Coalition for Thailand	1.00	1.28	0.28
Puea Chat	0.90	1.83	0.93
Thai Local Power	0.37	0.69	0.33
Others	2.43	2.81	0.37

From Table 1, The comparison between survey results and actual election results of members of parliament election in 2019, the figure indicates error of pre-election poll and actual election results. The error value is mostly founded in Future Forward Party for 9.24% followed by Democrats, Palang Prachrath, Thai Liberal Party, New Economics (NEP) and Pheu Thai at 6.63%, 5.15%, 4.50%, 4.44% and 3.19%, respectively.

Forecasting the election results by applying Pavia's method This forecasting contains some information, registration ratio of previous election, number of electorate in electoral zones, number of voters in electoral zones, set of electoral zones in sample area, survey area, electoral zone, all electoral zones and number of sample areas. This information is described in table 2.

Table 2 Comparison of forecasting error by using Pavia's Method and actual results of the members of parliament election in 2019

Party	Pavia's method application	election result	Survey result
Future Forward	22.45	25.94	16.69
Palang Pracharath	23.96	25.54	20.39
Pheu Thai	21.25	19.50	22.69
Democrats	19.12	15.31	21.94
New Economics (NEP)	1.12	4.52	0.08
Thai Liberal Party	5.21	3.09	7.58
Bhumjaithai	2.00	1.41	4.00
Action Coalition for Thailand	0.82	1.00	1.28
Puea Chat	0.84	0.91	1.83
Thai Local Power	0.21	0.37	0.70
Others	3.02	2.43	2.81

From table 2, the figure shows error of forecasting results at 23.96% for Palang Pracharath (election result at 25.54%), 22.45% for Future Forward (election result at 25.94%), 21.25% for Pheu Thai (election result at 19.50%), 19.12% for Democrats (election result at 15.31%), 1.12% for New Economics (election result at 4.52%), 5.21% for Thai Liberal Party (election result at 3.09%), 2% for Bhumjaithai, (election result at 1.41%), 0.82% for Action Coalition for Thailand (election result at 1%), 0.84 % for Puea Chat (election result at 0.91%), 0.21% for Thai Local Power (election result at 0.37%) and 3.02% for other parties (election result at 2.43%).

Table 3 The percentage of discrepancies between the 2019 members of parliament election results and the forecasting of elections based on Pavia's Methods and survey results.

Party	Percentage of discrepancies	
	2019 members of parliament election results and the forecasting of elections based on Pavia's methods	2019 members of parliament election results and survey results.
Future Forward	3.49	9.25
Palang Pracharath	1.58	5.15
Pheu Thai	1.75	3.19
Democrats	3.81	6.63
New Economics (NEP)	3.40	4.44
Thai Liberal Party	2.12	4.49
Bhumjaithai	0.59	2.59
Action Coalition for Thailand	0.18	0.28
Puea Chat	0.06	0.92
Thai Local Power	0.16	0.33
Others	0.59	0.38

From table 3, it was found that three parties were elected from 30 electoral zones in Bangkok, 12 zones taken by Palang Pracharath, 9 zones taken by Future Forward and 9 zones taken by Future Forward. Also, an error is showed at 1.58%, 1.75% and 1.58% for Future Forward, Phue Thai and Palang Pracharath, respectively.

The least error was found for Puea Chat at 0.06% and the highest error found was for Democrats at 3.81%.

The forecasting error by using Pavia's method and actual results of the members of parliament election in 2019 is described in the bar graph below to show errors for each forecasting method.

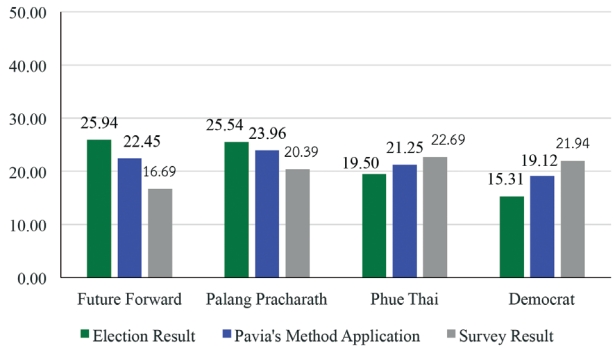

Figure 2 Comparison of the election results between applying Pavia's Method and actual election results

From figure 2, the figure shows that applying Pavia's method for election result forecasting has a small difference with the actual election results. This means applying Pavia's method can decrease forecasting error and create more accuracy of the forecasting.

Table 4 Forecasting error by applying Pavia's Method in the election of members of parliament in 2019

	Applying Pavia's Method with actual election results	Survey and Actual Election Results	Percentage of Decreased Error
Forecasting Error	17.72	37.65	52.94

From table 4, an error before applying Pavia's method, compared with actual election results of member of parliament in 2019 is at 37.65 %. However, after applying Pavia's method, an error is indicated at only 17.72%. This means accuracy of forecasting is significantly increased to be 82.28%.

Discussion

Forecasting the election results by applying Pavia's method shows a smaller error than forecasting the election result by polling before election, according to hypothesis no.3.The result of this research also proves that survey information before the election has error at 37.65%, compared with actual election result in 2019. However, using Pavia's method to forecast election results has smaller error at 17.72%. This means Pavia's method can decrease 19.93% of error, accounting for 52.94%. Nevertheless, error from using Pavia's method is still higher than expectation value from hypothesis, less than 10% of error.

The decreased error in the forecasting corresponds with the study of Armstrong (2006), the study was conducted for more than 25 years, explaining forecasting by using evidence, reveals new seven methods for forecasting which are categorised into three groups;

1. The method being capable to apply to all types of information, combination of forecasting method which can reduce error at 12%, including Delphi method which can improve comparison accuracy, 19 of 24 subjects, accounted for 79%.

2. Cross-Sectional Data consists of Causal Models which can decrease 10% of error, Judgmental Bootstrapping, which is able to decrease 6% of error and Structured Judgment, that is unable to evaluate forecasting error.

3. Application of Time Series Data, Damped Trend, that is able to decrease 5% of error while Causal Models improves accuracy for 3/4 of intermediate and the long- term forecasting.

Pavia (2005) explored forecasting without random sampling including case study of the night before election in 1990-1999, the study presents forecasting procedures of the night before the election, that includes information exchange of political parties or candidates taken place and this showed correspondence with actual election results from each polling station, especially forecasting about the last ratio of election results for each party by using past and upcoming opinion survey from each polling station. The Pavia's method is still continually edited and improved and it has high flexibility and efficiency which can apply to forecast the general election. Finally, researchers concluded that problems or obstacles can normally happen for any forecasting. Therefore, in order to receive accurate forecasting results, the Pavia's method has to be applied with other methods of problem solving in random sampling, such as, random sampling of the poll, insufficient dispersion of sample.

In keeping with the study by Pavia (2010) that improved the accuracy of forecasting. The study improved accuracy of forecasting results from polling results of polling booths by using the survey data on SigmaDos. The forecasting process introduced an 11-part of prediction by comparing it with SigmaDos. In the first three parts of the forecast, the use of raw data from direct surveys and the use of bias checking was implemented to measure the improvement of the Nonresponse Bias. Part 2 presented an approximation to be made after the use of bias correction, unanswered questions which helps to determine whether it is valuable. Moreover, in Section 3, the estimation of the other four estimates which are

obtained from Part 2, with the integration of different variables, resulting in improvements that can improve forecasting to be the actual election results and reduce discrepancies.

