

The Study of Factors Affecting the Issuance of COVID-19 Vaccine Passport in The Context of Thailand

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Abstract

The ongoing COVID-19 pandemic has caused a global impact in every possible way. However, COVID-19 effects have been the most severe in the tourism and leisure industry due to public health measures and travel restrictions. Once the vaccines have been rolled out for public use, Thailand exerted a strong attempt to introduce a so-called COVID-19 Vaccine Passport. It is untimely to present the identification framework given worries about the unquantifiable risk. Hence, the objective of this study is to identify the key factors affecting issuance of COVID-19 vaccine passport in Thailand and propose the optimal solutions for COVID-19 vaccine passport that will benefit stakeholders in Thailand's tourism supply chain. Understanding the factors affecting this will lead to success in implementation. A review of diverse publications was used to identify the factors. The major factors identified as (F1) health safety, (F2) area of implementation, (F3) ethical, (F4) support system, (F5) expenditure and (F6) duration of use. The study employs Analytic Hierarchy Process (AHP) and a questionnaire of experts has been attributed as being the originating quantitative research approach. Factors are assumed to be independent. It is expected that the hierarchical structure would be able to provide a better view of the factors. Results of this study will provide a useful insight of Thailand's tourism supply chain stakeholders toward the factors affecting the issuing of COVID-19 vaccine passport as well as suggestions. It is beneficial for Thailand's tourism stakeholder by considering the critical factors impacting issuance of COVID-19 vaccine passport to design the future preparation effectively. This study also discusses possible directions for future research as well as provide additional perspectives in this area.

Keywords

AHP, COVID-19, Tourism Supply Chain, Vaccine Passport

1. Introduction

A novel infectious disease called Coronavirus Disease 2019 (COVID-19) has been induced, Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), although not definitive Wuhan, China has been attributed by many as being the point of origin, COVID-9 has evolved and become a global pandemic (Wang et al. 2020). The World Health Organization (WHO) has declared a public health emergency in response to COVID-19 on January 30, 2020, warning all nations to be prepared and later on March 11, 2020, WHO made the assessment and elevated the public health crisis regarding COVID-19 to become a global pandemic (WHO 2020).

The COVID-19 has caused a global impact on supply chains and manufacturing operations across different industries, mostly in food and healthcare, because of disruptions at tier-1 suppliers (Singh et al. 2021). The imposition of a lockdown policy has also affected the distribution and logistics activities due to the nature of these activities involved with mobility. It has also had a negative influence on urban mobility as well, since the decrease in the use of public transportation and more dependence on private modes during this time is obvious (Campisi et al. 2021). However,

COVID19 effects have been the most severe in the tourism and leisure industry. In 2021, the number of tourists in Thailand dropped over 80% which could make up to 9% of GDP loss when compared to 2019 (Bank of Thailand 2021). This is due to public health measures and travel restrictions. While the business sector tries to practice supply chain resilience in order to respond to this disruption, vaccination is a silver lining in the fight against this crisis. Once the vaccines have been rolled out for public use, many countries showed a strong attempt to return to normalcy by introducing an immunity passport which would enable individuals to travel freely. This immunity passport or vaccine passport has not yet been clearly defined. The World Health Organization has mentioned the word “immunity passport” several times, referring to a document that presents the detection of antibodies to the SARS-CoV-2 (WHO 2020). While many scholars (such as Brazal 2021; Hall 2021; Osma et al. 2021 and Pavli and Maltezou 2021) used the term “vaccine passport”, Sharun et al. (2021) explains a vaccine passport as a document that provides proof of vaccination and certifies that the holder is protected from illness which can also be known as a “vaccination certificate,” “immunization passport,” or “digital health pass”. In Thailand, the Institution of Urban Disease Control and Prevention website also uses the term “vaccine passport” on the application window (Department of Disease Control 2021). The passports can also be useful for international travel since being vaccinated reduces the chances of contracting serious COVID-19 disease, which may necessitate hospitalization. In contrast, issuing such passport on the circumstance of unknown efficacy of vaccines leads to numerous challenges concerning positioning and clarification of how the passport should be used. Since April 2020, WHO raised a concern for the use of immunity passports which might possibly give a false proof of immunization due to the absence of evidence of immunodiagnostic at the present. The use of an immunity passport might put the public health at risk of continued transmission. Currently, WHO does not recommend the use of a vaccine passport as a requirement to travel. Despite that fact, Thailand proposed the idea of issuing vaccine passports for those who have been vaccinated. Bangkok Metropolitan, the capital of Thailand and home to millions of residents, is the most populated city in the country and according to Tantrakarnapa and Bhopdhornangkul (2020). Bangkok is the original source of spreading. Since many of the instances are cases from newcomers or locals with close contact with tourists (Wipatayotin 2020). This large population needs every sector to take certain courses of action. Thailand has set a vaccination start date of February, 2021, and yet it is still in the beginning phases of antibody rollout due to some internal complications. It is untimely to present the identification framework given worries about the unquantifiable risk. Furthermore, WHO has published the position paper regarding proof of COVID-19 vaccination for international travellers on February 5, 2021 which put scientific, ethical, legal and technological aspects up for consideration. In introducing vaccine passports under the current COVID-19 circumstance, countries should consider their own ability to secure various aspects. There are factors that play a crucial role in determining the effectiveness of implementing vaccine passports for public use. The importance of the initial problem that needs to be defined is that it is currently facing the lack of criteria in a standardized decision on the issuance of vaccine passports. In this paper, the study of factors that affect the decided-on vaccine passport will be conducted using a questionnaire as a research tool. The questionnaire will be answered by experts or people who are involved in the tourism supply chain. Data will be collected and analysed according to Analytic Hierarchy Process (AHP) in order to find the key factors that affect the issuance of COVID-19 vaccine passports in Thailand.

