



# Nimitmai Review

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(Humanities and Social Sciences)**

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## **About Nimitmai Review**

The Nimitmai Review is a peer-reviewed journal published by the Research and Development Office of Pacific Institute of Management Science (PIMS). The journal launched its first online publication in 2017 and published in English language twice a year (in January and July).

The publication serves the interests of both research-oriented scholars as well as professionals in related fields of the society. The journal will be the center for gathering top-tier original international research and review articles.

The journal is administered via online platform. Authors can submit manuscripts for review and publication through the web site. All correspondences including notification of the Editor's decision and request for revision will be done electronically; hard-copy will not be accepted.

## **Objectives**

The principal purpose of the journal is to publish academic works in the fields of humanities and social sciences in the classical sense as well as related fields of study including religious, political science, public administration, law, economics, management, business administration, social development and education etc.

A necessary criterion for publication in Nimitmai Review is that the articles entail significant academic contributions to serve the society as well as to enhance the development and integration knowledge to the wisdom society.

## **Aims and Scope:**

The Nimitmai Review is an international, peer-reviewed, open-access journal published twice a year, in January and July by Pacific Institute of Management Science (PIMS). The journal publishes articles of both research based and critical debate which promote original knowledge production through intellectual exchanges among local, regional, sub regional and global concerns.

Its focus is on advancing academic debates and enhancing the development of knowledge within the humanities and social sciences in the broadest sense of the terms. The journal publishes a variety of scholarly works including research articles, discussion articles, research notes and book reviews.

The journal is published in online version, which is free for access and download.

Interested authors are strongly encouraged to submit their articles for review and publication. Articles deemed suitable for consideration will be reviewed in a double-blind peer review process by two anonymous reviewers who are respected expert in their field.

The journal accepts only English-language manuscripts of original research and review articles. Redundant publication will not be accepted.

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## MOVING THAILAND'S AGRICULTURE INDUSTRY TO THE NEXT COMPETITIVE LEVEL THROUGH INTERNET OF THINGS (IOTS) <sup>1</sup>

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### Abstract:

The Internet-of-things (IoT), or alternatively known as the Internet of Everything (IoE), or the Industrial Internet, is a new technology paradigm envisioned as another wave of enabling technologies and business approaches that would revolutionize the world businesses, productions and services. At this juncture, the body of literature still lacks of a framework that can provide guidance to the policymakers and the investors, at both national, and company-levels, for generating competitive advantages. Thailand and its agricultural industry are the focus of this research. To fill the gaps, three research objectives are raised, (1) to suggest a systems framework capable to illuminate how IoT investments in the agricultural industry can lead to competitive advantage at national level, (2) to develop a generic business model configuration that can provide an explicitly understandable base for the investors and owners to comprehend and form the logics of how to actually benefit from the IoT investment, and (3) to draw some implications and suggest significant propositions to illuminate some important hindering and enabling factors that influence the investments of IoTs in agricultural industry. Case study approach and purposively sampling are used for the data collection, which targeted the Thailand IoT Association and a smart hydroponic farm located in Chiang Rai. The research results also in a generic business model canvas (BMC) that could provide to the agricultural industry an intellectual base for IoT investments.

**Keywords:** Internet of Things, Thailand, Agriculture, Business Model, Porter Diamond, Theory of Planned Behavior.

### Introduction:

The Agriculture sector has a pivotal role in Thai economy, which is generally recognized in the Public as a key source of export-earning and rural income in Thailand (Suphannachart and Warr, 2010), contributing to an approximate GDP of 9%. Nevertheless, the fast disappearance of land surplus for agriculture development (Siamwalla, 1996) and the problem of cost-price squeeze in the 1980s-1990s, with a declining agricultural workforce and increasing water scarcity, continued to push the % GDP contribution to Thai economies on downward trend, as shown in Figure 1. As such, it motivated the Thai industry and government, in the early 2000s, to make some structural adjustments, in the hope to improve the competitive advantages of the industry, which included facilitating farmers to exploit the more liberal trading environment, supporting commercial farmers, investing on genetic improvement and postharvest technology, mechanization and resource management, incentivizing contract farming companies, agribusiness firms and exporters who were willing to take risks and to readily respond to price signals (Poapongsakorn and Anuchitworawong, 2019). Government assisted through policy supports, such as by means of public research in the areas of genetic improvement and postharvest technology, and biotechnology, and improvement of production means to stimulate the production of safe and high-value food, and towards land-intensive but

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<sup>1</sup> The Int Conference on Global Trends in Business, Legal & Social Sciences Thailand 2019.

less water-intensive cropping patterns, promoting professionalism in farming, and with social supports.

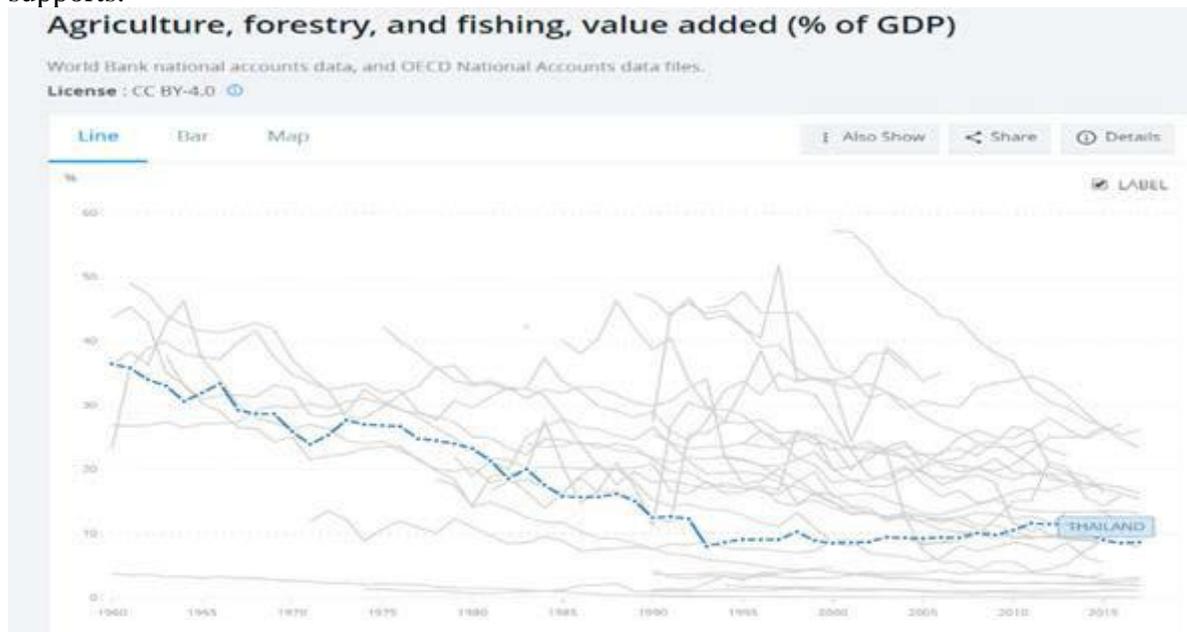


Figure 1: Continuing Downward Trend of GDP Contribution from Agriculture Industry in Thailand

With the flattening growth rate of the Thai population, as shown in Figure 2, it is strategically necessary to put forward an agricultural revolution to move towards a sustainable development avenue for smart agriculture. As Kumar and Sharma (2018) presented, the advent of intelligent techniques has changed the landscape of conventional agriculture tactics, which demands policy evaluation of various relevant schemes offered by the government.

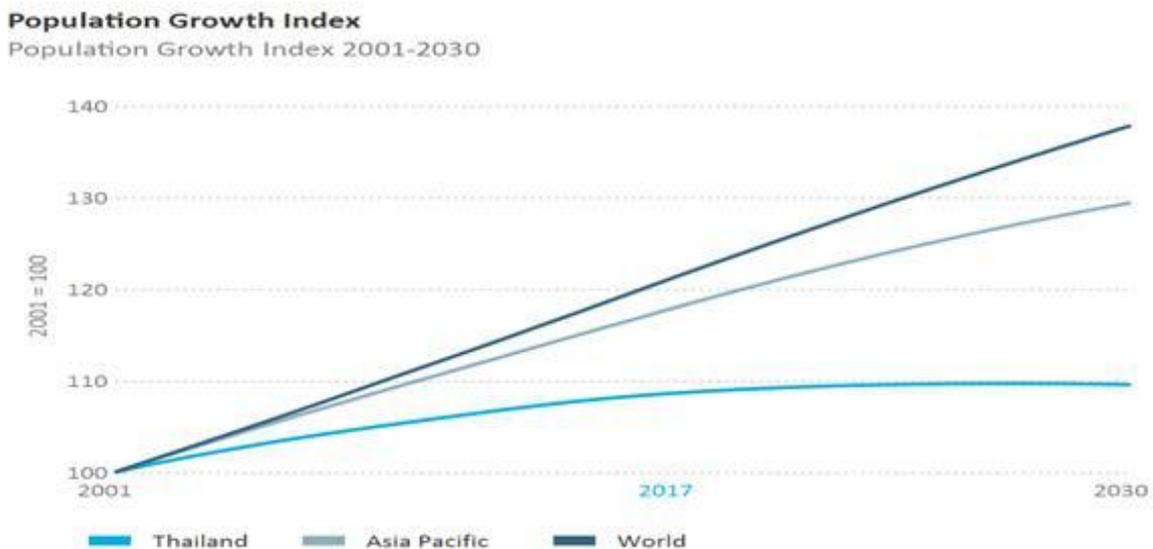


Figure 2: The Flattening Rate of Population Trend in Thailand

A recent trend towards accomplishing a sustainable agricultural industry development is by use of the Internet of Things (IoTs), partly propelled by the accelerated reliance on social media, Internet, and the obvious trend towards the roles played by big data and intensive use of analytics (Pham and Stack, 2017), and many countries have already started to address them as national policy. Nevertheless, the policy

structure and the pattern of the emphasis in the policy towards IoT is unclear, which prompts for the first research objective, to be discussed in the sequel.

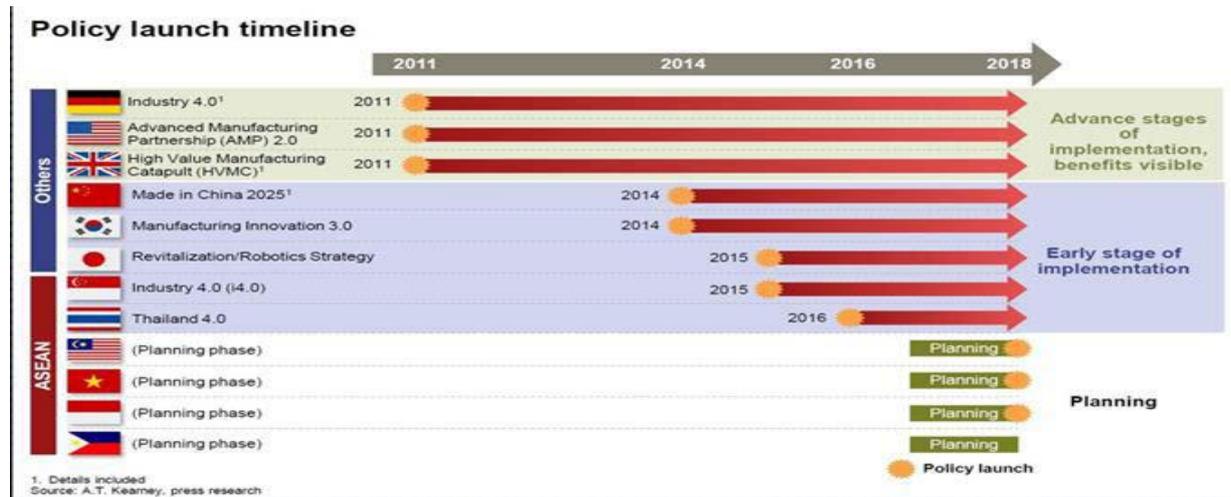


Figure 3:IoT Policy Launch Timeline of Some ASEAN Countries Compared to Other Developed Countries

Internet of Things (IoT) is a recent technology, which refers to the stringent connectedness between digital and physical world, known to capture numerous distinctive characteristics and advantages, such as the 3 A concept (anytime, anywhere, and any media), and things having identities and virtual personalities operating in smart spaces (implying uniquely addressable) (Ray, 2016). Figure 4 is a typical layer configuration of IoT, which shows the value-adding functions that interconnect and integrate the physical layers, through the communication, service, and application layers. For instance, through cropping system modeling, made possible by intelligent software programming, a diversity of smart-data based applications can be made possible, such as on weather (environmental modification), management (i.e. planting, harvesting, irrigation, fertilizer application, residue placement, tillage), soil plant-atmosphere (soil temperature, evapotranspiration), soil (soil dynamics, soil water, soil N, soil P, etc.), and plant modules (Jones et al. 2017).