Forecasting studies that use individual status variables that effect the forecasts of error predictions are Trangucci, Ali, Gelman, & Rivers (2018). They studied the voting pattern in 2016 which were surveyed by using Multilevel Regression and Poststratification: MRP in the pre-election of the year 2012 and 2016. The differences among the population who voted in the 2012 and 2016 elections were to divide the data by demographic and status information. It was found that (1) the gender gap had increased. In 2016, most government data relating to the study showed a U-Shaped curve displaying the larger gender gap of lower and higher education levels. (2) Younger white electorates who were not well educated gave more support to Donald Trump compared to younger electorates with higher education. (3) There were more women supporting Hillary Clinton than men, in addition, women who were young and highly educated support Hillary Clinton. (4) Elderly men with little education supported Donald Trump. (5) Color skin electorates overpoweringly supported Hillary Clinton. (6) The gap between electorates educated in colleges and those who are not educated in the college had approximately 10% of devotion of Hillary Clinton. The study of forecasting error also discovers similarity with Hibbs (2000), explaining "Bread and Peace" Model which indicates two explanatory variables), economic prosperity (Bread) and Peace. This Model gives well-explanation of USA presidential election from 1952-1992 but suggests incorrect forecasting of the election in 1996 and 2000. "Bread and Peace" Model specifies that a perfect forecasting model for USA presidential election does not truly exist and a powerful model must be completed by model improvement, all the time. These models play significant role as "Mind Reader" of the people. If primary behavior of electorate is changed, the previous or current forecasting model can give incorrect result due to structural problem of the model.

In Conclusion, from this research it can be concluded that forecasting the election results by applying Pavia's method by using background information of the electorate provides smaller forecasting error. This forecasting method has more accuracy than previous forecasting method which corresponds with hypothesis of the study.

Suggestions

1. For forecasting the election results, other related and external factors such as political situations, economic conditions, number of candidates, election system et al., have to be concerned in election forecasting.

2. Application and development of forecasting model has to consider the specific context of the election in each area.

3. Conditions and agreement have to be considered when choosing applied statistics for election forecasting.

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Impacts of Logistics and Supply Chain Policy on Farmers' Well-Being

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Logistics, Supply chain, farmers, Rice, Well-being, Public policy

Abstract

Thailand's master plan for logistics and supply chain development for agriculture (2017-2021), initiated by the Ministry of Agriculture and Cooperatives, focuses on logistics and supply chain of agricultural sector including fruit and vegetable, rice, sugarcane, oil palm, and cassava. Suphanburi is well-known as an important farmland for rice production. Hence, this study examines the impacts of logistics and supply chain policy on the farmers' well-being in this area. The samples of this study were 250 farmers in Suphanburi, Thailand. The data was collected using questionnaire as a research tool. This study employed multiple regression analysis (MRA) for hypothesis testing. The results indicated that strengthening the capacity of farmers' institutions (SCFI), and improving logistics infrastructure (ILI) has positive impacts on farmers' well-being (FWB). However, using technology and innovation (UTI), and creating value of supply chains for farmers (CVSC) had no impact on the FWB. Discussion and recommendation are discussed in this paper.

Introduction

Thailand's master plan for logistics and supply chain development for agriculture (2017-2021), initiated by the Ministry of Agriculture and Cooperatives, focuses on logistics and supply chain of agricultural sector including fruit and vegetable, rice, sugarcane, oil palm, and cassava. The preparation of this master plan has set the issues and guidelines for comprehensive development linked to the situation and trend of logistics and supply chain development both domestically and internationally (Ministry of Agriculture and Cooperatives, 2018). It is set up in accordance with the direction and development guidelines of the country's agricultural development plan, government policies, and other related dimensions. For instances, the 20 Years of Agricultural and Co-operative Strategies (2017-2036), the 5-year agricultural and cooperative development plan during the National Economic and Social Development Plan Issue 12 (2017-2021), Thailand 4.0, Eastern Economic Corridor Development: EEC) policy, and Thailand Strategic Logistics Development Plan No. 3 (2017-2021). This master plan has three major objectives which are (1) to increase the efficiency of logistics management throughout the supply chain (2) to encourage farmers to be the main mechanism to connect with entrepreneurs throughout the supply chain and (3) to increase the ability to create value added agricultural economy for farmers, farmers' institutes, and entrepreneurs.

According to the Logistics Performance Index reported by the World Bank (2018), Thailand was ranked

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the 32nd among 163 countries of the world. The logistics performance of the country has improved since 2016 (ranked the 49th). In the overall picture, it was found that the context of Thailand's logistics has improved but the gap between high and poor performing countries has widen since some countries still have not improved their logistics efficiency. The key success to improve logistics efficiency is to build credibility in a predictable supply chain and logistics service quality because the shipper needs certainty in the cost, time or method of delivery, which some shippers agree to pay higher shipping costs in order to obtain good quality logistics services (Ministry of Agriculture and Cooperatives, 2018). In 2015, the Office of Agricultural Economics, Ministry of Agriculture and Cooperatives was funded to conduct research on logistics and supply chains of five major agricultural products, namely rice, tapioca, rubber, vegetables (asparagus), and fruit (durian) by developing a database system, known as the Agricultural Logistics Performance Index (ALPI) to assess logistics management efficiency of agricultural products in Thailand.

The evaluation results indicated that transportation cost is the highest logistics cost of the agricultural product supply chain approximately 1.14-5.88 percent of the sales followed by the cost of warehouse management which accounted for 1.08-6.40 percent, product holding cost 0.03%-1.27%, and logistics management costs of approximately 0.48%-1.28% of the sales. This study found that white rice growers had the highest transportation cost when compared to Jasmine rice, cassava, rubber, durian, and asparagus growers. It was estimated that the white rice growers have transportation cost of 16.62 percent of the total sales. When considering the time for shipping of 5 types of agricultural supply chains, farmers, farmers' institutions, and processing plants use 1-3 days to deliver the products. According to the overall product damage rate, the farmers have damage rates between 2 - 5 percent per sales. However, the Jasmine rice growers have the highest loss at about 5 percent per sales.

The rice farmers bear a great amount of logistics costs since they lack the knowledge, understanding, and management skills of effective logistics activities, from pre-production, harvesting, sorting quality, collecting, and distributing products to the end customers. They also lack integration or networking that is linked to production, marketing, and related agricultural logistics system, especially the production process control, and quality assurance of agricultural products to be consistent both in terms of quantity and quality. They also lack from agricultural products value chain development. In addition, the farmers still have limitations on the delivery of products to operators effectively, that is, delivering the product on time both in terms of agreed amount and quality (Ministry of Agriculture and Cooperatives, 2018). Consequently, farmers have a return that is not worth the investment. It inevitably affects their well-being. In Suphanburi, many households have lost their lands due to mortgage loan and become the tenant of the lands. Some households have faced financial problems since they received the loan from the Bank for Agriculture and Agricultural Cooperatives (BAAC). For example, a family has approximate debts of 500,000 baht because of the wrong investment of a family member in farming such as buying a tractor, and being tricked by a fertilizer sale representative (Laiprakobsup, 2017).

To cope with the mentioned problems, the government has planned to develop infrastructure and agricultural logistics facilities, to improve agricultural product transportation, to promote the use of technology and agricultural logistics innovation, to develop e-commerce, to develop traceability system, to encourage green logistics, to implement the agreement, and to improve legal and relevant logistics regulations. As a result, the Ministry of Agriculture and Cooperatives requires government agencies at all levels to develop a logistics plan for agricultural products, focusing on a spatial development area, especially the area that is the important source of production, collection, and distribution of agricultural products. The main reason of doing so is to reduce the logistics costs for farmers and entrepreneurs. Thailand's master plan for logistics and supply chain development for agriculture (2017-2021) has established three major strategies to cope with the problem which are to increase the competitive advantage on agricultural logistics throughout the supply chain, develop agricultural logistics infrastructure and facilities, and develop agricultural logistics supportive factors. To increase the competitive advantage, increasing capability in agricultural logistics management, creating and developing agricultural product value chain, and creating cooperation throughout the agricultural product supply chain should be promoted. Improvement of logistics infrastructure and facilities, research and development, and legal improvement are among the means to achieve the goal set by the master plan.