1.1 Objectives

this study aims to analyse the factors that affect the issuance and development of COVID-19 vaccine passports in the Thai context. By exploring the ongoing event of the vaccine passport with limited literature available, it intends to identify the key factors in issuing COVID-19 vaccine passports in Thailand from a tourism supply chain stakeholders’ point of view and propose the optimize solutions for COVID-19 vaccine passport that will benefit stakeholders in Thailand’s tourism supply chain. By understanding the relative importance of each of the contributory factors as presented in pairwise comparison which can be beneficial for the further finding of the most optimal solution, creating a potential vaccine passport registration plan and readiness for both inbound and outbound travellers in the future. Moreover, future studies could use the tool and knowledge from this study as a reference. Benefits can be defined as the additional perspectives that could be improved or uncovered by further research.

2. Literature Review

2.1 Tourism supply chain and stakeholders in Thailand

Tourism is complex since many stakeholders are involved in delivering an anticipated service quality to complete the whole experience adequately. In the tourism industry, customer satisfaction has emerged as a critical concern. Several definitions have been proposed, and mainly all agree that customer satisfaction is a complex concept with unknown cognitive, psychological, and physiological dynamics (Ghaderi et al. 2018). Satisfaction here relies on interaction, experience and the expectations but the advent of the worst viral illness has impacted all economic sectors, causing

visitors and customers to be dissatisfied (Abbas et al. 2021). Cooperation is seen as a key component of success in the tourism industry. However, being an industry that is heavily dependent on its supply chain has highlighted its inherent vulnerability exposing it to unforeseen risks.

In Thailand, the economy is facing several challenges in multiple areas including industrial and agricultural sectors, on the other hand, the service sector, especially in the tourism industry, has gradually and consistently grown during economic downturns and is expected to be a driving force for the future of Thai's economy (Palang and Tippayawong 2019). Tourism accounts for 11-12% of the country's GDP and 20% of employment (Bank of Thailand 2021). Like other parts of the world, tourism stakeholders are varied and can have direct or indirect influence in tourism business. Soonsan (2017) classified tourism stakeholders in Thailand into 5 groups which are government sector, private sector, non-government organization, residents and tourism. The government sector, represented by the Ministry of Tourism and Sport, local administration and Tourism Authority of Thailand among others, is in charge of supporting, developing plans, coordinating and promoting the tourism industry, while, private sector is accountable for managing the tourism business. These stakeholders are the Tourism Council of Thailand, tourism businesses and workers. In solving social problems, non-government organizations play a crucial role in working closely with local communities and policy makers. Some of the stakeholders in this group are members of the association of Thai Tour Leaders. Those who live in touristy areas will be classified as local residents and those temporarily visiting are tourists. The components that are involved in the tourism supply chain are, mostly referred from the work of Zhang et al. (2009), including accommodation, transportation and excursion. The tourism supply chain in Thailand could be seen as shown in figure 1 below.