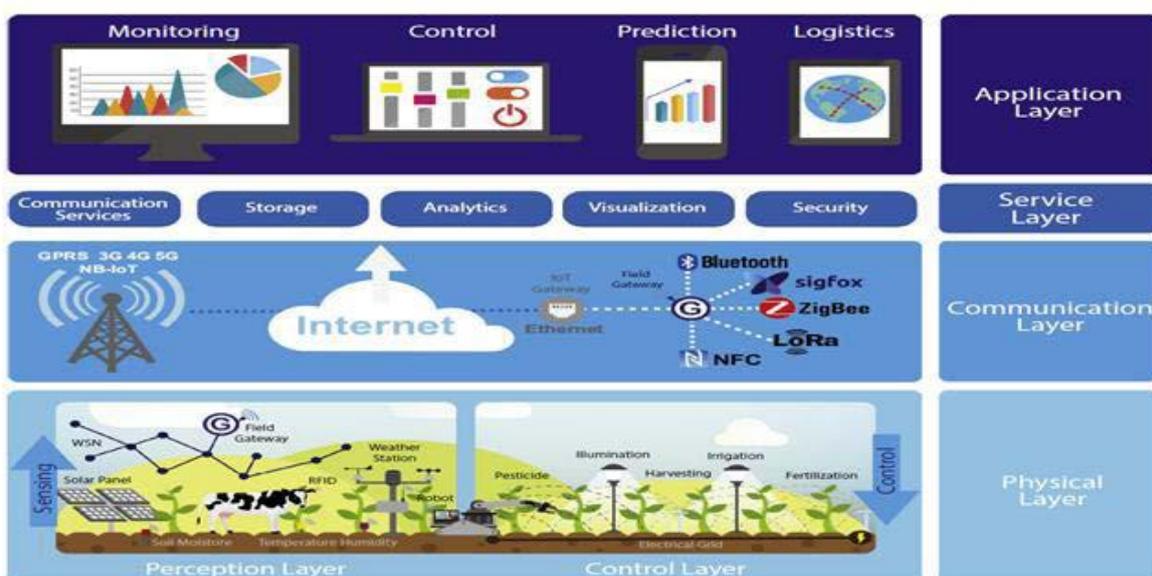


Figure 4:IoT Architecture Configuration

The fast-trending of the incorporation of IoTs, big data, AI (Artificial Intelligence), and intelligent data analytics, will, according to Porter and Heppelmann (2014, p. 66), eventually, force firms to reevaluate their business assumptions: “Smart, connected products raise a new set of strategic choices related to how value is created and captured, how the prodigious amount of new (and sensitive) data they generate is utilized and managed, how relationships with traditional business partners such as channels are redefined, and what role companies should play as industry boundaries are expanded.” (Also referred to Pham and Stack, 2017, p. 131).

Scholars have highlighted that to enhance the competitiveness of a nation’s industry and performance, an industry must be situated within a conducive environment that is supportive of the business (cf. Porter, 1980). Although IoT (Internet of Things) is a relatively new emergent technology, to make IoT popularly used in the industry, and nationwide, it can be inferred that an industry’s environment that captures the characteristics of competitive advantages at national level should be actively promoted, made possible and be supported by the government. IoTs are important technological inventions and components in realizing Industry 4.0, which are used to meet the demands for horizontal, vertical and end-to-end digital integration (Telukdarie, Buhulaiga, Bag, Gupta, and Luo, 2018). In particular, IoTs are capable to update the production and operations services in the context of Industry 4.0 to an intelligent level, by taking advantages of advanced information and manufacturing technologies to achieve flexible, smart, and reconfigurable manufacturing processes in order to address a dynamic and global market” (Zhong, Xu, Klotz, and Newman, 2017, p. 616). To be specific, based on the inter-networking world which offers advanced networked connectivity of physical objects, systems, and services (p. 619), and data that carry rich information and knowledge (p. 626), the typical production resources can be converted into smart manufacturing objects (SMOs) that are able to sense, interconnect, and interact with each other to automatically and adaptively carry out manufacturing logics (p. 618).

Due to the recent accelerated development of Internet-enabled technologies and systems of businesses exploiting Internet platform, it has resulted in a growing attention of researchers focusing on IoTs. To facilitate the decision-making of owners and investors in IoTs and their enabled business model design and implementation, it requires them to reasonably understand the logics and utilities behind the investment, and form a level of confidence.

The three research objectives provide an intellectual structure to guide organizations invest and deploy IoT policies and identify clear organizational goals. The three research objectives are given below:

1. Suggest a systems framework capable to illuminate how IoT investments in the agricultural industry can lead to competitive advantage at national level, and thus, as an implication, the systems characteristics and strengths can lead to a favorable industry-level and market-level environment conducive for IoT investment.

2. Develop a generic business model configuration, which provides an explicitly understandable base for the investors and owners to comprehend and form the logics of how to actually benefit from IoT investments. In other words, the business model configuration should provide an insight into the integrative functions of IoTs and thus to draw the attention on key activities for success.

3. Draw some implications and suggest significant propositions to illuminate some important hindering and enabling factors that influence the investments of IoTs in agricultural industry, which structures the derivations based on the business model framework and the competitiveness systems.

The linkage between objective 1 and objective 2 can be rationalized in numerous ways. Objective 1 can serve as an opportunistic environment, of reduced or controllable risk, which provides an atmosphere of stimulation and confidence for the businesses. The second objective, which serves to facilitate the perceived usefulness of IoTs or technologies, can provide a

structural guideline to help the businesses evaluate the fit between opportunities and business models up-front in a systematic way since “business model innovation is too important to be left to random chance and guesswork” (Christensen, Bartman, and Van Bever, 2016). The third objective can serve numerous functions, such as pointing out the areas of strategic potentials (Pricop, 2012), and as a preliminary examination of the stress factors affecting BM components, which Haaker et al. (2017) suggest using a concept of “Heat Map” of the following color coding:

-Red – The outcome on the stress factor, which makes a BM component no longer feasible.

-Orange – The outcome on the stress factor, which makes a BM component no longer viable.

-Green – The outcome on the stress factor, which affects the feasibility or viability of the BM component, but not in a negative way (p. 18).

### **Literature Review:**

A number of theories in the field and discipline of strategic management (SM) can be exploited to assist research scholars and practitioners derive understanding and conceptualize implementation design of IoTs, for instance, in the agricultural industry.

Based on IoTs’ capability on networked and seamless inter-connectivity and smart communication, its use can help leverage the stakeholder theory to a new level. That is, when rooted in solid knowledge, the IoT investment can help the firms provide a cybernetic platform to develop mutually trusting relationships with their stakeholders that will have a competitive advantage over firms that do not (Kull, Mena, and Korschun, 2016). To be exact, the stakeholders are both internal and external in the business ecosystems, including the fact that the business model components, i.e., the tangible and intangible resources (Pera, Occhiocupo, and Clarke, 2016), should also be treated as the stakeholders. The similar premise is found in the actor-network theory, which Laasch (2018) explains that in actor-network theory, “the list of who or what can be an actor is open ended, including human beings, machines, animals, nature, ideas, and organizations,” (p. 4), which “an actor can literally be anything provided it is granted to be the source of action” (Latour, 1996, p. 373). In addition, by treating IoT resources as networked assets and capabilities, it can help the firm to flexibly and intelligently control and use their resources, that transcends given weather and operating environment – that is, IoTs enable a seamless conversation being established among the devices, systems of activities, and the environment, to make intelligent decision-making.

Being flexible and intelligent in the embedded IoTs, the technologies can pull stakeholders together to co-create values, and thus, another relevant theory is owed to the service-dominant (SD) logic of value creation (Meynhard, Chandler, and Strathoff, 2016). As advocated in Vargo and Lusch (2008), the activities and processes enabled by IoTs should be catalyzed by a service concept that emphasizes on offering a solution to a problem, and an application of competences for the benefits of others. To be specific, the SD logic of value creation should maximize the knowledge, skills, and competences of each of the stakeholders and their resources (Vargo and Lusch, 2016), for the benefits of the collective systems of businesses, and the industry. Another important theory is owed to Michael Porter, who is widely recognized in the academic circles as one of the most influential academicians that shaped the thinking of a generation of academics and managers (Dobbs, 2014). In particular, a theory that studies how companies position within the structure of the industry is highlighted, known as the industry-based view (Garrido, Gomez, Maicas, and Orcos, 2014). The industry-based view underlies on a logic that an industry’s structure can be known by studying the five forces, which are considered as the threats posed by competitive rivalry, powerful buyers, powerful suppliers, potential new entrants and substitutes, and the collective strength of these

forces, ultimately, determine the ultimate profit potential of the industry (Porter, 1980). On a creative front, Kim and Mauborgne (2005) advocate a strategic move by exploiting simultaneous value creation and cost strategies in making a major market-creating business offering.

In evolution, the practices of the Industry 4.0 would be widely recognized as the rules of the game in the industry (Williamson, 1998). The institution-based view of strategy advocates on these industrial rules and practices as the key factors that condition strategic choices (Garrido et al. 2014).

**Business Model:** Although the literature involving the studies of business model (BM) are still heterogeneous and fragmented (Biloslavo, Bagnoli, and Edgar, 2018), Osterwalder's (2004) business model canvas (BMC) is popularly cited in the extant literature. The business model canvas presents a structure of variables that integrates and explains the logics of competition, which serves to help the managers, the investors and owners make sense of doing business (Blank, 2013). Through an explicit configuration, BMC allows management to visualize, test, and fine-tune strategic decisions, and guide the implementation process (Biloslavo, Bagnoli and Edgar, 2018).

Whether explicitly recognized or not, Teece (2010) states that every company working in a competitive market has a business model (BM) that describes how the business creates, delivers and distributes, and captures values, for its stakeholders (Haaker, Bouman, Jansen, and de Reuver, 2017). Most publications on BM involve the domains of innovation and technology management (Chesbrough, 2007), and not specifically towards IoTs. For the papers with IoT focus, they tend to focus on treating IoTs with emerging outlook and a particular attention on the value creation and value capture aspects of the resources, such as values as newness, performance, customization, "getting the job done," cost reduction, accessibility, convenience and usability, possibility for updates, design, risk reduction, comfort and brand/status, and price (Metallo, Agrifoglio, Schiavone, and Mueller, 2018). Nevertheless,

BM conception for IoTs lack of the support of empirical data and some very fundamental knowledge of cybernetic physical systems (CPS).

### **Methods:**

The agricultural industry is targeted, as it makes an important contribution to the economies and competitiveness of Thailand as a nation. Case study method is used, which serves as particularly effective in research issue that is contemporary in nature, and could involve drilling into why, what and how types of questions (Tan, 2019). To enhance validity, the case method is supported by triangulated sources of evidences, i.e. systematic interviewing, focus-group observations, and public and private archival document reviews.

The sampling technique is purposive. The data collection took place in 2018 and focused on seeking the views and experiences of the President of Thailand IoT Association and owner of a smart-hydroponic farm towards their experiences in the use and promotion of IoTs in agricultural productions and businesses. While the former shares the experiences to benefit the industries at national level, the latter illustrates a single-case experience that sheds light on the utilities and benefits at a company level, and illuminates a partial picture of the proposed generic business model.

While interviewing the IoT Association President, a smart mushroom farm designed and implemented by the IoT Association President was introduced to the researcher, as shown in Figure 5.