The authors, therefore, would like to examine the

impact of logistics and supply chain, as proposed by the government, on farmers' well-being. This study focuses mainly on the mentioned strategies and means which are associated with strengthening the capacity of farmers' institutions, improving logistics infrastructure, promoting use of technology and innovation, and creating value of supply chains for farmers. Results and discussion of the findings are beneficial for government agencies, farmers, and other relevant stakeholders.

Objectives

1. To examine the impact of logistics and supply chain, as proposed by the government, on farmers' well-being.

2. To provide suggestions and recommendations for policy makers.

Theoretical framework

1. Farmers' well-being

There is no single definition of well-being since it is associated with many aspects toward people's lives. More recent research has placed important on well-being as an ability to fulfill one's goals (OECD, 2011), happiness (Pollard & Lee, 2003; Promphakping, 2012), being in good health (OECD, 2011), and life satisfaction (OECD, 2011; Promphakping, 2012; Peel, Berry, & Schirmer, 2016; Promphakping (2012) stated that well-being in the view of psychologists refer to life satisfaction and global happiness. However, economists view well-being as happiness and wealth. According to Msuta & Urassa (2015), well-being is defined in different aspect. They defined this term as a "household's ability to meet its children's education costs, its asset ownership, and a households' food security status." Well-being can be categorized into five types; psychological well-being, physical well-being, mental well-being, economic well–being, and material well-being (Breslow, 1972; Helliwell & Putnam, 2004; Ryff, 1989). Hence, measuring well-being is quite complex depending on each context. Gasper (2004) proposed 6 dimensions of well-being which are pleasure or satisfaction, preference fulfillment, free choice, opulence, the attainment of certain values which can be specified independently of the individual concerned (good health, physical and mental), and possession of favorable capability, a favorable range of valued opportunities. In Thailand, The Institute for Population and Social Research, Mahidol University created a tool named HAPPINOMETER to measure well-being. This tool consists of nine indicators; happy body, happy relax, happy heart, happy soul, happy family, happy society, happy brain, happy money, and happy work-life (Kittisuksathit, 2017). This research developed a measurement to measure farmers' well-being based on these indicators.

2. Creating value of supply chains and farmers' well-being

Value chain is defined as "the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use" (Kaplinsky & Morris, 2001). To promote the creating of supply chain for farmers, the government has promoted the production of rice to meet the standards and the needs of the market, the value-added for agricultural products, the establishment of a distribution center, the development of the rice market system, risk management, and the supply chain management for famers (Ministry of Agriculture and Cooperatives, 2018). FAO (2014) suggested that the development of the value chain will reduce the costs of food products to consumers or increase their benefits. Creating value of supply chain resulted in the change in local communities. People in the communities received benefits through lessening expenditure and increasing income. It also led to building network among farmers' households so they can be self-reliant (Namkham & Booncharoen, 2017). Hence, the authors proposed that creating value of supply chain would lead to the well-being of the farmers. Then, the first hypothesis is proposed as follow:

H_1: Creating value of supply chains has a positive influence on farmers' well-being

3. Strengthening the capacity of farmers' institutions and farmers' well-being

In Thailand, there is a Farmer Organization of Thailand. It has formed a group of more than 10 groups of farmers, each of which is powerful and expressive to represent the national farmers. This also includes representatives of dozens of farmer groups in each province and region. In the past decades, it was impossible to unite varies farmers' organization. To strengthen the capacity of farmers, and farmers' institutes, the government has tried to promote and support agriculture in accordance with the philosophy of sufficiency economy, to promote and develop knowledge of farmers to be professional farmers, promote

strengthening and linking farmers' networks among people in the community, promote sustainable agriculture, and focus on the farmers' occupation and make the farmers proud of the rice farming profession. Building and strengthening a network results in the community strength and development. Msuta & Urassa (2015) found that farmers' organizations contributed positively to their members' well-being. Whenever the society is good, people living in the community would be happy. Hence, the second hypothesis is proposed:

H_2: Strengthening the capacity of farmers' institutions has a positive influence on farmers' well-being

4. Technology and innovation and its impact on farmers' well-being

According to Thailand's master plan for logistics and supply chain development for agriculture (2017-2021), major logistics technology and innovation to be developed and improved include Electronic Data Interchange System (EDI) (2) barcode system) (3) radio frequency identification (RFID) (4) global positioning system (GPS), enterprise resource planning (ERP), (6) warehouse management system (WMS), and transportation management system (TMS). The government also promotes lean management to minimize waste of overproduction), waste of waiting, waste of transportation, waste of processing, waste of inventory, waste of motion, waste of defect, and waste of underutilized people (Ministry of Agriculture and Cooperatives, 2018). The World Development Report (World Bank, 2016) stated that the development of ICTs support allows more people and firms to participate in markets by creating more productive, and benefits. Improving technology and innovation leads to optimized supply chain management. It also enhances coordination of transportation, delivery of products, and improving capacity utilization (Dixie & Jayaraman, 2011). Karippacheril, Rios, & Srivastava (2011) found that technology improvement ensures food safety in global agriculture product chains. Some studies (Grossman & Tarazi, 2014; Jack & Suri, 2014) found technology can facilitate fast and secure payment. The authors believe that promotion and support of research, technology and innovation utilization in farming will enhance the farmers' well-being. Development of agricultural information technology and implication of the research findings, are also beneficial for the farmers. The third hypothesis, therefore, is proposed as follow:

H_3: Using technology and innovation has a positive influence on farmers' well-being

5. Logistics infrastructure and farmers' well-being

Logistics infrastructure could be divided into two types; hard infrastructure, and soft infrastructure. The soft infrastructure refers to all the services required to maintain the economic, health, and cultural and social standards of a population. Hard infrastructure involves the physical infrastructure of roads, bridges etc. (Charoonpipatkul, 2018). To improve the country logistics infrastructure, Thailand's master plan for logistics and supply chain development for agriculture (2017-2021) proposed two major strategies to improve logistics infrastructure. The first strategy is to develop and improve agricultural product checkpoint. It can be achieved by improving service efficiency of the checkpoint, linking relevant data through the National Single Window (NSW) and developing network connecting to ASEAN Single Window (ASW), minimizing the inspection and certification process of import-export of agricultural products, including providing part-time services to facilitate fast and extensive services. The latter strategy consists of seven minor means which are (1) building, improving and developing logistics infrastructure and agricultural logistics facilities of farmers' institutions, such as central market, cold room and modern technology systems (2) supporting the establishment of logistics service centers in the community including storage, distribution, and transportation of agricultural products (3) supporting shared use of logistics infrastructure and logistics Pooling between farmers, farmers' institutes, and entrepreneurs (4) developing agricultural product activities and facilities such as collection centers, distribution of products, warehouse and cargo (5) supporting the network of farmers, farmers' institutes, and entrepreneurs as well as promoting the use of E-Logistics by applying innovation and agricultural technology and (6) encouraging government agencies to develop the logistics database system for farmers, farmers' institutes, and entrepreneurs (Ministry of Agriculture and Cooperatives, 2018). Improvement and development of logistics infrastructure is beneficial for the economy of a country. It is a key factor for economic growth and enhances efficiently delivery of products between producers and consumers (Raimbekov, Syzdykbayeva, Baimbetova& Rakhmetulina, 2016). Generally, the economic growth was an important contributor to poverty reduction (OECD, 2010). Hence,

it could be implied that improving logistics infrastructure results in farmers' well-being. The fourth hypothesis, therefore, is proposed:

H_4: Improving logistics infrastructure has a positive influence on farmers' well-being

Then, the conceptual framework for this study is proposed as illustrated in Figure 1.