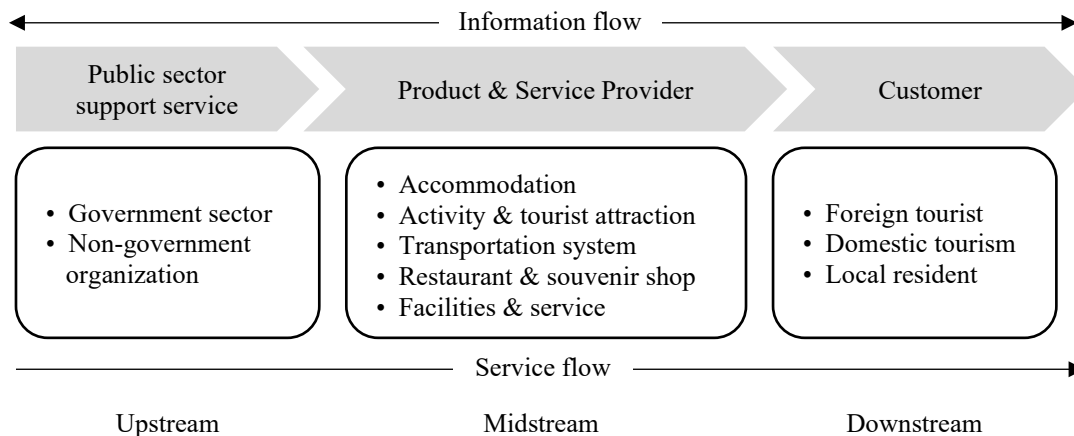


Figure 1. Thailand's Tourism Supply Chain
Adopted from Zhang et al. (2009); Soonsan (2017); Palang and Tippayawong (2019)

In response to COVID-19, Thailand set up the Centre for COVID-19 Situation Administration (CCSA) on March 12, 2020 (Office of the Prime Minister 2020). This body was chaired by the Prime minister and tasked with implementing policies related to the outbreak of the disease. In the case of vaccine distribution, CCSA's tools called Mor Prom is an application developed by the Ministry of Public Health to allow residents to easily access vaccinations and track their side effects. It also includes a feature that allows post-vaccination monitoring and vaccination related information sharing (Ministry of Public Health 2021). Through the Mor Prom application, People who have received two shots will be issued a digital vaccine certificate. This can be used to apply for a travel health certificate in any hospital (The Bangkok Post 2021). While vaccines have started to roll out, The Tourism Authority of Thailand (TAT) has also proposed the campaign called 'Phuket Sandbox' on June 16, 2021 in order to attract vaccinated tourists (The Tourism Authority of Thailand Newsroom 2021). While the Phuket Tourism Sandbox program was expected to be launched on July 1, the CCSA's sub-committee has requested that the TAT revise the Tplan before it can be forwarded to the CCSA's main committee. Eventually, the Prime Minister made an official visit to launch the Phuket Sandbox on July 1. There are requirements set for visitors such as traveling from countries/territories approved by CCSA and applying for a Certificate of Entry (COE) which requires a proof of vaccination (The Tourism Authority of Thailand Newsroom 2021). This is the trial show of certificate of COVID-19 vaccination supremacy being set as a requirement of entry approved by CCSA. During this COVID-19 pandemic, government bodies have tremendous influence in the tourism industry. The further concern will be posted on the so-called proof of COVID-19 vaccination which will be discussed in the next section.

2.2 The Proof of COVID-19 vaccination

As COVID-19 vaccines have been distributed, many countries such as Chile, United Kingdom and the United States of America have exerted a strong attempt to introduce immunity passports (Phelan 2020 and Voo et al. 2020). Although the World Health Organization has strongly criticized vaccine passports for potentially exacerbating social inequalities, considering the speed at which countries vaccinate, as well as other conditions. It is not just the government's approach on vaccine passports, international organizations such as the IATA also come up with documentation on COVID-19 vaccination or test results for the purpose of resuming everyone to normal days on open platform called IATA Travel Pass. The European commission published the framework for certificates on vaccination or Digital Green Certificate during the COVID-19 pandemic. These regulations are for union citizens and valid in all EU countries for exemption of free movement regulations. Despite the decentralized initial approach and the practical challenges of implementing a universally recognized system, the idea of vaccine passports is likely to come into force separately in many countries.

Compared with the form specified in the IHR (2005) Annexes 6 and 7 which provide specific requirements for both the content and format of the certificates of vaccination against yellow fever (ICVP), the required format for certificate includes expiration date. The prior yellow fever vaccine was valid for ten years but after amendment in 2016, they are now automatically valid for life. For other vaccines, the validity of this certificate shall extend until the date indicated for the particular vaccination or prophylaxis. Since there is a lack of evidence to support the effectiveness and duration of immunity for COVID-19 vaccine, the duration of the certification validity box will be left blank or not included in other certifications.