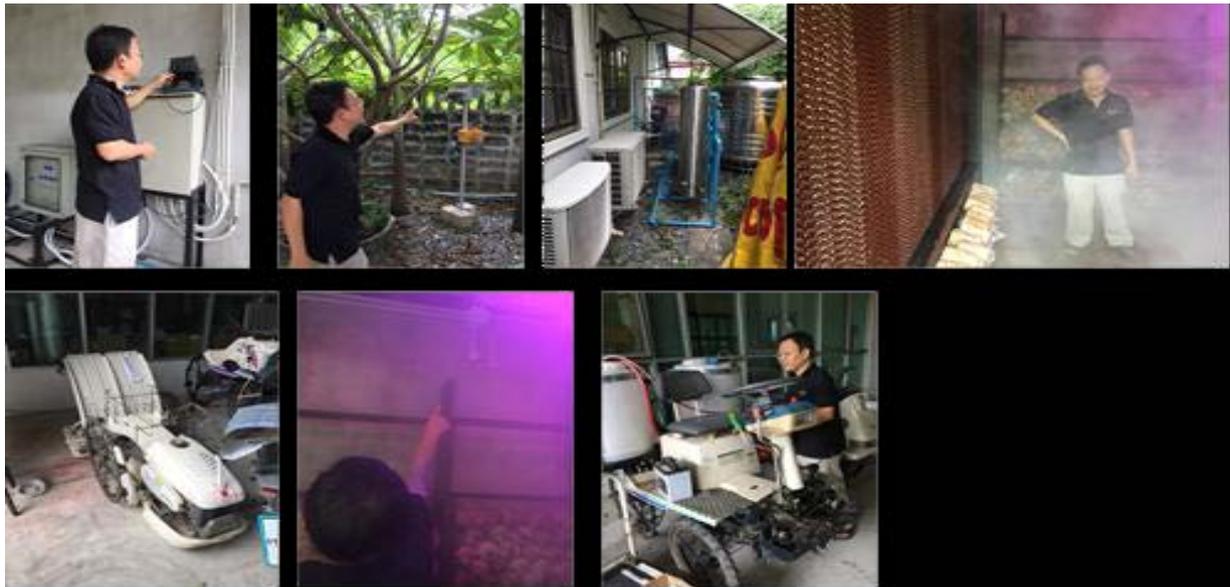


Figure 5: A Smart Mushroom Farm in Bangkok

A humidity-control aspect of the mushroom control system is illustrated schematically in Figure 6, which reiterates the role of “sound engineering knowledge” in the IoT smart farming investments, as also repeatedly reinforced in the second case with a smart agriculture farm in Chiang Rai, as shown in Figure 7.

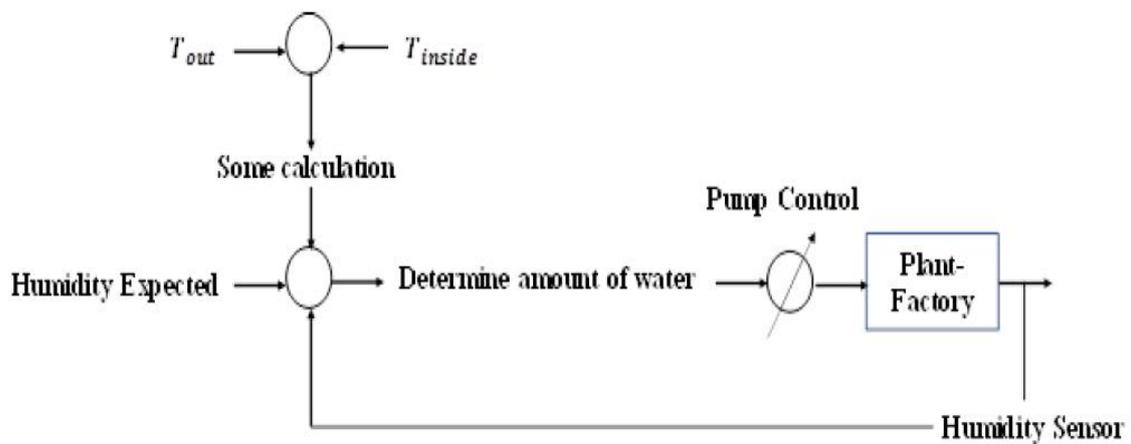


Figure 6: A Close-loop Control Logics of the Smart Mushroom Farm



Figure 7: Smart-Farm in Chiang Rai

To help the Thai government and the industries push forward the national IoT agenda, The IoT Association has established five strategic pillars of working groups, namely (1) technology development working group, i.e. the agricultural technology working group, as shown in Figure 8, (2) advanced business model promotion working group, (3) IoT security working group, (4) data flow working group, and (5) international cooperation working group.



Figure 8: Agri-Tech Working Group in Session

The working group pillars of the IoT Association share the integrative Framework structure of Porter’s Diamond that the ultimate purpose is to cultivate and nurture the strengths of national industry and the market activeness in order to acquire a national competitive advantage position, as shown in Figure 9.



Figure 9: Pillar of the Thai IoT Association’s Working Groups.

In particular, the “advanced business model promotion” working group exploits a guiding principle that aims to build the confidence level of the investors, business owners and managers, which in a way shares the theoretical logics of the Theory of Planned Behaviors (Ajzen, 1991), by making use, also, of the theory of technology diffusion that maximizes the integrative functions of observability, trialability, compatibility, simplicity and relative advantage elements as advocated in Rogers (1995), and market externality effect, as shown in Figure 10.

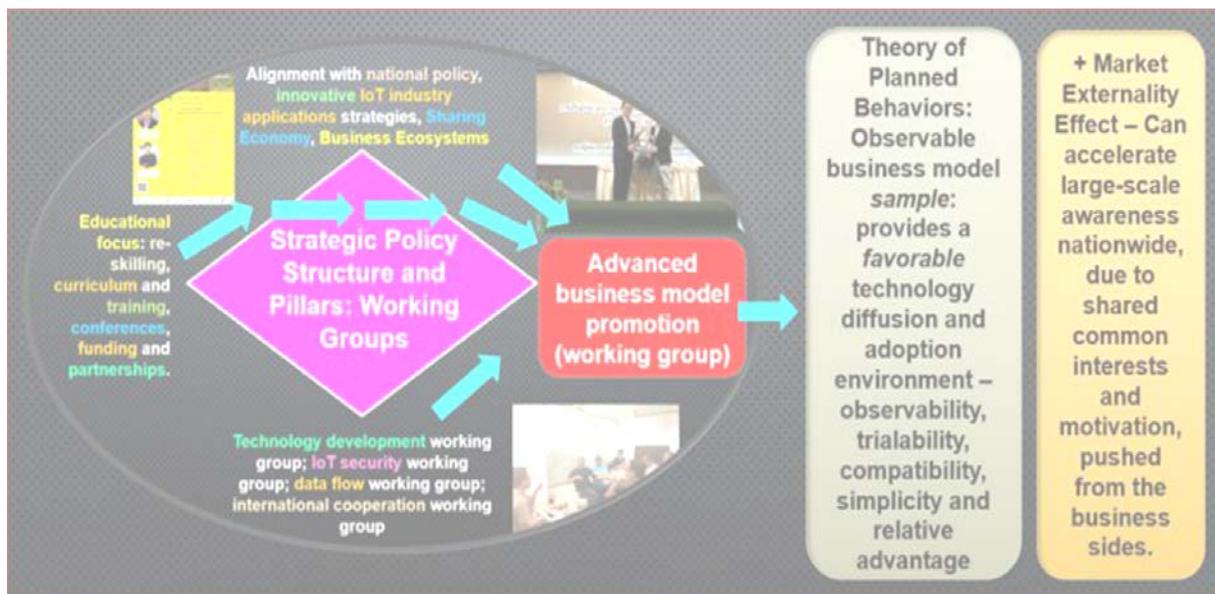


Figure 10: Pillars Guided by Theory of Planned Behaviors, Theory of Technology Diffusion, and Market Externality Goal

### Findings:

The findings are presented in addressing each of the research objective raised in the Introduction section.

Objective 1: Suggest a systems framework capable to illuminate how IoT investments in the agricultural industry can lead to competitive advantage at national level, and thus, as an implication, the systems characteristics and strengths can lead to a favorable industry-level and market-level environment conducive for IoT investment.

To address the objective 1, we triangulate by (1) the available 110-nation data on Global Innovation Index, Global Competitiveness Index, Corruption Perceptions Index, World Digital Competitiveness Index, and Logistics-Performance Index, (2) the documentary study of policy-relating voices of the Thai government and some supporting offices, and private sectors of significant weights, and (3) the in-depth interview with the IoT Association President, and working-group observations.

Based on the recent updates of the 110-nation data, it shows that 89.8 per cents of the variance of global competitiveness index of a nation can be explained by the combined world digital competitiveness index and logistics performance index, which are representatives of both the digital and physical connectivity and competencies, as shown in Figure 11. In addition, governmental role and the innovation strategies of a nation are also significantly important in influencing the development of both digital and physical logistics infrastructures and capabilities. Together, Porter's Diamond structure of variables contributing towards national competitive advantages is revealed as a feasible, preferred systems framework to illuminate how IoT investments in the agricultural industry can lead to competitive advantage at national level.



Figure 11: Global Competitiveness Index and its Digital and Physical Determinants

Specifically, both the documentary data analysis and an in-depth interview with the IoT Association President provide an evidence that their voices do reflect a structure of variables as advocated in Porter’s Diamond framework of national competitive advantage, as shown in Figure 12. To realize Thailand as a “hub of IoT”, the different stakeholders in the documentary analysis share a common understanding.

That is, Thailand needs to boost up the demands at many different market domains: at the domestic level (diversity of domestic industries, and local communities), at neighboring countries (ASEAN markets), and world markets. The Digital Economy Promotion Agency (DEPA), being established in 2017 with 280 million Baht budget and an ad-hoc Baht 1.5 billion budget, aims to drive the digital economy under Thailand’s 4.0 strategic plan. To succeed, DEPA stresses policies that also reflect the systemic integration of the Porter’s Diamond elements: “DEPA proposes digital HRs and talents, and technological competencies such as AI, cloud computing, and multi-disciplinary and mechatronics engineering,” as key elements in stimulating the factor condition.

“Actively promote new startup and new S-curves industries, focusing on innovation, scalability, and repeatability, with a need to enlarge the startups and advance them to mature stages, with particular emphasis on diversified industries in the country” (Strategy, DEPA).

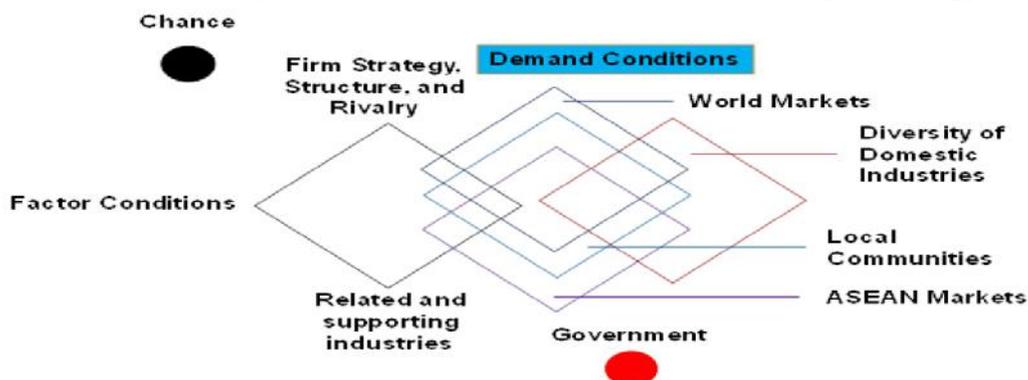


Figure 12: National Competitive Advantage Induced Structure of Factors

The following captures some of the voices expressed by the IoT Association President relating to the different elements illuminated in Porter’s Diamond Model: “Without business activities pursuing IoTs in scales and scopes, it would be difficult to create large-scale awareness nationwide. A shared common interest and motivation is very important” (Strategy, Market Condition) “The IoT market should deliver clear benefits or values of IoT, i.e. cost reduction, operational equipment uptime, and availability improvement, operations speed increase, product quality improvement and safety” (Market, value-driven Strategy)

The market condition should stress on the entrepreneurial segments, as they play significant pull factor: “The entrepreneurial segments, including innovative retail sectors, are constantly in search of higher value-added products, such as fruits as herbal products, the cosmetics, chemical extract, rice varieties, and they have the ability to pull the upstream stakeholders to participate in IoTs” (Market Condition)

“Both the physical and the digital worlds must be integrated in the design and implementation, as the digital world does not have the resources as the physical world. The digital world, by its nature, has to use the resources of the physical world, as shown in the Grab taxi and shared motorbikes concepts.” (Strategy)

“Where should Thailand focus in IoT investment. An example is to look at the IoT value chain. A typical IoT configuration is picturized by smart objects and smart devices at the field level, followed by connectivity and communication layer, and then, software customization and applications at the customer level. Typically, there is 5-10% of value at the smart-device level, but is dominated by China, with already around 80% of the smart-device market.