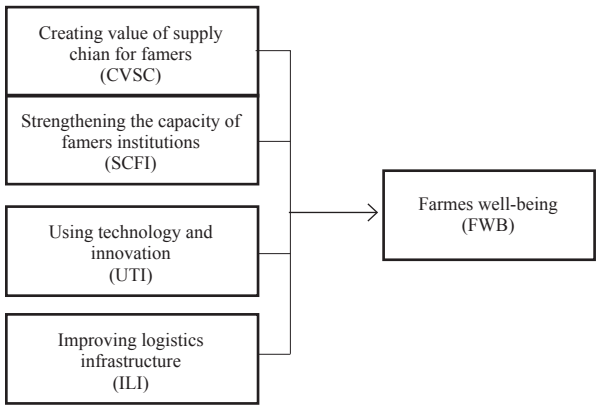

Figure 1 Conceptual framework

Research methodology

1. Sample

Pedhazur & Schmelkin (1991) recommended appropriate sample size for multiple regression analysis N ≥30k, where k is the number of predictors. Hence, the minimum sample size should be 120 (k = 4). In this study, the samples were 250 farmers in Suphanburi derived from simple random sampling. The average age of respondents was 51 years old. In terms of demographics, 50.80 percent of the respondents were female, 83.60 percent were married, the majority of them were primary school graduated accounting for 66.00 percent, and they have been working as farmers for 25 years as illustrated in Table 1.

Table 1 Demographic information of the samples

Demographic information	Frequency	Percentage
Gender		
Male	123	49.20
Female	127	50.80
Marital status		
Single	21	8.40
Married	209	83.60
Widowed	18	7.20
Divorced	2	0.80
Education background		
Primary school	165	66.00
Secondary school	46	18.40
High school	19	7.60
University/College	20	8.00

2. Measures

The questionnaire was sent to three experts to examine. The author employed item-objective congruence index (IOC) for evaluating content validity. According to the analysis, the IOC value of each item was higher than 0.50 indicating acceptable validity (Muneerat & Chinokul, 2014). Then, the pilot test was conducted by asking 30 participants to fill the questionnaire. The Cronbach's alpha of each construct was ranged from .800-.910 indicating a good and excellent reliability (George & Mallery, 2003).

3. Farmer's well-being (FWBQ)

Well-being of the farmers was measured using ten items of Farmers' Well-Being Questionnaire (FWBQ) developed by the authors. The alpha reliability of this measure was .800 indicating good reliability. Respondents were asked to rate their level of agreement with the response scale anchored by (1) strongly disagree and (5) strongly agree. Some items include "I am healthy," and "I have enough income and not in trouble," and "My family is happy and we do not fight."

4. Creating value of supply chains for farmers (CVSC)

Creating value of supply chains for farmers (CVSC) was measured using the five items of the Creating Value of Supply Chains for Farmer Questionnaire (CVSCQ) developed by the authors. This measurement revealed scores showing an alpha reliability of .857 indicating good reliability. Respondents were asked to rate their level of agreement with the response scale anchored by (1) strongly disagree and (5) strongly agree. Example items include "Government agencies have promoted the production of rice to meet the standards and the needs of the market," "Government agencies are promoting value-added for agricultural products, especially adding value to rice," and "Government agencies have promoted and established the rice market center and developed its system."

5. Strengthening the capacity of farmers' institutions (SCFI)

Strengthening the capacity of farmers' institutions (SCFI) was measured using the five items of the Strengthening the Capacity of Farmers' Institutions Questionnaire (SCFIQ) developed by the authors. This measurement revealed scores showing an alpha reliability of .886 indicating good reliability. Respondents were asked to rate their level of agreement with the response scale anchored by (1) strongly disagree and (5) strongly agree. Example items include "Government

agencies have promoted and supported agriculture in accordance with the philosophy of sufficiency economy," "Government agencies have promoted and developed the knowledge of farmers to be professional farmers," and "Government agencies help to promote and strengthen the farmers' networks to people in the community."

6. Using technology and innovation (UTI)

Using technology and innovation (UTI) was measured using the three items of the Using Technology and Innovation Questionnaire (UTIQ) developed by the authors. This measurement revealed scores showing an alpha reliability of .868 indicating good reliability. Respondents were asked to rate their level of agreement with the response scale anchored by (1) strongly disagree and (5) strongly agree. Example items include "Government agencies are promoting and supporting research, technology, and innovation in farming," "Government agencies have developed agricultural information technology and systematically linked the data," and "Government agencies promote the use of research, technology, and innovation to benefit farmers."

7. Improving logistics infrastructure (ILI)

Improving logistics infrastructure (ILI) was measured using the five items of the Improving Logistics Infrastructure Questionnaire (ILIQ) developed by the authors. This measurement revealed scores showing an alpha reliability of .910 indicating good reliability. Respondents were asked to rate their level of agreement with the response scale anchored by (1) strongly disagree and (5) strongly agree. Example items include "Government agencies have developed a logistics database system for farmers, farmers' institute, and entrepreneurs," "Government agencies have developed agricultural logistics facilities such as product collection and distribution centers for the benefit of farmers," and "Government agencies have supported the use of common agricultural infrastructure and logistics resources between farmers, farmers' institutes, and entrepreneurs to lighten cost burden, increase efficiency in logistics management, and promote the use of resources to create value."

8. Analysis

Stepwise multiple regression analysis was employed in this study since it is suitable for getting a regression model which has the fewest number of statistically significant independent variables. This technique is a modification of the forward selection so that after each step in which a variable was added, all candidate variables in the model are checked to see if their significance has been reduced below the specified tolerance level. If a non-significant variable is found, it is removed from the model. It also provides maximum predictive accuracy according to Hair, Black, Babin, & Anderson (2014). This technique requires four assumptions; there must be a linear relationship between the outcome variable and the independent variables, the residuals are normally distributed, the independent variables are not highly correlated with each other or no multicollinearity, and there should be no clear pattern in the distribution.

Results

1. Testing normal distribution

The multiple linear regression analysis requires that the errors between observed and predicted values should be normally distributed. The author employed skewness and kurtosis values to test the normal distribution of each item. According to Schmider, Ziegler, Danay, Beyer, & Bühner (2010), they recommended skewness and kurtosis values of less than |2.0| and |9.0| respectively. The analysis provided the skewness values ranging from .200-1.047 while the kurtosis ranging from .009-4.257. These values indicate normal distribution.

2. Testing linear relationship

The linearity assumption can best be tested with scatterplots. Figure 2 depicts the linear relationship between the independent and dependent variables.