It could be seen that each certificate includes different data elements. Thailand's Immunization Certificate seems to copy the format from the original ICVP and does not include the details on vaccines which differ from what WHO's Smart Vaccination Certificate suggested. The EU Digital Green Certificate, in contrast, includes a limited set of information for personal data security manners. As the Commissioner for Justice said, this EU Digital Green Certificate will be available in all EU member countries and it is to influence global standards and lead by example based on our European values like data protection (European Commission 2021). While national attempts to issue certificates will likely foster the need for an internationally accepted program, different countries leading different discussions outside the WHO's efforts will increase the difficulties of international coordination and the defining of standards. Issuing such a passport on the circumstance of unknown efficacy of vaccines leads to numerous challenges such as positioning and clarification of how the passport should be used. Certainly, there is a clear need to standardize data across vaccine passport options so that it can be universally accepted.

2.3 Challenges of implementing COVID-19 vaccination documentation

As many mentioned the uncertainty about the vaccine, the vaccine efficacy is an important factor in determining the effectiveness of vaccine passports to prevent further spreading. According to WHO (2021), the effectiveness of vaccines is considered under the scientific criteria which includes efficacy in preventing disease and limiting transmission, including variants, duration of protection offered by vaccination; timing of booster doses, protection against asymptomatic infection and other specific contraindications. Until now, there is no scientific proof for this but in order to make this vaccine passport work, it should have some threshold set for acceptable risk. Among the unknown facts about the vaccine, feasibility should be applied in response to any changes to further scientific facts and discovery of variants. Ethical consideration also plays a crucial role. There are many countries where vaccination and vaccine distribution are still lagging behind. The rate of vaccination will affect the issuance of vaccine passports since vaccine passports will be issued for those who have been vaccinated which will create an inequality among people. For some people who might have already received the vaccine, there is still an unclear direction about how to access and receive the vaccine passport. The concerns arise on equitability and accessibility that issuance and the use of a vaccine passport should not interfere with basic human rights and liberty. Under the legal perspective, state parties who are members of WHO and have agreed on IHR should follow the recommendations. Until present, IHR only recognizes yellow fever vaccination to be required for proof for international travel. The requirement of proof of COVID-19 vaccination is still not recommended. In parallel, many countries have created their own vaccine certificate system. This creates an effect on the issuance of vaccine passports for international usage. The factor that drives interoperability is the uniform documentation which supposedly should follow WHO advice. Furthermore, the issuance of vaccine passport should not stir the social discrimination among people or give privileges to some groups of people. It should be based on domestic and international law that deals with labour, health and safety with fairness and legitimacy. While a vaccine passport could allow the holders to be exempt from social restriction, such questions arise which the government should be able to answer for people about to what extent and how to compensate the non-holders.

Technological factors also play a critical part in insurance of the vaccine passport. Although there are attempts to create vaccine passports in both physical and digital form, there are still technological advantages and disadvantages among countries. Technology will define the effectiveness of vaccine passports concerning the process of issuing, validity and personal data protection. In terms of economic matters, the factors that affect the issuance of a vaccine passport will depend on the cost of registration that a person has to pay and the cost of maintaining the system for the government. In introducing vaccine passports under the current COVID-19 circumstance, countries should consider their own ability in completing mentioned factors. Those factors play a crucial role in determining the effectiveness of implementing vaccine passports for public use. Countries that have already issued or are attempting to do so must revise their initiative or perhaps, come together and build some multinational consensus in deciding the set of standards and usage. Due to the limited literature available at the moment, the key factors that affect the issuance of COVID-19 vaccine passports mentioned in literature will be combined with other publications such as those released by WHO. Figure 2 illustrates the chosen criteria and sub-criteria that will be used in the assessment. The criteria and their sub-criteria were chosen based on literature review.