The smart-objects share the similar scenario, at 15- 20% of the value in the value chain. The 20-40% of the connectivity businesses are dominated by AIS, DTAC and TRUE companies in Thailand, which require big investments, and make it infeasible areas for IoT investments.

The feasible areas are the software customization, at 15-20% of value, and the applications another 10-20% of the total value of the IoT value chain.” (Strategy direction). “IoT integrates both the physical objects and digital technologies, turning each physical object into smart object, that is capable of sensing and making intelligent decisions, based on programmable logics and deep learning, AI corrections” (Strategy)

“Market sustainability of new concept, that exploits IoTs or some emergent technological and business model concept, as illustrated in the shared motorbikes in China and elsewhere, has to stand on an ability on system-wide organization of physical resources, and the responsible attitude of consumers” (Factor and Market Conditions)

“Farmers often show phobia with technology and computers. They do get excited with the drone flying around their farms trying to collect data and providing the irrigation and chemical spraying services. However, farmers hesitate to engage with the computerized gadgets.” (Factor condition)

“While the world population continues to grow, the agricultural workforces in both the developed and developing nations continue to show a downward trend. To alleviate the workforce shortages in the agricultural sectors, the IoT investment is a viable plan, by shifting to advanced technology” (Factor condition).

Technological trend and various governmental policies show “the chance” is there for IoT investments. “There is a closed ‘plant factory’ concept, for agricultures, which can offer safer and higher valued products, i.e. of higher vitamins and minerals, and use less spaces.” (Chance)

The supporting role of Government has, also, to support the IoT investments. This is obvious from the documentary evidences.

A number of socio-psychological factors and concerns are also evidenced: “Our working groups work under a 3M principle, namely developing a Model to serve as a Motivator for the investors and business owners to invest on Money, ..., and someone must take on a ‘Leadership’ role to establish the Model, so that others can emulate” (IoT Association, reflecting the Theory of Planned Behavior in the working).

“Depending on budget and operator’s concern, the IoT investment could be arranged on gradual basis, in order to build confidence and establish the competencies step by step: We can start with localized automation, at machine level, and proceed to automation in a

production line, and gradually be extended to factory wide, and beyond the production boundary, using a smart-logistics concept.” (IoT Association)

“Without security and privacy standardization in place, and in support by the national Laws, the widespread usage of IoT would be very limited” (IoT Association)

“Sustainable commitment and efforts on shared things and systems could be hindered by human beings, being self-centered, with neglectful attitude towards shared responsibilities such as on devices and systems. If this could be resolved, we could, probably and easily, implement shared economy concept. IoT is suitable for realizing shared economy, as everything is connected on digital platform.” (IoT Association)

Objective 2: Develop a generic business model configuration, which provides an explicitly understandable base for the investors and owners to comprehend and form the logics of how to actually benefit from IoT investments. In other words, the business model configuration should provide an insight into the integrative functions of IoTs and thus to draw the attention on key activities for success.

The business model concept is used to depict a logic of competition (Tan, 2018). Osterwalder and Pigneur (2009)’s business model canvas (BMC) is currently the most frequently used approach in presenting the business model concept of a firm, and its simplicity, as depicted in the nine-block canvas configuration, presents a shared language for describing, visualizing, assessing and adjusting the business strategies.

The interviews with Thailand IoT Association President and owner of a smart-hydrophobic farm in Chiang Rai reveal a generic BMC as shown in Figure 13. The IoT business model should be solution centric, and able to leverage networked resource capability, smart devices and smart interconnectivity, in order to innovate the activities on the various domains of BMC, such as the activities that can contribute to the planning, management and control of the supply chain (Accorsi et al. 2017). The business model should serve not only the operations of the businesses, in smart agricultural farms and their enterprises, but from the view of Thailand IoT Association, should also serve a “developmental” function, i.e. by making use of “Partnership” to instill nation-side motivations.

With IoTs, farmers can present to their wholesale or retail customers, and the markets, with a quality consistency image and reputation, in cost-efficient manner, and thus, are more capable to fight against the competition in the markets and the industry, and equip the farmers with the ability to provide a consistent service that the traditional farmers (those without IoTs) are not easily able to deliver: “By transforming my hydroponic farm into IoT system, it allows me to position myself as a supplier of consistent ability to supply to the volume and quality requirements. As such, I can maintain my selling price, while others have to face the price fluctuations in the market.” (The smart-hydroponic farm case).

“The fresh vegetable supply system in the market is not a straightforward business, and I have seen businesses enter and exit continuously. During the Winter, the production goes smoothly, and suppliers can generally meet the market i.e. the wholesale / retailer expectations. In hot seasons, production goes down, along with diseases, quality issue and defects, which demotivate the suppliers, and cause exits. The IoT allows me to have the first-hand knowledge of the farms and their health in real-time basis, and the system adjusts itself automatically to maintain the quality expected.” (The smart-hydroponic farm case).

| Partnership   | Activities  | IoT Value   | CRM   | Target Segment   |
|---|---|---|---|--|
| <ul style="list-style-type: none"> <li><input type="checkbox"/> Industry members</li> <li><input type="checkbox"/> Banks</li> <li><input type="checkbox"/> Governments</li> <li><input type="checkbox"/> Professional bodies</li> <li><input type="checkbox"/> Educational sectors</li> <li><input type="checkbox"/> International partners</li> <li><input type="checkbox"/> IoT systems and device vendors</li> <li><input type="checkbox"/> The ICT companies</li> <li><input type="checkbox"/> Private sectors of different industry nature</li> <li><input type="checkbox"/> Exhibition and events organizers</li> <li><input type="checkbox"/> Smart devices organizations</li> </ul> | <ul style="list-style-type: none"> <li><input type="checkbox"/> Activities: underpinned on digital ecosystem concept, shared economy principle, solution-driven, IoT value-driven, IoT resources and capabilities enabled, smart and feedback control, AI activated.</li> <li><input type="checkbox"/> IoT activities span across the whole BMC (Business Model Canvas) concept.</li> <li><input type="checkbox"/> IoT-enabled Operations management, seamless inter- and intra-operations.</li> <li><input type="checkbox"/> IoT-enabled R&amp;D</li> <li><input type="checkbox"/> Maintenance: Condition based, predictive.</li> <li><input type="checkbox"/> Smart Automation and farming</li> <li><input type="checkbox"/> Quality control activities and processes, yields optimal cost and quality.</li> <li><input type="checkbox"/> Product inventory optimization</li> <li><input type="checkbox"/> Smart strategy and planning</li> <li><input type="checkbox"/> Overall KPIs monitoring</li> <li><input type="checkbox"/> Smart co-sharing and co-creation with experts and among farmers.</li> <li><input type="checkbox"/> Precision-enabled.</li> </ul> | <ul style="list-style-type: none"> <li><input type="checkbox"/> Cyber-Physical System (CPS) principle centric – virtualize SCM and operations.</li> <li><input type="checkbox"/> Automating, controlling and reporting functions, virtualization of operating system</li> <li><input type="checkbox"/> Smart services driven.</li> <li><input type="checkbox"/> Greater customer benefits.</li> <li><input type="checkbox"/> Big-picture of the business operations</li> <li><input type="checkbox"/> Innovation driven i.e. Internet of Pigs, Internet of Chicken.</li> <li><input type="checkbox"/> Predictive value, monitoring and control</li> <li><input type="checkbox"/> Real-time insight, Contextual insight</li> <li><input type="checkbox"/> Visibility, Virtualization of the operating system</li> <li><input type="checkbox"/> Productivity and cost saving, risk reduction</li> <li><input type="checkbox"/> Design enrichment, development-oriented platform, customization</li> <li><input type="checkbox"/> Convenience.</li> <li><input type="checkbox"/> Traceability and quality controls</li> <li><input type="checkbox"/> Responsiveness</li> <li><input type="checkbox"/> Continuous learning</li> <li><input type="checkbox"/> Safety and security</li> <li><input type="checkbox"/> Engineering-knowledge driven programming – closed-loop control system</li> <li><input type="checkbox"/> Information richness of the business</li> <li><input type="checkbox"/> Cost advantages and differentiation.</li> </ul> | <ul style="list-style-type: none"> <li><input type="checkbox"/> Automated services: Control, monitoring, reporting, on-demand adjustment, alerting.</li> <li><input type="checkbox"/> Interactive communication, Customer engagement and co-creation.</li> <li><input type="checkbox"/> Customer's Omnichannel Experiences</li> <li><input type="checkbox"/> Supplier engagement</li> <li><input type="checkbox"/> Contextual insight</li> <li><input type="checkbox"/> IoT provides a robust image of consistence in quality, reputation – Brand integrity, image, and loyalty centric.</li> </ul> <p style="text-align: center;"><b>Channel</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Traditional channel bases strengthened by IoT capability</li> <li><input type="checkbox"/> Conferences and events (IoT Association)</li> <li><input type="checkbox"/> Connected logistics and supply-chain system</li> <li><input type="checkbox"/> Mobile phone activated and data platform</li> <li><input type="checkbox"/> Cloud computing services.</li> </ul> | <ul style="list-style-type: none"> <li><input type="checkbox"/> Large-scale segment</li> <li><input type="checkbox"/> Livelihood-purpose segment</li> <li><input type="checkbox"/> Supporting and supplementary segment</li> <li><input type="checkbox"/> Entrepreneurial segment</li> <li><input type="checkbox"/> Agricultural types, such as the open field and the factory type.</li> <li><input type="checkbox"/> B2B, B2C</li> <li><input type="checkbox"/> Entrepreneurial segments</li> <li><input type="checkbox"/> Startups</li> <li><input type="checkbox"/> Startups transiting to maturity phase</li> <li><input type="checkbox"/> SMEs</li> <li><input type="checkbox"/> Smart farmers</li> <li><input type="checkbox"/> Weather resisting and holistic sustainability segments</li> </ul> |
| <b>Resources and Capabilities</b>   |   |   |   |  |
| <p>Expanded resource spaces:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Cyber</li> <li><input type="checkbox"/> Physical</li> <li><input type="checkbox"/> Social</li> </ul> <p>Characteristics:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Networked and online connectivity, smart communication, across different layers of IoT systems.</li> </ul>  |   | <p>Layers of IoT Systems:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Object layer</li> <li><input type="checkbox"/> Sensor layer</li> <li><input type="checkbox"/> Hardware and software</li> <li><input type="checkbox"/> Network layer</li> <li><input type="checkbox"/> Cloud platform</li> <li><input type="checkbox"/> Cloud application</li> </ul>   |   | <p>Knowledge Types:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Engineering</li> <li><input type="checkbox"/> Business management</li> <li><input type="checkbox"/> Multi-disciplinary in nature</li> </ul>  |
| <b>Cost Structure</b>   |   |   | <b>Revenue Stream</b>   |  |
| <ul style="list-style-type: none"> <li><input type="checkbox"/> Sharing economy concept driven – i.e. for small farmers.</li> <li><input type="checkbox"/> Engineering and systems design, development teams</li> <li><input type="checkbox"/> For IoT Association: Five-pillar investment and expenses</li> <li><input type="checkbox"/> Conferences and events</li> <li><input type="checkbox"/> Site visits and longitudinal observations</li> </ul>   |   |   | <ul style="list-style-type: none"> <li><input type="checkbox"/> Context-contingent or application oriented</li> <li><input type="checkbox"/> Real-Time on-demand service</li> <li><input type="checkbox"/> Systems-wide design and installation</li> </ul>  |  |

Figure 13: The Generic Business Model – for Thai Agriculture Industry

Objective 3: Draw some implications and suggest significant propositions to illuminate some important hindering and enabling factors that influence the investments of IoTs in agricultural industry, which structures the derivations based on the business model framework and the competitiveness systems.

The interviews with Thailand IoT Association President and owner of a smart-hydrophobic farm in Chiang Rai reveal a generic BMC as shown in Figure 13, which also yield numerous important propositions stated below: “IoT as networked resources and resource-efficiency leveraging machines”. The term, IoT, illuminates broadly an “extension of network connectivity and computing capability to objects, devices, sensors, and items not ordinarily considered to be computers” (Boyes et al. 2018, p. 3).