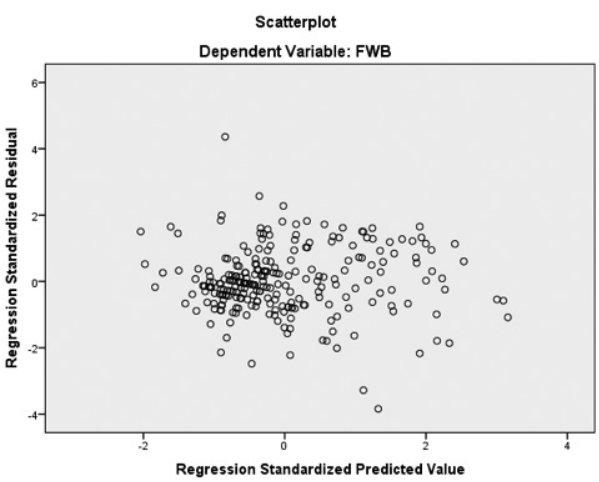

Figure 2 Testing linearity

3. Testing multicollinearity problem

The authors employed correlation matrix to test the multicollinearity problem. When computing a matrix of Pearson's bivariate correlations among all independent

variables, the magnitude of the correlation coefficients should be less than .80 indicating no high correlation among each independent variable. Table 2 shows that there is no correlation efficient that is higher than .80 indicating no multicollinearity problem.

Table 2 Correlation matrix among independent variable

		CVSC	SCFI	UTI	ILI
CVSC	Pearson Correlation	1	.555**	.515**	.573**
	Sig. (2-tailed)		.000	.000	.000
	N	250	250	250	250
SCFI	Pearson Correlation	.555**	1	.520**	.572**
	Sig. (2-tailed)	.000		.000	.000
	N	250	250	250	250
UTI	Pearson Correlation	.515**	.520**	1	.591**
	Sig. (2-tailed)	.000	.000		.000
	N	250	250	250	250
ILI	Pearson Correlation	.573**	.572**	.591**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	250	250	250	250

** Correlation is significant at the 0.01 level (2-tailed).

4. Testing the homoscedasticity

The last assumption of multiple linear regression is homoscedasticity requiring there should be no clear pattern in the distribution. To test the homoscedasticity, a scatterplot of residuals versus predicted values was employed. The testing result indicates that the linear regression is homoscedasticity as depicted in Figure 3.

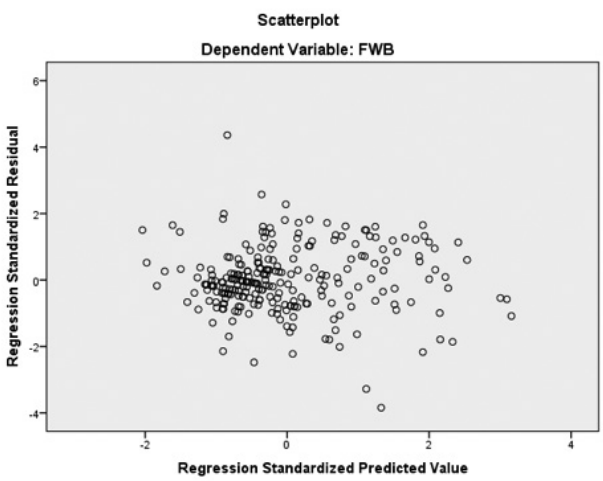

Figure 3 Scatterplot

5. Descriptive analysis results

The descriptive analysis results are presented in Table 3. The results indicate that farmer well-being (FWB) has the highest mean followed by using technology and innovation (UTI), creating value of supply chains for farmers (CVSC), strengthening the capacity of farmers' institutions (SCFI), and improving logistics infrastructure (ILI), respectively. According to Table 3, the farmers or respondents have a high level of well-being. However, their attitudes toward UTI, CVSC, SCFI, and ILI are quite moderate.

Table 3 Descriptive analysis results

Variable	Mean	Standard Deviation	Meaning
FWB	3.4756	.67289	High
CVSC	2.9456	.68554	Moderate
SCFI	2.9240	.75505	Moderate
UTI	3.0400	.83977	Moderate
ILI	2.8200	.81949	Moderate

According to the results, it could be implied that the farmers are happy with their lives. However, there is not much improvement in the logistics structure by the government as well as moderate use of technology and innovation, creating value of supply chain for farmers, and strengthening the capacity of farmers' institutions.

6. Stepwise multiple regression analysis results

For hypotheses testing, the authors employed stepwise multiple regression analysis to analyze the data. According to this analysis technique, each independent variable was added to the equation one by one according to its correlation with the dependent variable. Table 4 illustrates the Pearson's product moment coefficient between the independent variables and the dependent variable ranging from the highest of .331 (ILI) to the lowest of .265 (UTI). According to the analysis, improving logistics infrastructure (ILI) and strengthening the capacity of farmers' institutions (SCFI) were loaded into the equation, respectively. However, using technology and innovation (UTI), and creating value of supply chains for farmers (CVSC) were excluded from the equation.

Table 4 Correlations matrix

Variables		FWB	CVSC	SCFI	UTI	ILI
Pearson Correlation	FWB	1.000	.290	.326	.265	.331
	CVSC	.290	1.000	.555	.515	.573
	SCFI	.326	.555	1.000	.520	.572
	UTI	.265	.515	.520	1.000	.591
	ILI	.331	.573	.572	.591	1.000
Sig. (1-tailed)	FWB	.	.000	.000	.000	.000
	CVSC	.000	.	.000	.000	.000
	SCFI	.000	.000	.	.000	.000
	UTI	.000	.000	.000	.	.000
	ILI	.000	.000	.000	.000	.

To test the significance of the model, an ANOVA test was conducted as illustrated in Table 5 and Table 6. Based on the ANOVA test results, the model was found to be statistically significant with the significant value of .005. The R square is .137 and F is 19.653 indicating that the independent variables (ILI and SCFI) jointly explained 13.00 percent of the variance in the dependent variable (FWB) ($F=19.653$, $p < .05$).

Table 5 Model summary of multiple regression analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.331[a]	.109	.106	.63635	.109	30.415	1	248	.000
2	.371[b]	.137	.130	.62752	.028	8.029	1	247	.005

a. Predictors: (Constant), ILI

b. Predictors: (Constant), ILI, SCFI

The F-ratio in the ANOVA (Table 6) tests whether the overall regression model is a good fit for the data. The table shows that the independent variables statistically significantly predict the dependent variable, $F(1, 248) = 30.415$, $p (.001) < .05$ (i.e., the regression model is a good fit of the data).

Table 6 ANOVA[a]

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12.316	1	12.316	30.415	.000[b]
	Residual	100.425	248	.405		
	Total	112.741	249			
2	Regression	15.478	2	7.739	19.653	.000[c]
	Residual	97.263	247	.394		
	Total	112.741	249			

a. Dependent Variable: FWB

b. Predictors: (Constant), ILI

c. Predictors: (Constant), ILI, SCFI

The final model indicates that strengthening the capacity of farmers' institutions (SCFI) and improving logistics infrastructure (ILI) were the most important factor affecting the farmers' well-being (FWB), respectively. However, using technology and innovation (UTI), and creating value of supply chains for farmers (CVSC) had no impact on the farmers' well-being (FWB) as illustrated in Table 7.

Table 7 Coefficients of multiple regression analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.710	.144		18.758	.000
	ILI	.271	.049	.331	5.515	.000
	(Constant)	2.449	.170		14.423	.000
2	ILI	.175	.059	.214	2.966	.003
	SCFI	.182	.064	.204	2.834	.005

a. Dependent Variable: FWB

A one unit increase in improving logistics infrastructure (ILI) is associated with a 0.175 unit increase in the farmers' well-being (FWB) holding the capacity of farmers' institutions (SCFI) constant. In addition, each additional unit of the capacity of farmers' institutions (SCFI) is associated with a 0.182 unit increase in the farmers' well-being (FWB) holding the improving logistics infrastructure (ILI) constant.