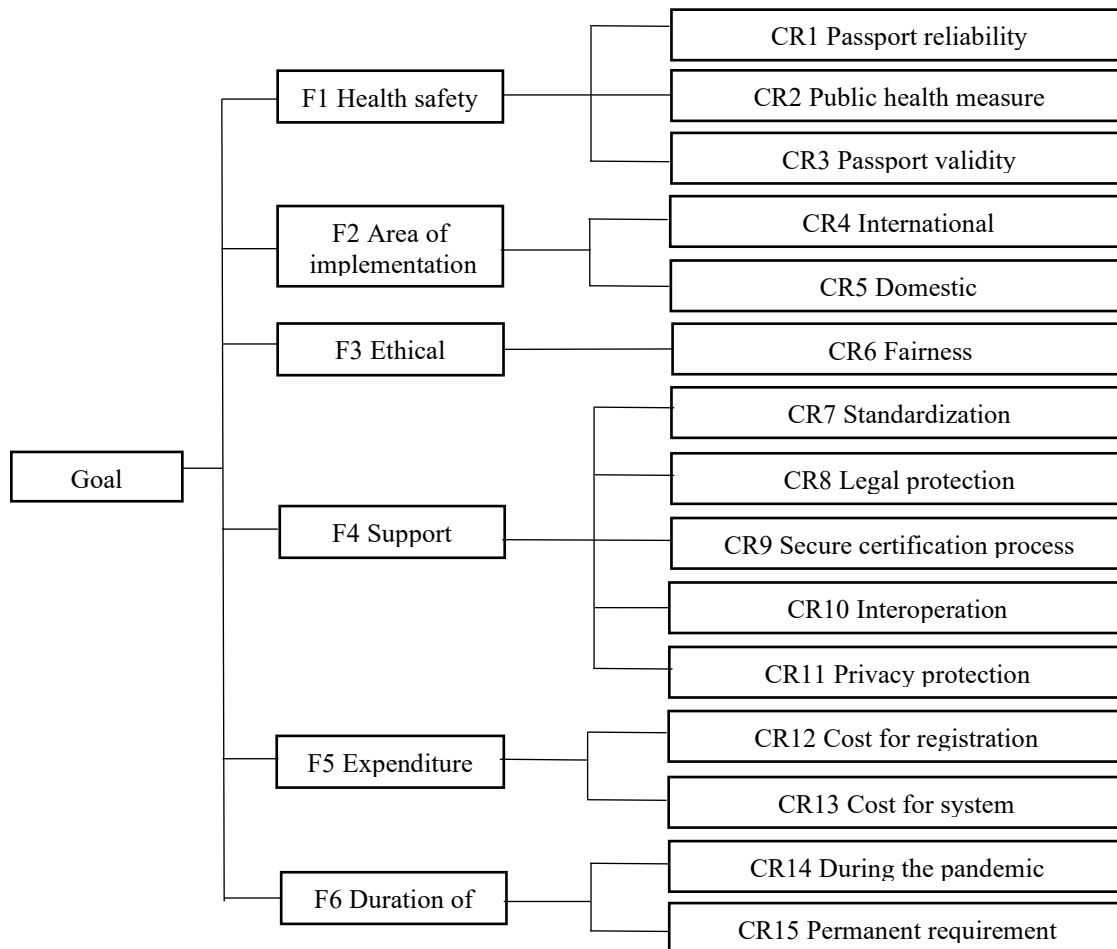


Figure 2. The hierarchical structure of factors affecting the issuance of COVID-19 vaccine passport in Thailand

3. Methods

The Analytic Hierarchy Process (AHP) is one of the tools in multiple criteria decision making (MCDM). Saaty (1987) who developed the AHP in 1971 explained that it is a theory of measurement which takes several factors into consideration and derives ratio scales from both discrete and continuous paired comparisons. AHP has benefits for solving large-scale problems which involve multiple criteria. The criteria can be tangible but it also can be intangible which have no measurements to serve but the AHP method can be used to establish measures in both by deriving relative priorities.

In this research paper, the purpose is to identify the key factors in issuing COVID-19 vaccine passport in Thailand. Numerical results that provide available value for each potential action would be more helpful than ranking of potential actions, without assignment of a numerical value for each. It is not about choosing the best alternative but rather studying the relative impact of each criterion for further decision-making in order to find the most optimal solution. The best part in this type of analysis is that multiple criteria give a balanced view of the problem and look at the problem in totality by incorporating all the relevant criteria (Khaira and Dwivedi 2017). As in prior discussion, on challenges of implementing COVID-19 vaccination documentation, the key concerns are not naturally dependent and neither do they influence others. When considering AHP, it assumes that criteria are independent and then gives relative importance of one criterion over another. AHP allows sub-criteria to be involved in decision-making which significantly affects the criteria and over decision-making process. Sub-criteria that fall under the same criteria will be compared in order to calculate the weight associated with each sub-criteria, as local weight. Sub-criteria serve as a foundation for evaluating each of the decision alternatives (Longaray et al. 2015). AHP has proven its potential to solve a variety of decision-making problems. It has been widely applied in many fields to support the decision-making process. In the area of COVID-19 study, Singh and Avikal (2020) studied a decision-making approach for prioritization of preventive activities during COVID-19. Since social awareness plays an important role against the spreading, it is important to identify the activities that should not be performed during the crisis. Zeferino et al. (2021) studied the quarantine facility selection for COVID-19 patients via AHP and Pareto. The result provides policy and decision makers the critical factors that must be considered in selecting the quarantine facilities. Abdelwahab et al. (2021) conducts a study on vaccine selection decision making model for COVID-19. Six criteria were identified to support vaccine selection.