With the IoTs, the resources become networked resources, which have a spectrum of analytical and intelligence capabilities (Kane et al. 2015), and thus, the entire BMC elements are the domains of the IoT-induced functions. This proposition virtualizes the supply chain and can help organizations suggest the best ways to improve productivity and solve customer problems, and thus, can significantly improve the planning, orchestration and coordination of members of the supply chain in cost-efficient manner (Verdouw et al. 2013).

“Resources should simultaneously target on cyber-, social and physical spaces” by exploiting the cyberphysical computing (i.e. situation awareness, context-aware computing,

data fusion and data mining), social computing (i.e. collective intelligence, recommendation system, crowdsourcing), and thinking computing (i.e. affective computing, brain informative) (Ning et al. 2016, p. 511) capabilities.

“IoT value proposition should rely on and make plan based on cybernetic-physical systems (CPS) principle.” CPS is defined in Boyes et al. (2018) as “a system comprising a set of interacting physical and digital components, which may be centralized or distributed, that provides a combination of sensing, control, computation and networking functions to influence outcomes in the real world through physical processes”, adapting the version of Boyes (2017).

Hindering areas could lie in both livelihood-purpose segment and large-scale segment. The former is a segment which is smaller in scale and whatever the agriculture focus it is livelihood-important. This segment has low propensity towards technology employment, because of cost-burden, and the intermediary buying that tends to push downward the selling price from the farmers. The latter is largescale operator segment, having own markets, with stability, and have some sufficient capability to resist pressures from the environment. The large-scale companies tend to source IoT designs from international suppliers, and have the capability to replicate with a low-cost version that would benefit them competitively in the markets.

“The smaller-sized segments in the agricultural sectors, generally, do not have the investment power as well as the market power. They have insufficient funds to make large-scale investment, coupled with low-return due to smaller scale. We suggest a “sharing” strategy, which can make use of integrating a group of small farmers, to share on IoT systems investment. Some challenges do exist, such as in how to convince the farmers on shared economy.” (IoT Association).

Sound engineering knowledge of farming production is considered a crucial ingredient for success in the IoT systems design and implementation, as voiced from both the cases.

“Without sound engineering knowledge, it is quite impossible to succeed in, for instance, an IoT integrated plant-factory investment, such as a closed mushroom-plant factory.” (IoT Association)

What is considered “valuable and rare” from the perspective of suppliers may not be similarly shared by the customers. For instance, the second informant, of the owner of a smart-hydroponic farm in Chiang Rai, highlights an aspect of a restraining force, as follows:

“Although IoT is a rare technology, considered of tremendous value, but our customers not really value, as they see the value from the product, that is, the hydroponic vegetables we deliver to them. (Hydroponic farm case)

## **Discussion and Conclusion:**

This research provides a cross-sectional view of the current IoT market and industry in Thailand, as guided by the three research objectives in which the emerged themes and propositions identified are conceptually bounded and facilitated by Porter’s Diamond Model framework and the business model canvas (BMC) concepts.

A fundamental goal of this research is to provide the information and inferred knowledge to the industries, in general, to help them understand the IoT-enabled business environment and learn of a generic configuration of IoT-enabled business model, which they can exploit. Osterwalder’s business model canvas (BMC) configuration is selected as the basis for the summary of the qualitative data analysis, due to its simplicity and intuitive exhibit of the interrelations among the model’s components(Rusu, 2016).

The three research objectives not only match the trilogy of strategy, which consists of context (Porter’s diamond model), concept (i.e. for technology diffusion, based on theory of planned behavior, and national competitiveness atmosphere), and conduct (business model), but they can also be reckoned to underpin on three purposive perspectives, namely

- (1) descriptive (supported and based on empirical data),
- (2) normative (guided by Porter's diamond framework and business model canvas ontology), and
- (3) instrumental view that establishes a connection between the business model and systems of efforts and the attainment of a firm's performance and industry's competitiveness.

The research also helps the research scholars to form an expanded understanding to some of the recognized theories commonly used in the discipline of strategic management. One important theory is the stakeholder theory, which the business model components should also be treated as the stakeholders, and in addition, the IoT invested should enable the firm to develop mutually trusting relationships with its stakeholders, leading to a competitive advantage over firms that do not yet implement IoTs through networked connectivity capability.

The seamless connectivity and smart communication of smart devices and sensors, through AI programmable logics and systems, and actuators eventually for the foundation to realize the so-called "business ecosystems", leading to shared competitive advantages.

When the business model is actively mastered, the case informants indicate that one will gain the competences to replicate them, and thus, provide an avenue for production and market expansions.

In sum, to serve to develop IoT investments at national level, this suggests shed light on a number of areas which the policy-makers can pursue:

- An industrial environment showing national strength towards competitive advantage.
- A big picture in IoT investments manifested in the IoT-enabled business model, with CPS-centered value propositions that can push forward the virtualization of supply chains and business ecosystem, and is leveraged through networked resources, capabilities and activities that exploit IoTs.
- Resolving some of the restraining or hindering socio-psychological factors that relate to the motivation and confidence levels of potential investors, owners and managers.
- The activities of the business model should underpin on digital ecosystem concept and the shared economy principle, and is solution-driven.

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## HAEMATOLOGICAL PROFILE IN FISH AS AN EFFECTIVE AND SENSITIVE INDEX IN AQUATIC POLLUTION<sup>2</sup>

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### **Abstract:**

The present investigation assessed toxic effects of aquatic pollution on fish collected from the contaminated station of Chambal River. Both water and fish (*Mystus tengara*) samples were collected from upstream and downstream of Chambal River at Nagda, Ujjain (M.P. India). Water quality parameters of the water were assessed and fish were used to study the various blood parameters. The changes in haemoglobin concentration, red blood cells, and white blood cell count were studied. The secondary blood indices were also calculated. Compared to the reference site, the fish from the downstream shown decreased numbers of RBC, Hb and Hct. However the values of WBC count, and Mean Corpuscular Volume (MCV) increased significantly. The Mean Corpuscular Haemoglobin Concentration (MCHC) values were significantly reduced. These outcomes advocate that fish from the polluted station revealed alterations in haematological responses, which possibly point out the health disturbances. Additionally, the results suggest that blood parameters are useful, tools in the monitoring of aquatic pollution. These biomarkers show that fish have macrocytic hypochromic anaemia. Leucocytosis showed general defence response against the pollution-induced toxicity. In conclusion, the results acquired from the current study shown that the fish *M.tengara* at downstream was exposed to pollution-induced stress that caused a significant reduction in Hb, RBC and Hct values but increased the clotting time, ESR and WBC values. Water from the downstream has strong potential to induce stress making the fish anaemic, weak, and vulnerable to diseases.

**Keywords:** Biomarkers, River Pollution, Haematological Parameters, *MystusTengara*.

### **Introduction:**

Though industrialization has brought economic affluence but it also resulted obvious stress by discharging huge waste into the soil and water [1],[2],[3]. Xenobiotics and heavy metals present in wastewater could cause negative effects on the flora and fauna. Fishes are extensively used as biomonitoring organisms in ecotoxicological studies as they are sensitive to the probable risks of contaminants introduced in the aquatic environment.[4][5],[6]Fish are sensitive and very vulnerable to alterations of water quality, which possibly reflected in their blood components. ([1][5],[7]

The endurance, distribution, reproduction, and normal metabolism of fish depend on water quality parameters. Blood parameters are most vital markers of the physiological stress that reflect the endogenous or exogenous changes in fish.[1],[3]. [7],[8],[9]

Blood indices can offer adequate information about the overall health status and physiological response of fish to environmental changes that affect homeostasis.[3],[7],[8],[10],[11]

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Haematological studies facilitate us in understanding the association of blood indices to the habitat and adaptability of the species to the environment. A huge number of intrinsic and extrinsic factors cause variations in haematological data. [7], [12], [13] Therefore, haematological studies are significant for ecological monitoring of fish and their health status as they are so closely linked with the aquatic environment.

Even though, fish haematology maintains to offer an important tool, but the progress in establishing normal range values has been sparse and information in this area is still incomplete. For that reason, a number of haematological indices such as haemoglobin (Hb), haematocrit (Hct), total erythrocyte (TEC) and total leukocyte counts (TLC), and mean corpuscular haemoglobin (MCH) are considered to measure the health status of the fish and ecological pollution. Therefore, the present study is aimed to evaluate haematological parameters of the fresh water fish, *Mystus tengara* from upstream and downstream of the Chambal River at Nagda (India). The information generated from this study may offer a valuable data bank for upcoming investigations of pollutant effects on haematological parameters in aquatic environment.

**Material and Methods:** Study Area: River Chambal at Nagda town (23°27'N and 75°25') receives wastewater from various industrial units and sewage from municipality of Nagda town. The surface water samples from upstream and downstream of the River were collected in December 2018 at almost 10 cm below the surface. Acid rinsed glass containers were used for collection. Collected samples were processed for the analysis of various physico chemical parameters and heavy metals in water according to the protocol given by APHA. [14]

**Fish:** Live samples of fish *Mystus tengara* (n = 10), (8.2 ± 0.7cm; 7.1 ± 0.41g) (irrespective of the sex) were collected from upstream (Reference site) and downstream (polluted site) of the River during winter months of 2018 with the help of local anglers. They were immediately transferred to laboratory independently for further haematological studies.

**Haematological study:** Blood sample was collected by cardiac puncture using disposable syringes and kept in separate vials. Haematological parameters like Hb, RBC, WBC, ESR and PCV were estimated following the procedures of Wintrobe, [15] and Sood, (1996)[16]. Mean cell haemoglobin concentration (MCHC), Mean cell haemoglobin (MCH), and Mean cell volume (MCV) were calculated using the formulae mentioned by Dacie and Lewis (2001).[17]

**Statistical analysis:** The data observed in the experiment were statistically analyzed for the calculation of standard error (S.E.) and students' t test was administered for testing the hypothesis with the help of computer software excel program. The data shown are the averages of three replicates ± S.E.

## Results:

**Water Quality Parameters:** Major fluctuations in the water quality of Chambal River at Nagda were detected between the study stations. The site located at downstream of the River was characterized by poor water quality conditions. The results of water quality parameters of Chambal River at Nagda are presented in Table.1.

Table 1: Water quality data from Upstream and Downstream (polluted area) of Chambal River at Nagda

| Parameter           | Upstream    | Downstream  | % Change over reference |
|---------------------|-------------|-------------|-------------------------|
| Temperature °C      | 22.4±0.33   | 22.9±0.74   | 2.232                   |
| DO mg/L             | 7.4±0.42    | 4.6±0.5     | -37.83                  |
| pH                  | 7.1±0.09    | 8.8±0.89    | 23.94                   |
| TDS mg/L            | 110.10±5.3  | 392.5 ±5.3  | 256.49                  |
| Total hardness mg/L | 200.5 ±9.67 | 1296.7±9.67 | 546.73                  |
| TSS mg/L            | 26.1±2.2    | 136.7±4.6   | 423.75                  |
| BOD mg/L            | 7.6±0.45    | 52.4±3.2    | 589.47                  |
| COD mg/L            | 11.6±1.01   | 32.3±2.4    | 178.44                  |

Results point out that virtually all water parameters calculated were higher than the accepted limits laid by the Central Pollution Control Board (CPCB) [18]. Most of the assessed parameters shown poorest values at station 2, displaying the worsening of water quality at this station. The discharge of both municipal sewage and industrial pollution contribute to this fall in water quality. Moreover, the low levels of dissolved oxygen observed at station 2 are the result of the increase in BOD, bacterial activity as well as to the rise in the ammonia nitrogen, leading to oxygen consumption downstream from the city sewage discharge.