Discussion

The findings indicate that using technology and innovation (UTI) does not affect the farmers' well-being which is inconsistent with the World Development Report (World Bank, 2016) who stated that the development of ICTs support allows more people and firms to participate in markets by creating more productivity , and benefits. Also, it does not support the finding of Dixie & Jayaraman (2011), Karippacheril, Rios& Srivastava (2011), Grossman & Tarazi (2014), and Jack & Suri (2014). This could be implied that implementing technology and innovation for agricultural sectors is still very low in Thailand. The farmers may not be familiar with using high technology and innovation to improve the way of growing rice. Hence, they feel that this factor is not important for achieving higher productivity .

Creating value of supply chains for farmers (CVSC) is also unassociated with farmers' well-being. It is inconsistent with the FAO (2014) who suggested that the development of the value chain will reduce the costs of food products to consumers or increase their benefits. It does not support Namkham & Booncharoen (2017) who claimed that farmers' households can be self-reliant if there is a presence of creating value of supply chains for farmers. This may imply that the Thai farmers have a limited understanding about logistics and supply chain. In addition, provision of logistics and supply chain is based on the benefits of the rich rather than the poor since the rich people have more power to influence the policy makers.

The finding of this study indicates that strengthening the capacity of farmers' institutions is the most influential factors affecting the farmers' well-being.

This result is consistent with the study of Msuta & Urassa (2015) who found that farmers' organizations contributed positively to their members' well-being. Moreover, improving logistics infrastructure was also an influential factor affecting the farmers' well-being. This is consistent with the study of Raimbekov, Syzdykbayeva, Baimbetova & Rakhmetulina (2016) who found that improving logistics infrastructure is a key factor for economic growth and enhances efficient delivery of products between producers and consumers. Then, the economic growth was an important contributor to poverty reduction (OECD, 2010) leading to well-being of the farmers. Therefore, government agencies both in national, regional, and provincial level should place importance on integrated farmers' network which consists of farmers, farmers' institutes, and firms so they can share information and logistics resources. Promotion and support of agriculture in accordance with the philosophy of sufficiency economy should be provided by the government agencies so the farmers will receive and develop their knowledge to become a professional farmer and make them proud of their occupation. Provision of logistics infrastructure such as logistics service center, storage, distribution, and transportation of agricultural products would be beneficial for the farmers and relevant stakeholders that will promote the well-being of farmers as well. Finally, policy makers should pay more attention on farmers' demands prior to making a decision on any famer-related policies. The author expects that this research model would be beneficial for both academics and related organizations to apply the results of this research. Researchers and scholars can apply this model in their future research. Also, there should be a study conducted in other regions or wider areas of the country so the samples can represent the whole country population. In addition, interview approach can be applied to collect in-depth information to support or validate the results derived from quantitative approach.

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Flipped Classroom as a Pedagogical Approach for the Development of Mathematics Instruction for Learning in the 21st Century

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Abstract

Flipped classroom is a pedagogical approach which changes instructional activity from teacher's lecturing to student's self-learning. In flipped classroom, students learn concepts via digital technology and apply understanding about the concepts in classroom activities. In the classroom activities, teachers have the important role in facilitating students to develop better 'conclusions. Flipped classroom approach consists of four stages: (1) experiential engagement, (2) concept exploration, (3) meaning making, and (4) demonstration and application. The learning in flipped classroom approach is relevant to learning in the 21st century where students are able to learn anytime and everywhere via digital technology. Flipped classroom approach is able to be implemented in mathematics classroom instruction in order to prepare students for Thailand 4.0.

Introduction

A goal of education in the 21st century is to prepare students for work and everyday life A teacher is an important factor who can facilitate students to achieve the goal. Teachers have to be active and creative to conduct high quality instruction that enhances students' knowledge, abilities, and skills necessary for everyday life . (Kiratiganont, 2014; Nopakhun, 2017) Among a number of instructional approaches, flipped classroom is highly recommended. Flipped classroom is an instructional approach that is aligned with the current education. It changes instructional activity from teacher's lecturing to students' self-learning. Students learn content via digital technology, such as website, that teacher prepares. Then, students apply understanding, which they have learned, in classroom activity. The way that students learn in flipped classroom is relevant to learning in the 21st century where students can learn anytime and everywhere via digital technology. Flipped classroom is effective to both students and teacher. Students individually learn content so that they understand the content. In classroom activities, there is no need for teacher to re-teach the content. Instead, teacher can provide students opportunities to do activities to promote students' thinking and other skills. As a result, students will develop better and meaningful understanding about the content and necessary skills.

Background of Flipped Classroom

Flipped classroom is a pedagogical approach that was originally developed by Jonathan Bergmann and Aaron Sams who are chemistry teachers in Woodland Park School, Colorado, USA (Bergmann & Sams, 2017). In their class, there were chemical concepts that were

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complicated so that students need more time to study. In addition, there were some students who were not able to attend classroom activities because of extra-curricular activities in school. To solve the problems, Bergmann and Sams had ideas about instruction that: 1) integrates the use of digital technology, such as computer and mobile phone, to enhance students' learning and 2) includes activities that connect teacher to students such as allowing a teacher to pose a problem and allowing students to ask questions (Na Mahachai, 2013; Panich, 2013). These ideas are included in a flipped classroom approach.

There are several differences between flipped classroom and traditional classroom. The main difference is the roles of teacher and students. In traditional classroom, the teacher has to prepare content prior to class. Then, the teacher lectures students in the classroom. Students have to listen to teacher's talk, take notes on the important issues, and do homework. In contrast, in flipped classroom, teacher has to prepare content and post the content on a digital platform such as website. Students have to study the provided content prior to class. Then, students do in-class activity that focuses on promoting students' higher order thinking rather than teaching the content. In the activity, students have a chance to discuss with teacher and peers so that they have better understanding about the content (Educause, 2012). The summary of differences between traditional classroom and flipped classroom is shown in Figure 1.

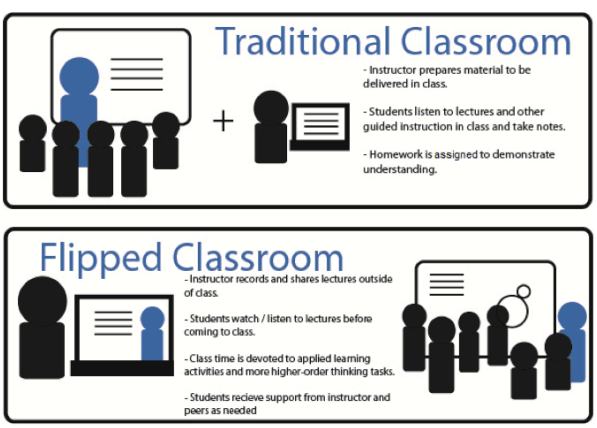

Figure 1 Summary of differences between traditional classroom and flipped classroom
(From http://www.slu.edu/cttl/resources/teaching-tips-and-resources/flipped-classroom.resources)

Advantages of Flipped Classroom for Students

Flipped classroom has several advantages to students. First, flipped classroom supports students to use digital technology. This support provides students, who can and cannot attend class, opportunities to learn and understand content prior to class. Also, students can review the content after class. Second, flipped classroom provides students opportunities to revisit the content. For example, students can re-watch the videotape that teacher posts on website as much as they want. Third, flipped classroom supports interactions between teacher and students and between students and students. During in-class activity, students have to apply understanding, which they have gained from learning via digital technology prior to class, to do activity such as solving problems. In the activity, they can discuss their ideas, concerns, or questions with teacher or peers. Last, flipped classroom enhances students to develop higher order thinking. Since students understand content prior to class, teacher does not have to re-teach the content. Thus, in classroom activity, teacher has more time to pose questions and have discussion to promote students' higher order thinking (Pahay, 2013; Ramnarong, 2013).