According to Russo and Camanho (2015), the procedure of AHP consist of six phases as follow: (1) define the problem or goal, (2) structure the decision hierarchy, (3) construct a set of pairwise comparison matrices, (4) calculate the relative weight, (5) check and balance of decision, and (6) decision documentation. The value in the pairwise matrix depends upon the decision maker. To calculate the relative weight of the criteria on each level, there are steps to follow, starting with adding the value of the columns to normalize the matrix. This is to find the eigenvector or calculate the priority vector by adding up the members of each column to find the total and to normalize each column to sum to 1.0 or 100%. Then divide elements of that column by the total of the column and sum them up. If a matrix is absolutely consistent, the maximum eigenvalue (λ_{max}) is equal to n . In contrast, if the maximum eigenvalue exceeds n , it is inconsistent. To measure consistency, Saaty defined the consistency index (CI) as

$$CI = \frac{(\lambda_{max} - n)}{(n - 1)}$$

The consistency ratio (CR) is obtained by comparing the CI with an average random consistency index (RI). If CR is about 0.10 or less, it is acceptable but if greater than 0.10, the evaluation process must be revised.

$$CR = \frac{CI}{RI}$$

Where RI is derived from a sample of size 500, of a randomly generated reciprocal matrix. RI for matrix $n = 1$ to 10 is shown below Table 1

Table 1. Average Random Index (RI)

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.9.	1.12	1.24	1.32	1.41	1.45	1.49

After calculating the value of each criterion, add the values of each sub-criteria to obtain the final value. It is necessary to check and balance the result with expectations to avoid the gaps between the model and expectations. Finally, record all the reasons that support the decision when it comes to selecting the alternative. It is helpful to justify the process when how and why is present.

4. Populations

As according to Schmidt et al. (2015) who studied AHP in research on healthcare and found that there is no rule or standard method of calculating the sample size in AHP. The sample size could be varied from 1 to thousands depending on studies' goals. This research topic concentrates on vaccine passport in context of Thailand. The research will be carried out through questionnaires and will be focus on expert in this field. The expert in this study could be referred to figure 1 which represent the stakeholders in the Tourism supply chain in Thailand. Due to the limited population of experts in this field, this study is conducted in a small sample size of 7 experts; 3 from the Ministry of Public Health, 2 from the Ministry of Foreign Affairs and 2 from the tourism industry.

5. Results

According to figure 2, 6 main criteria and 14 sub-criteria have been selected to study and identify the key factors. The weights of the main criteria and their sub-criteria were calculated by comparing them pairwise. The comparison must be done by level comparing like for like so as to arrive at a standard true comparison. The result of Pairwise comparison between main criteria is shown in table 2. It is seen that Health Safety (global priority weight = 37.4%) is found to be the most important in the second hierarchy level than the other ones whereas the Support system factor comes later (global priority weight = 16.1%) whereas the Ethical factor has 14.4% global priority weights while Duration of use and expenditure rank the lowest among these criteria as they both have 11.3% and 8.1% respectively.

Table 2. Pairwise Comparison Matrix of factors affecting the issuance of COVID-19 vaccine passport in Thailand, Ranking, and CR

	F1	F2	F3	F4	F5	F6	Global Priority	Ranks	
F1: Ethical	1	0.4 1	1.2 7	0.9 1	1.6 3	1.1 7	14.4%	3	CI = 0.0048 CR = 0.0038 RI = 1.24
F2: Health safety	2.4 6	1	3.3 9	2.5 2	4.3 0	2.9 9	37.4%	1	
F3: Area of implementation	0.7 9	0.2 9	1	0.9 3	1.7 0	1.1 4	12.7%	4	
F4: Support system	1.1 0	0.4 0	1.0 8	1	2.3 3	1.5 6	16.1%	2	
F5: Expenditure	0.6 2	0.2 3	0.5 9	0.4 3	1	0.7 6	8.1%	6	
F6: Duration of use	0.8 6	0.3 3	0.8 7	0.6 4	1.3 1	1	11.3%	5	

Pairwise comparisons at the third level of the hierarchy were used to determine the relative importance of each sub-criterion with respect to its corresponding criterion and the goal (consolidated and global priority) as shown in table 3. The priority weights of sub-criteria show the top five most weighted factors that affect the issuing of COVID-19 vaccine passports are as follows: Passport Reliability (global priority weight = 17%) in the Health Safety category, Public health measure (global priority weight = 15.5%) also in the Health Safety category, Fairness (global priority weight = 14.4%) in the Ethical category, International (global priority weight = 10.9%) in the Area of implementation category and the During the pandemic (global priority weight = 9.8%) in the Duration of use category. The consistency ratio (CI) has been checked and it is 0.018 which is acceptable. When combining the weight of these five factors, it accounts for 67.6% of the overall decision that should be considered by decision makers when issuing of COVID-19 vaccine passports.