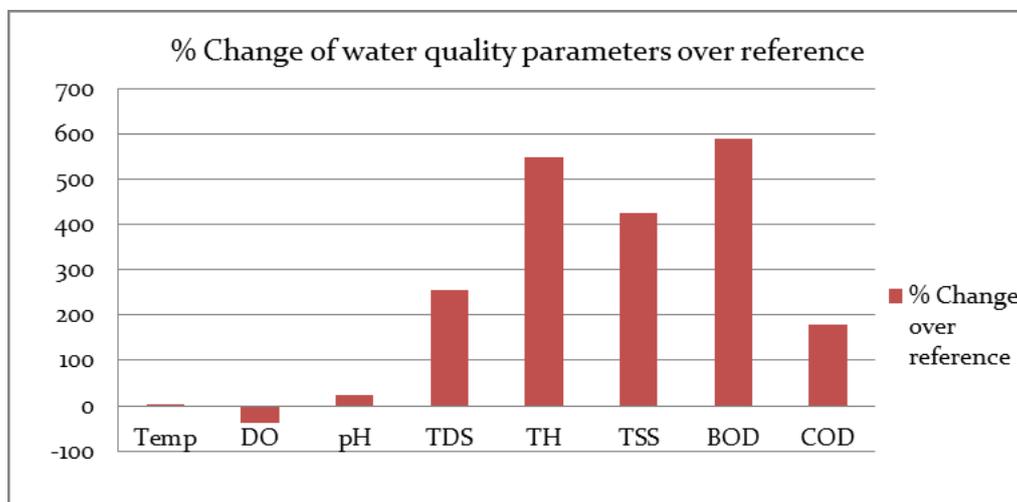


Figure 1 The results of blood analyses

Haematological Parameters: The results of blood analyses (n=10) are given in Table 2. The Hb percentage is significantly decreased (-11.326%) in the fish exposed to pollution.

Table 2: Changes in Haematological Parameters in Freshwater Fish, M.Tengara

| Parameter                                | Reference fish | Exposed fish  | % Change over reference |
|--|----------------|---------------|-------------------------|
| Hb%                                      | 10.33±0.06     | 9.16*±0.08    | -11.326                 |
| RBC (x10 <sup>6</sup> /mm <sup>3</sup> ) | 3.95±0.04      | 3.11*± 0.12   | -21.26                  |
| WBC (x10 <sup>3</sup> /mm <sup>3</sup> ) | 62.88±0.27     | 89.13*± 1.33  | 41.74                   |
| Hct%                                     | 43.42±1.20     | 28.31*±1.01   | -34.79                  |
| ESR (mm/hr)                              | 8.23± 0.57     | 16.94*±0.88   | 105.83                  |
| Ct/Sec                                   | 49.54± 0.03    | 58.88*± 0.15  | 18.85                   |
| MCV                                      | 144.36± 6.05   | 126.42*± 7.59 | -12.42                  |
| MCHC                                     | 24.11± 0.82    | 27.16*± 1.37  | 12.65                   |
| MCH                                      | 34.87± 0.61    | 25.72± 2.10   | -26.24                  |

MCV= mean corpuscular volume, MCHC= mean corpuscular haemoglobin concentration, MCH= mean corpuscular haemoglobin. Values are mean of three replicate SE and (\*) significance of P<0.05

The RBC number (-21.26%) and Hct percentage were decreased significantly in the exposed fish when compared to the fish from reference site. However, a significant increase in total white blood cells (WBC) count over the controls was observed (41.74%). The erythrocyte sedimentary rate (ESR) and clotting time (CT) registered an increased trend significantly (105.83% and 18.85%) in the fish of downstream in compare with control. The mean corpuscular volume (MCV) value and mean corpuscular haemoglobin (MCH) values decreased (-12.42% and -26.24%) in compare with control fish while mean corpuscular haemoglobin concentration (MCHC) values increased (12.65%) in comparison with control fish.

#### Discussion:

Blood is a pathophysiological reflector of the whole body. Aquatic animals are often exposed to various stressors like excess crowding, transport, and pollution, can directly reflect in various biological and haematological responses. Therefore, the study on the changes of haematological parameters of fish can provide a valuable information in the identification of stress, environmental contamination and pathology. [1],[3],[7],[8],[11],[19] Changes in these indices from reference give an indication of disease. Low TEC usually leads to low PCV and Hb levels, which has also been observed in the current study. In the present study, Hb percentage, RBC content and Hct values significantly decreased in the fish of downstream. In contrast, WBC counts, ESR, CT and MCHC values were found notably increased compared to control fish. Reduction in total erythrocyte count, haemoglobin percentage, and Hct values indicates the occurrence of anaemia. Hb seems to be the best blood indicator of environmental stress. [20] Besides, behavioral and morphological adjustments, fish has to adjust to low oxygen levels by altering several physiological and biochemical parameters. [21]

Earlier investigations have also reported low DO levels at this station. [3], [22], Nevertheless, we cannot reject the effects of other pollutants (xenobiotics, pesticides, ammonia, heavy metals, etc.) present in the downstream. The reduction in haemoglobin value perhaps due to distraction of iron synthesis in fish exposed to polluted water. The decrease in total RBC, haemoglobin percentage and Hct values in the present study perhaps due to the damage of mature RBCs or inhibition of erythropoiesis by cocktails of pollutants in River. One more possible explanation for the reduction in RBC and HB may be due to the cytotoxic effects of pollutants on the hematopoietic tissue as in *Heteropneustes fossilis*. [23],[24] Decrease in haemoglobin concentration may perhaps due to pollutants induced production of reactive oxygen species (ROS) which might be caused the destruction of the cell membrane of erythrocyte and its function. [25],[26] Another possible explanation for the decrease in blood indices may be due to haemolysis and haemodilution, a manner of diluting and reducing the effect of the toxicant/pollutants. [28]

The higher number of WBC in the exposed probably might be due to the stimulation of the animal's defense mechanism and the immune system by pollutants. Most of the of the oxygen inspired by fish (95%) is utilized for ATP production. Fish react to hypoxia with mixed behavioral, functional, and cellular responses to maintain homeostasis and functional physiology in a low oxygen environment (hypoxia). The decreased levels of RBC, Hct and Hb concentration in the present study maybe demand a well-coordinated comeback to obtain more oxygen from the depleted environment. Conversely, leucocytes are mainly involved in phagocytic and immune responses. The increase in the number of leucocytes (leucocytosis) in the present study is a common response against the entry of contaminants. Accordingly, higher number of WBC count was observed in fish at downstream could be caused by heavy metals exposure or probably a complex mixture of pollutants could be occurring due to mixing of both urban and industrial waste. [1], [3]

The changes in the number of white blood cells are the natural response on the exposure to toxicant. [27], [28] In the present study, WBC count (Table 1) is significantly increased in

the fish exposed to pollution at downstream, which may be due to stimulation of the defense mechanism of the fish to counteract the stress of toxicant. Similar results were recorded on the toxicity and recovery of insecticides on haematological parameters in *Labeo rohita* [29] and *Cyprinus carpio*. [30]

The hematocrit (Hct) values are significant to determine the effects of a stressor on the health status of fish and are used to determine the oxygen carrying capacity of blood. Variations in Hct happened in the fish of downstream under hypoxic conditions. The significant increases in Hb concentration in were complemented by increases in the number of erythrocytes perhaps to raise the blood oxygen capacity in order to supply more oxygen to the tissues under hypoxic conditions. We also noticed that the changes in haematological parameters are associated with low levels of dissolved oxygen (DO). The reduction in blood values might also be due to the disrupting action of water contaminants on erythropoietic tissue, which consecutively induced anaemic condition in fish of downstream. The decrease of RBC is mostly due to development of hypoxic condition, which successively leads to increase in the destruction of RBC or decrease in the rate of formation of RBC due to non-availability of Hb content in the cellular medium.[31] The anaemic condition in fish results from an abnormal decrease of erythrocytes or with little amount of haemoglobin.[32]

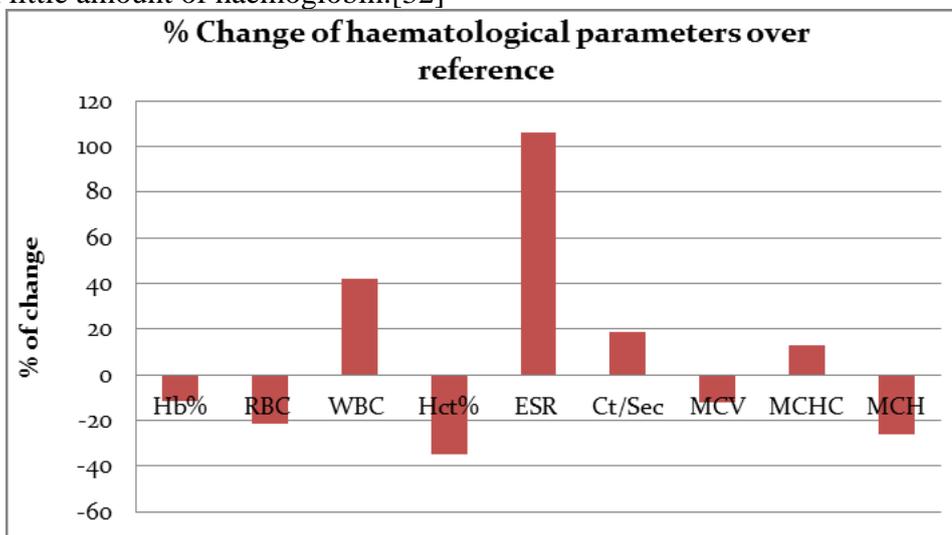


Figure 2 Change of haemalogical parameters over reference

The increase in ESR levels in the fish of downstream possibly due to Pollutants (heavy metals and xenobiotics) induced oxidative stress and caused tissue damage, anaemia, neoplasia an increase in fibrinogen.[2], [3] A clot is formed as the product of blood coagulation. The clot under normal conditions undergoes contraction when serum is expressed from the clot, and finally, the clot becomes denser. The blood clotting substance in fish blood is prothrombin, which is present in a high percentage. However, it is less than that of mammalian blood level. A substance released by the platelet (thrombos then in) is responsible for clot retraction. Water pollution caused a significant decrease in RBCs count, Hb and PCV values, in the in *Channa punctatus* along with acute anaemia. [33] Similar results were also reported in *Labeo rohita* [34] and in *Channa punctatus* exposed to tannery effluent. [35]

### Conclusions:

The results acquired from the current study clearly displays that the fish *M.tengara* at downstream was exposed to pollution-induced stress that caused a significant reduction in Hb, RBC, and Hct values but increased the clotting time, ESR and WBC values. In conclusion, the results acquired from the current study shown that the fish *M.tengara* at

downstream was exposed to pollution-induced stress that caused a significant reduction in Hb, RBC, and Hct values but increased the clotting time, ESR and WBC values. Water from the downstream has strong potential to induce stress making the fish anaemic, weak, and vulnerable to diseases. This study will be beneficial for upcoming research in explaining the detailed effects of river pollution in other fish species. The information generated from this study may offer as a valuable databank for upcoming investigations of pollutant effects on haematological parameters in an aquatic environment.

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## INDIAN POSITION ON LEGAL STATUS OF REFUGEES

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### Abstract:

India is one of the few countries in the world which has experienced refugee situation, time and again and that too on a gigantic scale in the last less than half-a-century. History of India is marked by large scale migrations of people from other countries and continents. These migrations had principally taken place across of two gateways- Hindukush Mountains in the west and patkoi range in the East. As Prof. M.P. Singh observed (M.Katju, "India's Perception of Refugee Law" 251 - 253, ISIL year book of International Humanitarian and Refugee Law, 2001.) : "From the times immemorial, people from different parts of the world have been coming to India in various categories such as travellers, invaders, settlers, refugees etc., and have made, this land their home with or without separate identity". An intricate legal question arose as to the legal status of displaced persons as the definition of displaced person provided by the Rehabilitation Finance Administration Act of 1948, is at variance from the definition of the term refugee provided by the 1951 convention relating to the status of refugees. In this case, the situation creating the refugees was the result of an agreement between the two governments. Prof. Khan aptly observed that the plight of the people who had migrated was the same as that of refugees. They were displaced from one country to another, had undergone harrowing experiences and had sought refuge in a country not of their origin. (J.N. sexana "Legal Status of Refugees: Indian Position" 501-515, Indian journal of International law 1986.)

**Keywords:** Rehabilitation Finance Administration, refugee, Hindukush Mountains

### Introduction:

Refugee : Generally speaking, A refugee is a person who is displaced or who has been forced to cross his national boundaries and also cannot return his home safely. The Legal Definition: "owing to well founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular group, or political opinion, is outside the country of his nationality and is unable or, owing to such fear is unwilling to avail himself of the protection of that country, or who not having a nationality and being outside the country of his former habitual residence as a result of such events, is unable or, owing to such fear, is unwilling to return to it. A. Some definitions by eminent judges and defines in the conventions:

a) A refugee is a person who has left his or her native country and is unable or unwilling to return there only because of a threat to his or her life or freedom.

b) Asylum seeker:-It is a legal term referring to a person who has applied for refugee status and not yet received a final decision on his or her claim.

c) A refugee is someone who (According to the 1951 Convention relating to the status of Refugees and its protocol 1967.)