Roles of Teachers and Students in Flipped Classroom

Flipped classroom changes not only students' role but also teacher's role. Teacher's role is changed from preparing content and teaching the content in the classroom to preparing content and teaching the content by posting the content on a digital platform. Emphasis of classroom activity is changed from teaching content to allowing students to apply knowledge about the content so that they can develop higher order thinking skills.

The changes of teacher's and students' role in flipped classroom are advantage in developing students' learning. Figure 2 shows supports of teacher's and students' role in flipped classroom to develop each learning stage in Bloom's Learning Taxonomy, in comparison with that in traditional classroom.

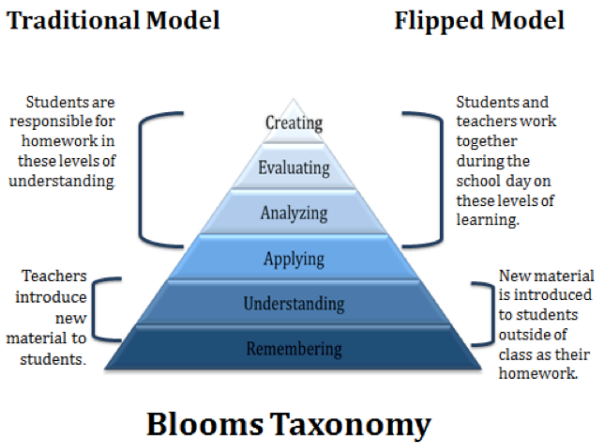

Figure 2 Comparison of instruction in traditional classroom and flipped classroom that support students' learning in each stage of Bloom's learning taxonomy
(From https://flippedchem.wordpress.com/2015/07/30/theoretical-frame-work-for-the-flipped-classroom-model-2/)

From Figure 2, teacher's and students' role in traditional classroom and in flipped classroom can be summarized as shown in Table 1.

Table 1 Teacher's role and students' role in traditional classroom and flipped classroom to support students' learning in each stage of Bloom's Learning Taxonomy

Learning Stage of Bloom's Learning Taxonomy	Roles of Teachers and Students	
	Traditional Classroom	Flipped Classroom
Remembering	Teacherslecture students on new content in the classroom.	Students learn new content by themselves via technology
Understanding		
Applying	Students do homework by themselves.	Teachers and students collaboratively work on classroom activities to enhance various levels of learning.
Analyzing		
Evaluating		
Creating		

Flipped Classroom in Mathematics Instruction

Mathematics is an important discipline in the 21st century. However, mathematics instruction in Thailand is not successful since a number of teachers teach mathematics only by lecturing. Often, a teacher does not use instructional materials to enhance students' learning and does not provide students opportunities to participate in classroom activities. As a result, students dislike mathematics, develop a bad attitude toward mathematics, and have low achievement in mathematics. Thus, it is very important that a teacher has good understanding in mathematics and abilities to develop activities, exercises, and instructional media to support students' learning (Chaikhwang, 2011; Khunranartsiri, 2014)

Flipped classroom is one of the solutions to solve the problem about mathematics teaching. With the use of digital technology in flipped classroom, students are motivated. The implementation of flipped classroom approach also provides students opportunities to learn mathematics anytime and everywhere. Lee (2016) specifies five strategies for implementing flipped classroom approach to mathematics instruction as follows:

Strategy 1: Planning. Planning prior to class is effective for teacher. Teachers who plan for teaching prior to class have more time to understand content and design interesting strategies to deliver the content. Also, a teacher has time to develop additional materials to support students' learning such as online test that can be used to evaluate students' understanding.

Strategy 2: Introducing concepts in class. Mathematics is a complex discipline. It is very important for teacher to have students understand objective of lessons before allowing them to learn content via digital technology.

Strategy 3: Using mathematics applications. Use of mathematics applications help students better understand mathematical content. Examples of mathematics applications are the followings.

- Operation Math (http://www.teacherswithapps.com/operation-math)
- Power Math Apps (http://www.powermathapps.com/)
- DragonBox (http://dragonbox.com)
- MathLab (http://www.mathlab.mtu.edu)
- Geoboard (http://www.mathlearningcenter.org/resources/apps/geoboard)

Students could learn mathematics via these applications with fun anywhere and at any time.

Strategy 4: Video. When teacher plans for delivering content to students by using videotape, a teacher should concern on difficulty of the content included in the videotape. The teacher should classify the content, which will be included in videotape, in various levels such as easy, moderate, and hard. This content classification will be effective in teaching students with various abilities.

Strategy 5: Student teaching. After students learn content via digital technology prior to class, teacher should provide students opportunities to teach peers. With this strategy, teacher will be able to check how well students understand and prepare additional support if

students need more help.

Strategies for Implementing Flipped Classroom Approach in Mathematics Instruction

Schoolwires (2013) describes that stages for implementing flipped classroom approach in classroom instruction consist of four stages as follows:

Stage 1: Experiential Engagement. In this stage, a teacher explains what the instruction and what the content consist of in this course, which is conducted based on flipped classroom approach.. In this stage, students will understand their role before the lesson starts.

Stage 2: Concept Exploration. In this stage, a teacher explains to the students about the digital technology used in this course. The digital technology that a teacher introduces to students can consist of what the teacher developed, such as teacher's website, or it could be in the form of what the teacher does not develop, such as Facebook.

Stage 3: Meaning Making. In this stage, students learn content via digital technology that the teacher provides. In their self-learning process, students have to understand the content so that they can bring their understanding to do in-class activity which is in the next stage.

Stage 4: Demonstration and Application. In this stage, students apply the understanding they have gained from the previous stage to do in-class activity. In the activity, students have opportunities to discuss the content they have learned, apply their understanding to solve problems, and make a conclusion about the content with teachers and peers.

Based on these stages to implement flipped classroom approach in classroom instruction, there are five strategies for implementing flipped classroom approach in mathematics instruction as follows:

1. The teacher has to prepare digital technology, which will be used to deliver content to students, before the lesson starts. For example, when a teacher makes a decision to deliver content to students by using a video clip, the teacher has to prepare or select a suitable video clip. Then, the video clip has to be uploaded to a digital platform that the teacher selects such as YouTube (http://www.youtube.com), Facebook (http://www.facebook.com), or other platforms. The uploaded content will allow students to learn the content anytime and everywhere. Besides the content that teacher uploads, students should be encouraged to explore information from other sources by themselves.

2. During the experiential engagement stage, teacher has to ensure thatstudents understand the teaching and learning strategies in mathematics flipped classroom. Students have to understand what they have to do when they engage in the lesson. Then, teacher assigns students to learn content from digital platform, which teacher prepares, or from other sources.

3. During the concept exploration stage, the teacher provides students opportunities to study and explore concepts by themselves via digital platform, which teacher prepares, or from other sources. In this stage, the teacher has to encourage students to understand the content as much as possible so that they will be able to do in-class activity.

4. During the meaning making stage, teacher has to encourage students to apply the knowledge and understanding, which they have gained from their self-learning, to do in-class activity. The in-class activity is an activity that both teacher and students participate in. The teacher is responsible for posing a problem, giving suggestion, and leading discussion to enhance students' thinking skills.

5. During the demonstration and application stage, teachers provide students opportunities to demonstrate and present what they have learned from the activities. Then, teachers and students collaboratively make a conclusion about the content learned from the lesson.