Table 3. Relative weights for sub-criteria, Their ranking and a brief description

Criteria	Weight of sub-criteria	Global priority	Rank	Brief Description
Health Safety				

Criteria	Weight of sub-criteria	Global priority	Rank	Brief Description
Passport Reliability	0.454	17.0%	1	A COVID-19 passport should be scientifically valid. It should provide reliable evidence that holder has been fully vaccinated against COVID-19 and is at low risk of infection and spreading the disease to others (Dye and Mills 2021).
Public health measure	0.416	15.5%	2	The issuance of vaccine passports should consider future risks. Vaccine passports holder could be exempt from restrictions (Phelan 2020) and may violate public health measures that could pose a risk of ongoing pandemic.
Passport Validity	0.130	4.8%	7	The duration of protection conferred by vaccines should be tied to passport expiration dates. Currently, it is still unclear. Uncertainty makes passports impractical (Brown et al. 201). Vaccine passports should be flexible enough for updates and changes with options. In addition, passports should be invalidated in case of the emergence of new Covid-19 species (Dye and Mills 2021).
Area of implementation				
International	0.852	10.9%	4	Vaccine passports are to promote the safe resumption of international commercial trade and travel (Pavli and Meltezoou 2021).
Domestic	0.148	1.9%	14	Vaccine passport should extend the scope of use to the home country. For instance, passport holders have the legitimate right to return to in-person jobs without risk to personal or public safety (Brazal 2021).
Ethical				
Fairness	0.144	14.4%	3	Vaccine passport should not be a tool in creating societal division (Osama et al. 2021). It is likely that vaccine passport would be a significant benefit for holders compare to non-holders (Brown et al. 2021).
Support system				
Standardization	0.251	4.0%	8	Vaccine passports should be globally acceptable and comply with International Health Regulations or IHR (Petersen et al. 2021). Vaccine passports should have a standard set of information provided and standard form, whether ot be digital or physical.
Legal protection	0.219	3.5%	10	The use of vaccine passport should not violate the basic human rights or restrict freedom of people (Phelan 2020). Neither should it give privileges to vaccinated people. Vaccine passport holders should bear some form of responsibility with legal supported punishment and rewards (Brown et al. 2020).
Secure certification process	0.227	3.7%	9	The process of issuing the vaccine passports should be secured with verifiable credentials against any unlikely events such as the leak of data or easily counterfeit in the future (Osma et al. 2021).
Interoperation	0.149	2.4%	12	Vaccine passport requires international cooperation for interoperability standards (WHO 2021). Country-by-country approach will not work as a global solution (Schlagenhauf et al. 2021). There should be a technological platform serve as a gateway for vaccine passport for multi agents or cross border cooperation.
Privacy protection	0.154	2.5%	11	Authorities must protect the privacy of passport holders and information governance held in vaccine passport (Brown et al.

Criteria	Weight of sub-criteria	Global priority	Rank	Brief Description
				2021). There should be a limited access to holder's data that protect against the loss of privacy.
Expenditure				The Public Health Minister of Thailand has announced that people who complete the full course of COVID-19 vaccine doses can apply for vaccine passports in print or digital format at a cost of 50 baht (Boonlert 2021). Affordability needs to be considered as it should be affordable for both individuals and government. It is doubtful whether the costs associated with regulating the passport outweigh the benefits (Brown et al. 2020).
Cost for registration	0.736	5.9%	6	In Thailand, it would cost 50 baht for people to get the vaccine passport in Thailand while EU proposed a free of charge, in digital or paper format, Green Certificate (European Commission 2021).
Cost for system	0.264	2.1%	13	There are costs in issuing vaccine passport, maintaining the database and verification. This also concerns responsible parties. If vaccine passports are digital, it would create difficulty to low- and middle-income countries (Osma et al. 2021). Also, some economic benefits of issuing a vaccine passport could be lost in the cost of management in area such as policing and validity (Brown et al. 2020).
Duration of use				In April 2021, the Thai Royal Gazette announced the format of a so-called vaccine passport an official immunization certificate for international travel for use with Covid-19 vaccination in Thailand. Compared to International Certificate of Vaccination or Prophylaxis (ICVP) which states the expiration date clearly, such a document presented in Thailand only states the vaccination date but no expiration date. The unclear duration of use needs further discussion.
During the pandemic	0.863	9.8%	5	Vaccine passports are likely to be widely implemented for a certain period of time, as a temporary recommendation (Pavli and Meltezou 2021) such as an EU Digital Green Certificate. The purpose of vaccine passport is to facilitate mobility during the time of COVID-19 only.
Permanent requirement	0.137	1.5%	15	This criterion is the reciprocal of above.