- Is outside his or her country of origin or habitual residence;
- Has a well- founded fear of being persecuted because of his or her Race, Religion, Nationality, Membership of a particular social group ; or political opinion.
- Is unable or unwilling to avail him- or herself of the protection of that country, or to return there, because of fear of persecution; and
- Is not explicitly excluded from refugee protection or whose refugee status has not ceased because of a change of circumstances. From the above mentioned definition it is evident

that a person is not a refugee until and unless he has not fulfilled the criteria contained in this definition.

d) A regional refugee definition also including (According to the Organisation of African Unity (OAU) 1969 Convention Governing the specific Aspects of Refugee Problems in Africa)

□ Any person compelled to leave his or her country “owing to external aggression, occupation, foreign domination or events seriously disturbing public order in either part or the whole of his (or her) country of origin or nationality “.e) A refugee definition to include (According to the Cartagena Declaration, 1984)

□ Person who flee their countries “ because their lives, safety or freedom have been threatened by generalized violence, foreign aggression, internal conflicts, massive violation of human rights or other circumstances which have seriously disturb public order”.

In other words Refugee is a name given by the circumstances or by fate and the circumstances are such which are beyond that person’s control. There are some specific grounds to be recognised as a ‘Refugee’ and these grounds are fear of persecution and consideration of a number of factors which may be responsible individually or collectively.

f) Other foreigners who are not come in the definition of refugees (T. Ananthachari”,2001.)

Who are foreigners: All the persons who are not Indian citizens are ‘foreigners’ which also includes categories. But there are some categories who are different from ‘refugees’. And these categories are:-

(i) Temporary Residents, Tourists and Travellers: These are the specific Category of persons who come to India for a specific purpose and duration with the prior permission of the Government of India. In some cases persons fall in this category could become eligible for being a Refugee.

(ii) Illegal Economic migrants: Any foreigner who left his or her country of origin without any permission from the authorities. For the purpose of improving his or her economic prospects is not a Refugee. Bangladeshis who are the illegal migrants are the best examples of this category.

(iii) Criminals, Spices, infiltrators, militants (etc.): persons Falls in this category can never become eligible to be Refugee. But on the other hand they have to be dealt with many provisions of the Indian criminal laws or any other special laws.

(iv) Internally displaced persons (IDP): a person falls in this category or those persons who have not crossed any International border. But those persons who are fleeing persecution and violation of human rights from one region of the country and then take shelter/refuge in another region of the same country. For not crossing the International border they are not termed as refugees. But categorised as ‘internally displaced person’. Best example of this categories or Kashmiris in Indian origin who have been forced to flee from Jammu and Kashmir and then settled in other parts of India.

Historical Background:

□ The Declaration of Independence in 1947 resulting in the creation of India and Pakistan, caused the world’s largest uprooting and movement of population in recent history in the Indian sub-continent estimated at 15 million, nearly 8.5 million immigration from India to Pakistan and 6.5 million the other way round. (Cornellis D. jong de (1998),pp.688-99)

□ At the initial stage, 160 relief camps were organized and the total expenditure incurred on relief up to the end of 1950 was Rs. 60 crores. Various schemes were prepared for the rehabilitation of the refugees. The Government of India took necessary legislative and administrative measures to meet the situation. (Supra 5)

□ The Rehabilitation Finance Administration Act,1948 was passed in this direction. The two Governments ( India and Pakistan) entered into a special treaty on April 8, 1950,

regulating the flow of refugees and evolving modalities for settlement of claims of refugees over property, and payments. (Tim Dunne and Nicholas J. Wheeler, (ed) 1999)

The Chinese takeover of Tibet in 1950, India had faced another refugee influx in 1959 when Dalai Lama along with his 13,000 followers fled the country and reached India as refugees. The Government of India granted political asylum to the Dalai Lama and his followers. The institution of Dalai Lama was dealt a severe blow.

□ India faced another massive refugee influx in 1971 when 10 million people fled from the erstwhile East Pakistan, now Bangladesh and reached India as refugees.

□ India is not a party to the 1951 UN Convention on Refugees or its 1967 Protocol, nor is there any Indian law establishing asylum or refugee status. The Government of India handles refugee matters administratively, according to internal domestic and bilateral political and humanitarian considerations. UNHCR has no formal status in India and it is usually permitted to deal only with nationals from countries not bordering India. (B.S. Chimni, 2000)

The following discussion examines the general law relating to refugees focusing mainly on the status of refugees and protecting under international law. It also highlights elaborately on the legal aspects of the current refugee situations in India keeping in view the question of bindingness of international refugee law on India and its relations with India municipal law.

**Refugees and Legal Provisions:** India being a sovereign nation, has the absolute right either to grant asylum or to refuse to admit an alien. But, at the same time India, like any member of the international society, has to respect the international obligations. At least, India is bound by customary international law to provide certain minimum standards of treatment which should respect the fundamental human rights of the refugees. In spite of the fact that India faced many times in the past and is still facing acute refugee problems there is no specific legislation to deal with the problem. It has handled the issue at the political and administrative levels, with the single exception at the time of partition in 1947. The Rehabilitation Finance Administration Act was passed in the year 1948 to cope with the massive migration of people from Pakistan. The other relevant documents and legislations are:

- 1) The Constitution of India
- 2) The Foreigners Act of 1946
- 3) The Registration of Foreigners Act of 1939
- 4) Tize Extradition Act of 1962
- 5) Passport Act of 1967
- 6) Etc.

These are various constitutional and legal provisions with the refugees may be concerned under varying circumstances<sup>16</sup>:

**B. Constitutional Provisions:** There are few articles of the Indian Constitution which are equally applicable to refugees on the Indian soil in the same way as they are applicable to the Indian Citizens. (Article 14, 20 and 21 of the Indian constitution.)

1. "The state (India) shall endeavour to foster respect for international law and treaty obligations in the dealings of organized peoples with one another". (Article 51 c of the Indian constitution law.) These are mentioned in the directive principles of state policy in the part of IV of the constitution which are not enforceable in the court.

2. The constitution lays down that "Parliament has power to make any law for the whole or any part of the territory of India for implementing any treaty, agreement or convention with any other country or countries or any decision made at any international conference, association or other body". (Article 253 of the constitution of India)

3. Right to life and personal liberty, applies to all irrespective of the fact whether they are citizens of India or aliens. (Article 21 of the constitution of India)

4. The various High courts in India have liberally adopted the rules of natural justice to refugee issues, along with recognition of the United Nations High commissioner of refugees as playing an important role in the protection of refugees.

5. The Hon'ble High Court of Guwahati has in various judgements, recognised the refugee issue and permitted refugee to approach the UNHCR for determination of their refugee status, while staying the deportation orders issued by the district court or the administration.

6. Case laws:

a) Gurunathan and others Vs. Government of India and others (WP No.S6708 and 7916 of 1992) and in A.C. Mohd. Siddique Vs. Government of India and others ( 9 9 8 (47)DRJ(DB)p.74.) in both cases, the High court of Madras expressed its unwillingness to let any sri Lankan refugees to be forced to return to Sri Lankan against their will.

b) In P.Nedumaran Vs. Union of India(This case is pending before the National Human right Commission of India,13 August 1997.18 ), before the Madras court Sri Lankan refugees had prayed for a writ of mandamus directing the union of india and the state of Tamil Nadu to permit UNHCR officials to check the voluntariness of the refugees in going to back to Sri Lankan, and to permit those refugees who did not want to return to continue to stay in the camps in India. The Hon'ble court was pleased to hold that since the UNHCR was involved in ascertaining the voluntariness of the refugees return to sri Lankan, hence being a world Agency, it is not for the court to consider whether the consent is voluntary or not. Further, the court acknowledge the competence and impartiality of the representatives of UNHCR.

c) The Bombay High Court in the matter of Syed Ata Mohammadi Vs. Union of India(Criminal writ petition no.7504/1994 at the Bombay High Court.) was pleased to direct that "there is no question of deporting the Iranian refugee to Iran, since he has been recognised as a refugee by the UNHCR". The Hon'ble court further permitted the refugee to travel to whichever country he desired. Such an order is in line with the internationally accepted principles of 'non-refoulement' of refugees to their country of origin.

d) The Supreme court of India has in a number of cases stayed deportation of refugees such as Maiwand's trust of Afghan Human Freedom Vs. State of Punjab(Crl.WP No.125 &126 of 1986) and in the case N.D .Pancholi Vs. State of Punjab & ors(WP civil no.1294 of 1987,unreported) & Malavika karlekar Vs. Union of India(Crl.WP no.243 of 1988) the supreme court directed to stay of deportation of the Andaman Island Burmese refugees, since "their claim for refugee status was pending determination and a prima facie case is made out for grant of refugee status." The Supreme court judgement in the Chakma refugee case clearly declared that no one shall be deprived of his or her life or liberty without the due process of law. And other case –State of Arunachal Pardesh Vs. Khudiram Chakma( 1 9 9 4 supp.(1) SCC615) and Luis De Raedt Vs. Union of India ( 1991) 3 SCC544) had also stressed the same point.

Treatment of Persons Granted Asylum in India: This may be discussed under these heads:

- (a) National treatment
- (b) Treatment that is accorded to foreigners
- (c) Special Treatment
- (a) National Treatment(B.S. Chimni}1994):

1. Equal Protection of Law: Article 14 of the Indian Constitution guarantees the right that state shall not deny to any person equality before the law or the equal protection of the law within the territory of India. This right is available to all persons including non-citizens. So, as per the provision of this Article, State would not discriminate a refugee against other refugees of same class regarding any benefits or rights they enjoy by virtue of their refugee status.

2. Religion Freedom: Article 25 of the Indian Constitution provides that subject to public order, morality and health and to the other provisions of the constitution, all persons are

equally entitled to freedom of conscience and the right freely to profess, practice and propagate religion.

3. Right to Liberty, etc.:- Article 21 of the Indian constitution guarantees the right to life and personal liberty of all persons. A person is further guaranteed protection against arbitrary arrest and detention and free access to the courts. That the right to life, personal liberty and free access to the courts (under article 21 and 22 ) have been extended to every person irrespective of the fact whether the person concerned is an alien, refugee or a citizen of India. His free access to the courts is assured under articles 32 and 226 of the Constitution equality and protection of law, right to practice his own religion, the right to life and personal liberty. So as desired in Art.16 of the 1951 Refugee Convention, a refugee has free access to the courts of law in India as permitted under the Constitution.

4. Right to Social Security: Regarding right to Social Security, there is no special provision on social security in any Indian legislation, but non-citizens in India enjoy social security- equally with citizens.

5. Educational Rights: India has been providing free primary education to all recognised refugees, although there is no legal guarantee for the enjoyment of that facility as a matter of right. As for higher education, only Tibetan refugees enjoy that privilege.

(b) Treatment that is accorded to Foreigners (J. Garvey ,1985):

1. Right to employment or profession: Among the main rights of concern to the refugee is that of free access to employment, which in practice means the right to an independent existence. In the case of wage earning employment, Article 17 of the 1951 Convention provides that the contracting state shall accord to refugees lawfully staying in their territory the most favourable treatment accorded to aliens. Article 17 further invites contracting states to give sympathetic consideration to assimilating the rights of all refugees with regard to wage – earning employment to those of nationals. The provisions of Articles 18 and 19 concerning self employment and the liberty of profession do not go so far.

2. Freedom of movement and residence: Article 26 of the 1951 convention proclaims the right of refugees to choose their place of residence and to move freely within the territory of the country concerned. (J.L.Goldenziel 2013.) In India this freedom of movement and residence is available to all refugees, subject to the restrictions necessary for the safety of India or its international relations. The refugees who could afford to live on their own are allowed to live wherever they want and they are given freedom to move within India subject to conditions such as national security or public order.( Supra no.8) In case of large number of refugees such as Chakmas in Tripura and Sri Lankan Tamils in Tamil Nadu, their right to freedom of movement and residence is hampered by the fact that they are totally dependent on the Government. They are therefore, confined to camps. When they need to go out from the camps they need to take permission of the camp authorities. (G. Ghosh,1998.)