Summary

Flipped classroom is an instructional approach which changes instructional activity from teacher's lecturing to students' self-learning via digital technology such as YouTube, Facebook, Blog, or other platforms that a teacher develops. Students' opportunities for self-learning via digital technology allow them to learn content anytime and everywhere. After students self-learn the content, they have to apply their understanding to do in-class activity with teacher and peers. In the activities, teacher facilitates students by giving suggestion or posing questions to motivate students to solve problems, exchange opinion, discuss, and make conclusion. This process enhances students to develop thinking skills. Flipped classroom approach can be implemented in mathematics instruction. The implementation of flipped classroom approach will support teachers to be creative. Teachers have to create the appropriate and interesting delivery of content so that students are motivated to learn and understand the content. In addition, teachers have to appropriately design and conduct in-class activities so

that students better understand the content and develop thinking skills.

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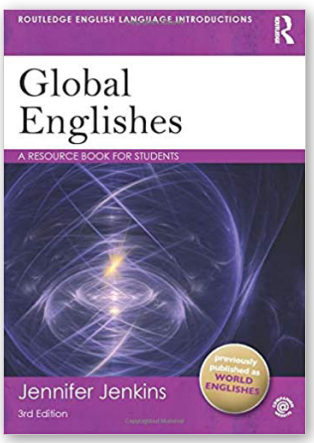
Book Review

Suttasinee Kespratoom



Title: **Global Englishes (3rd ed.)**
Author: **Jennifer Jenkins**
Publisher: **Routledge**
Jenkins, J. (2015). Global Englishes (3rd ed.). New York: Routledge.

Currently, English is a globalized phenomenon shown by the dramatically rising number of English speakers around the globe. It is said that the English language has transcended its original boundaries, resulting in more contact with other languages than any other language in the world (Galloway & Rose, 2015). The English language was spoken in the mid-sixteenth century only by a relatively small group of mother tongue speakers born and bred within the shores of the British Isles (Jenkins, 2015). Surprisingly, it is now spoken in almost every country of the world, with its majority speakers being those for whom it is not a first language (Jenkins, 2015). The author of Global Englishes is Professor Jennifer Jenkins: the Chair of Global Englishes and Founding Director of the Centre for Global Englishes in Modern Languages and Linguistics at the University of Southampton. The bookstarts with introducing the key topics in Global Englishes (GE) which consist of the historical, social and political context, who speaks English today?, standard language ideology in the Anglophone world, variation across postcolonial Englishes, pidgin and creole languages, English as an international lingua franca, English in Asia and Europe, and the future of global Englishes. Each topic lays the basis of Global Englishes so understandably that those who have no knowledge about Global Englishes (GE) are able to read and learn about GE. Next, the author explains the implications and issues of Global Englishes. This section consists of the legacy of colonialism, the English Today debate, standards across Anglophone space, 'legitimate' and 'illegitimate' offspring of English, characteristics of pidgin and creole languages, the nature of ELF communication, en route to new standard Englishes, and possible future scenarios. The author also highlights the value judgments of different Englishes. The negative attitudes which persist today towards certain varieties of English have their roots in the past and in the two dispersals of English: (1) English is transported to the New World and (2) English is transported to Asia and Africa. Obviously, there is scope for substantial disagreement as to whether the metamorphosis of English into Global Englishes is a positive or negative phenomenon. Therefore, the author explores the current debates in Global Englishes and has gathered readings in Global Englishes from scholars. This book is useful and practical for students and teachers who are interested in this field of study as well as those who accept the varieties of English in the modern world.

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2. The editorial board adjourns to consider the merits or submitted manuscripts and the scope of the journal. During this phase the integrity and accuracy of the manuscripts content is assessed.
3. An editorial letter is issued to the author for manuscripts that the editorial board deems inappropriate for publication. If the editorial board approves the manuscripts, an editorial letter will be sent to the author and the article will be subjected to peer review.
4. Articles that are deemed appropriate for publication are subjected to peer review by a panel of three experts in the appropriate field. In order to be deemed appropriate for publication, an article must be by recommended two of the three experts.
5. The qualitative assessments of the expert panel returned by the manuscript's author. The author is expected to make the appropriate alterations indicated by the experts' feedback.
6. The author returns the edited document; the editorial staff examines the changes to make sure they are congruent with the experts' recommendations as well as the journal format.
7. The revised version is granted the University's recognition of "Accepted" for publication status with the Journal of Multidisciplinary in Social Sciences Stamp on every page. Information regarding publication status (Accepted) is located on the journal's website (http/ research dusit ac.th/new/e-Journal)
8. The editorial tearm conducts an accuracy check for all articles before sending the manuscripts to the printer to create a draft journal issue.
9. The editorial board conducts a review of the draft journal issue before publication on the journal's website (http://research.dusit.ac.th/new/e-Journal). Suan Dusit University will place their official seal of approval on each page of the manuscript and to verify before formal publication.
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3. The manuscript's content is consistent with the aim and scope of the journal.
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7. There are four levels of assessments given to reviewed manuscripts:
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   7.4 Unsuitable for publication

In order to be assigned the "Accepted" status, an article must be assessed as “Requires minor or no modification prior to publication” by two of the three experts from the peer review process.

Formatting Guidelines

It is the author's responsibility to format manuscripts to the standards of Journal of Multidisciplinary in Social Sciences. The details of format style are contained herein,

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1.1 Single page printing on A4 paper with a width of 19 cm and height of 26.5 cm. The vertical and horizontal spacing from the margins must be 3.5 cm and 2.5 cm, respectively.

1.2 Typefaces and layout: English must be typed using TH SarabunPSK using Microsoft word. Specific font format guidelines are as follows.

1.2.1 The header contains the page number, aligned on the right side, in 12 pt. font.

1.2.2 The title in English languages must be 16 pt. font, bolded, and center aligned. The title should not exceed two lines of text.

1.2.3 The author's name in English language must be typed 14.5 pt. font and centered below the title. Asterisks (*) should proceed the authors' names which is correspond to the appropriate author.

1.2.4 Affiliations should match each author with their appropriate affiliated institutions and organizations. In case of different affiliations, superscript numbers should follow the surname1 and affliation1.

1.2.5 A footnote must be placed on the first page of the article with the text “*Corresponding Author”, the next line of text should contain “e-mail”, and the final line “**Affiliations” which specifies funding sources and agencies, for example “This research was supported by research grants from Suan Dusit University”.

1.2.6 “Abstract” in English must be 14.5 pt. font, bolded, left aligned, and placed below the Thai keywords section. Abstract text must be 14 pt. font, with 1 tab indentation from left and right margins.

1.2.7 “Keywords:” should appear in English language in 14.5 pt. font, placed beneath the English abstract text and be aligned with the left margin. English keywords must be 14 pt. font, and should not exceed four words. Each keyword should be separated by a comma (,) and space.

1.2.8 Regardless of language choice, the main text headings used throughout the paper must be 14.5 pt. font, bolded, and aligned with the left margin.

1.2.9 Bulleted items must appear as 14 pt. font, bolded, and be indented 1.5 tabs from the left margin.

1.2.10 Body text must appear as 14 pt. normal font, and be indented 1 tab from the left and right margins.

1.2.11 “References” must be 14.5 pt. font, bolded, and be aligned with the left margin. Individual entries must be 14 pt. font and should follow American Psychological Association (APA) formatting guidelines. Any lines of text for a single entry that exceed the first line should use a “hanging indent” of 1.5 tabs from the left margin.

1.2.12 Authors’ names in Thai must be 14.5 pt. font, bolded and be aligned with the left margin. Name should contain Mr., Mrs. and academic title for each author. Affiliations should be below in both Thai and English as 14 pt. font. An address must be listed for each author.

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Should follow American Psychological Association (APA) formatting guidelines. Guidelines for references can be found on the journal's website: http//research dusit ac.th/new/th/pr/

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