6. Conclusion and Discussion

With the coming Omicron variant, many have started to believe that COVID-19 is fading away. Yet, it might be too early to say according to WHO (2022). While this pandemic is still active and the number of infections is increasing sharply, the issue of COVID-19 vaccine passport is still critical. Based on the results of the study, it was found that the majority of experts give the greatest weight to the criterion of health safety, followed by ethics, duration of use, support system, area of implementation and expenditure, which is the least weighted. A list of factors such as passport reliability, public health measure, fairness, International (area of implementation) and during the pandemic (duration of use) need to be taken into consideration by decision makers when issuing the COVID-19 vaccine passports. Although, Thailand has already started to issue COVID-19 vaccine passports, is it also important that this document is flexible enough for further updates and changes. Cost for registration ranks sixth and that is because a majority of experts agree that it should be free. This is also another area for Thai decision makers to reconsider. Thailand's COVID-19 vaccine passport should offer procedures that people can access themselves without having to travel to the relevant authorities. Thai systems which have been perceived to be silo have reflected on the issue of COVID-19 vaccine passports. There seems to be a lack of collaboration. As of present, there are various platforms that allow vaccinated people to apply for vaccine passports but each platform interfaces with different authorities which results

in people having to travel to get the physical document. The postage option is currently unavailable which creates difficulty for residents outside the capital city. Considering this in the lens of supply chain, it could be said that the procedure of issuing COVID-19 vaccine passports in Thailand is not lean. There are extra works which do not add value in many areas. First, unnecessary travel to get the document puts people at risk of exposure to virus. In Thailand, when people receive the vaccine, the agents will issue a document called vaccine certificate. This document is not valid as a condition to travel abroad but it has the same set of data as the vaccine passport. Second, the process of queuing, requires people to have to register on the given platform and reserve a date to go in and get the COVID-19 vaccine passport. The queue is limited to a certain number of people each day. This might lead to fraud and counterfeit since the process is so troublesome and time consuming. Third is the cost of maintaining the vaccine passport application platform and data base system. This could be eliminated if we have a centralized system between different authorities and between vaccine certificates and passports. These three points mentioned are related to the first three factors found in this study. To achieve the goal of safe travel and resume tourism activities, Thailand's public health system needs to make adjustments to meet the same high standards throughout the country and eliminate non-value-added activities while maintaining the public health and safety.

There are two aspects that stakeholders in the tourism supply chain should aware of. One is the awareness of outbound tourists during the pandemic regarding the vaccine passport. This requires attention of upstream actors as government and non-government organizations. Their roles and responsibilities are to ensure that factors which have been studied in this paper, such as passport reliability, are being considered, prioritized accordingly and met. COVID-19 vaccine passports issued by Thai authorities should guarantee that the holder does not pose risks. This document will reflect the standard of Thailand. Another aspect is the inbound tourist's perceived risks. The issue of uncertain consequences associated with the destination could affect the tourist's perception and experience. Government organizations must be accountable and responsive by giving current information of the condition of their destination as well as conditions of the public health system. Tourism service providers who have closer contact with tourists should be able to provide necessary information from pre-travel preparedness until leaving. Official authorities must be clear about policy implementation and duration. In the past, Thailand authorities acted according to the situation. This seems to be reactive and continuously changing. It is a time to start acting in a more proactive way, anticipating strategically consistency. If upstream and midstream can present reliability and confidence, values will surely flow onto downstream which is tourists and hence, benefits could be shared to all stakeholders.

Finally, this scientific research prioritizes the factors that affect the issuance of COVID-19 vaccine passports in Thailand context. The pairwise assessment and ranking was presented with consistency and no bias. This study serves as a knowledge advisor for decision makers around the world since this is a global crisis. To make the COVID-19 vaccine passport benefit the tourism supply chain, it needs to gain credibility. This is going to require international attention and cooperation in creating an interoperability standard. Secure certification processes for an effective vaccination passport will help to create more confidence among tourists. The vaccination passport for COVID-19 should only be used temporarily. The more important issue to focus upon is the development of and access to vaccines and making coronavirus an endemic disease so people can live normal lives and do not need special measures.

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