3. Right To Housing: The requirement of Art.21 of the 1951 Refugee Convention in connection with housing is fulfilled and while the refugees are free to live in refugee camps, there is no rule to prohibit them from residing in private houses if they can afford. Many Afghan and Sri Lankan refugees are residing in private houses in Delhi and Madras respectively.( Supra no.25)

4. Right To Form Association: Article 15 of the 1951 Convention Relating to the status of Refugees lays down that as regards non-political and non-profit making associations and trade union the contracting states shall accord to refugees lawfully staying in their territory the most favourable treatment accorded to nationals of a foreign country(Supra no.24). In India, like foreigners, refugees too enjoy the right to form peaceful associations. Burmese and Chakma refugee communities have formed student and welfare refugee associations.

5. Right To Property: Article 13 of the 1951 Convention states that the contracting states shall accord to a refugee treatment as favourable as possible and in any event, not less

favourable than that accorded to aliens generally in the same circumstances, as regards the acquisition of movable and immovable property and other rights pertaining thereto and to leases and other contracts relating to movable and immovable property.

However, in India this right has not been accorded to the refugees. Even after three decades of their rehabilitation, Tibetans do not enjoy any property rights over the agricultural land and houses which they were allowed to use on lease.

#### **Special Treatment:**

##### **1. Exemption from Penalties (J.C. Hathway 1991.): Art.3**

(1) of the 1951 Refugee Convention provides that “the contracting state shall not impose penalties, on account of their illegal entry or presence on refugees who coming directly from a territory. Where their life or freedom was threatened...enter or are present in their territory without authorization, provided they present themselves without delay to the authorities and show good cause for their illegal entry or presence. This is one area where India is very apathetic towards refugees. Under Section 14 of the Foreigners Act, 1946 a foreigner is liable to the punishment with imprisonment for a term which may extend to five years and is also liable to fine. Due to lack of a procedure for considering asylum claims, all individual asylum-seekers who entered illegally or stayed in India without authorization were persecuted and punished under this section. However, in case of large-scale influx, India has always acted according to the principle laid down in the Refugee Convention and has not imposed penalties on the refugees.

2. Identity And Travel Documents: Since refugees do not enjoy the protecting of the government of their country of origin, they cannot claim a national passport. Only the authorities of the country of residence can make good this deficiency by issuing them a suitable travel documents. Since, however, this document is of no value unless it is recognised internationally, each of the agreements concluded after the First World War to assist various group of refugees make explicit reference to it. The 1951 Convention was no exception to this rule. Article 28 of the Convention provided that: “The Contracting States shall issue to refugees lawfully staying in their territory travel documents for the purpose of travel outside their territory unless compelling reason of national security or public order otherwise require (Supra no.29)”. In India, all refugees who are recognised so were given identification certificates showing their refugee status. But, as regards travel documents, no refugee has so far had a privilege of getting travel documents except Tibetan refugees. Tibetan refugees can even travel to foreign countries and come back to India on the basis of the such identification paper.

#### **Conclusion:**

Lastly, I want to discuss that India for the first time established its former relationship with the United Nations high Commissioner for refugees in 1969 and for rehabilitating Tibetan refugees in India. When the high commissioner visited India in July 1963, India expressed its interest in receiving assistance from the office of the United Nations high Commissioner for refugees for Tibetan refugees.

UNHCR made available some funds from the proceedings of the sale of “All Star Festival” record. Since a pre-requisite for such assistance was the proper supervision of UNHCR funds and careful coordination of international efforts, Indian government agreed that the presence of an on-the-spot UNHCR representative was desirable. A branch office of UNHCR was officially opened in Delhi on February 1, 1969. In-corporation with India UNHCR undertook new projects and consolidated old ones in the fields of agriculture settlement, housing for the aged lamas, and medical facilities. Thus a close working relationship between UNHCR and India was established by the time India government involved in providing emergency relief to Bangladesh refugees

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THE STIMULUS-ORGANISM-RESPONSE (SOR) FRAMEWORK  
FOR COSMETICS BRAND MANAGEMENT AS SUGGESTED  
BY CONSUMER BRAND PERCEPTIONS STIMULATED  
BY LOGISTICS-MARKETING MIX ANTECEDENTS: IMPLICATIONS  
FOR NEW START-UP LANADENE<sup>3</sup>

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**Abstract:**

The purpose of this paper is to investigate how brand perceptions formation by means of brand image and brand trust can be developed through a holistic integration of logistics-marketing variables, which includes factors such as living compound of place, and strategic location, choice and accessibility of place, in impacting positively on consumer loyalty. There are some important contributions illuminated in this research. The consumers who have obtained some levels or scopes of information clarity tend to perceive positively on the logistics-marketing mix variables. This insight is generally not addressed in the available literature. The overall conceptual integration can be structured in a structural equation model known as stimulus-organism-response (SOR) model. The SOR structure fits into the strategic intention of branding by embedding important stimulus-response capabilities and initiatives that could be used to drive repetitive purchases. Theoretical and some practical scopes of implications are discussed.

**Keywords:** Cosmetics, Brand, Stimulus-Organism-Response, Lanadene, Marketing Mix.

**Introduction:**

Cosmetic business is one of the record-breaking profitable industry for most of the manufacturers in the world where majority of population are actively consuming millions of cosmetic products every year. These days, attractiveness of a person solely depends on cosmetic and it is becoming a tendency for most people to use cosmetic in their daily life regardless of genders. Thailand's cosmetic industry is standing as a good demonstration on the diversity of consumer's various choice including foreign imported and national products (Phupoksakul 2006). Beauty is the great concern for the women especially for the Thai people who believe that beautiful proportional facial structure could attract the complimented admirers in both men and women. The trend has been going on for many decades that people cannot stay without cosmetics just to look presentable in the society. Having said that, there has been numerous cosmetic products available every nook and corner of the world.

When customers have ample of products at their wish, this can be tricky when the businesses dealing with same or identical products retain their customers. The buyer's decision makes great influence in their selection of the products. There are wide range in customer decision making processes in cosmetic purchasing behavior that the start-up stage cosmetic businesses should have with the strategic marketing plan. Not only should the diversity in customer's decision-making process, the companies must have strategic planning along with the logistic strategy of "Place" as well.

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An example of a start-up is LANADENE. LANADENE is the cosmetic product of School of Cosmetic Science of Mae Fah Luang University, located in Northern most of Thailand. The “LANADENE” cosmetic product is developed by the researchers with specialized knowledge and skills with no hazardous substances used in the products. The extract is mainly from nature with the formula of the researchers who have experimented and tested to ensure efficiency and safety of the users. Since the Lanadene products are in the development stage with limitation and obstacles, such as marketing tools, rules and regulation that could not properly create the strong brand perception to customer decision making processes. LANADENE would be one of the variables considered in this research, and as LANADENE is both a result of the research incubation works of Mae Fah Luang University (MFU), and the brands are mostly sold in MFU campus, the sampling would be focused on the population in the MFU campus. In this way, the comparative context would be meaningful to the management teams of LANADENE. Specifically, the following research objective is raised for this paper:

The purpose of this paper is to investigate how brand perceptions formation by means of brand image and brand trust can be developed through a holistic integration of logistics-marketing variables, which includes factors such as living compound of place, and strategic location, choice and accessibility of place, in impacting positively on consumer loyalty. A particular implication would be drawn to suggest for LANADENE brand for a more holistic management of its brand.

### **Literature Review:**

The literature review will discuss the underlying theoretical perspectives that support the stated hypotheses, and in particular, the stimulus-organism-responses theory of combined consumer behaviors and brand management (cf. Tan, 2017; Tan, 2018a, 2018b; and Tan, 2019) would lead the way. This section will also illustrate the logistics-marketing mix constructs which influence brand perceptions of consumers consuming cosmetics products.

**Logistics-Marketing Mix Constructs:** Many organizations still face the challenges in measuring marketing effectiveness, which leads them to resolve to a compromising premise that an imperfect measure is better than none (Brooks and Sim, 2012). Part of the reasons, for instance, according to Wise and Sirohi (2005), is that companies “lack enough hard data on what marketing stimuli work best in which circumstances and with which customers” (p. 10). Marketing mix concept has often been centralized in terms of Ps, such as the 7Ps (Ivy, 2008), namely product, place, promotion, price, physical evidence and people or process. Nevertheless, if skillfully implemented many alternative Ps can be absorbed into the traditional marketing mix of product, place, promotion and price, for instance, promotion can exploit the people concept, as “Salespersons of the brand I usually purchased are enthusiastic in explaining the products.” Marketing mix is also strategically and conceptually rooted with tight connection in logistics through Logistics Avenue in terms of place. The exploratory factor analysis of place in this research identifies two important logistics parameters, namely the living compound of place and the strategic location, choice and availability of place. In other words, the marketing organizations should consider a holistic marketing place that embraces the different logistical dimensions of place in the marketing mix initiatives, for instance, the strategic location decision of place is an important factor.

As information and Internet technologies are getting more sophisticated, the various marketing initiatives-logistics variables should be seamlessly integrated. For instance, in a recent Forbes Insight (2019)’s report, it was quoted that “In the old ways, we would mass market a message on three television networks and reach everybody... But today isn’t the case. Everything is so much more tailored to people’s tastes and behaviors”. Judged on these arguments and the pace of today’s Internet technology advancement, location-based or place-

based marketing becomes real-time, and the initiatives are often promotions customized to locations.

While taking a holistic approach, marketers should attempt to maximize their creativity capacities to the fullest as creative approach to marketing mix can leverage its effectiveness to a much higher level. For instance, in Kim, Choe and Petrick (2018), they study and find that a celebrity inclusion in the promotion avenue can induce the visitors to a destination to form positive and desirable destination brand images and thus loyalty.

Brand Image and Brand Trust as Organism for Closure of SOR Framework: In finding the best marketing mix strategies, Wise and Sirohi (2005) suggest that organizations should keep both brand and revenues in mind. Translating into the context of consumer behaviors and brand management, organizations should integrate brand perceptions (organism) and brand loyalty (that reflects revenue-earning potential) with marketing mix strategies (Tan, 2017; Tan, Sitikarn and Anomasiri, 2018), which leads to suggesting a stimulus-organism-response (SOR) framework (Tan, 2018a; 2018b; Tan and Patthracholakorn, 2018). The SOR thus should present the strategic factors of success (Kreutzer, 1988) for cosmetics brand management that integrates concepts of consumer behaviors through logistics marketing mix antecedents. Branding is an important part of product marketing (Vignali and Davies, 1994), and to sustain the brand development, Arshan and Altuna (2010) show that product brand image consideration is important.

When the brand image formation variables such as marketing mix are out of tune with the core theme of brand, it can lead to customer defecting from the loyal bases (Hogg, Cox and Keeling, 2000). The inclusion of brand image as an important mediating organism in the SOR model is important, as it is often reckoned as “a process of symbolizing the experience of objects stored in human’s association memory, tends to be a significant representation of the significance of consumption and include characteristics of self-expression (Song, Wang, and Han, 2019, p. 511; citing Paivio, 1969, and Lau and Phau, 2007). Being a significant part of consumption, brand image is thus highly related to brand trust in terms of how consumers categorize the brands as parts of the self (Escalas and Bettman, 2003; Gaustad, Samuelson, Warlop, and Fitzgimons, 2019), eventually leading to positive responses in terms of brand loyalty (Song et al. 2019).

S-O-R model, Stimulus-Organism-Response model, proposed in 1974 by Mehrabian and Russell. They stated that environmental stimulus affects the reactions and individual’s cognitive and it turn leading to some behavior (Mehrabian & Russel 1974). The external environmental condition and factors are affecting the inner state of perception, feelings and thinking exercise called organisms (Bagozzi, 1986) and actuate the execution of additive conduct. The previous researches considered as the positive and negative effects in order to make their final choice and the response as the behavior accordingly. (Mehrabian & Russell, 1974). In this study, Environmental Stimulus, Marketing Mix-Logistic variables are affecting to the inner stage of Organism “Brand Image and Brand Trust”. These inner perception and feelings or thinking create and occurs the response as “Brand Loyalty”.

In view of the above arguments, the following conceptual model is developed, as shown in Figure 1, together with the hypotheses.

### **Hypotheses:**

H1: Marketing mix-logistics variables, in terms of needs recognition and information searching, product, place, promotion and price variables, can significantly predict brand image.

H2: Brand image can significantly predict brand trust.

H3: Brand image and brand trust can significantly predict brand loyalty.

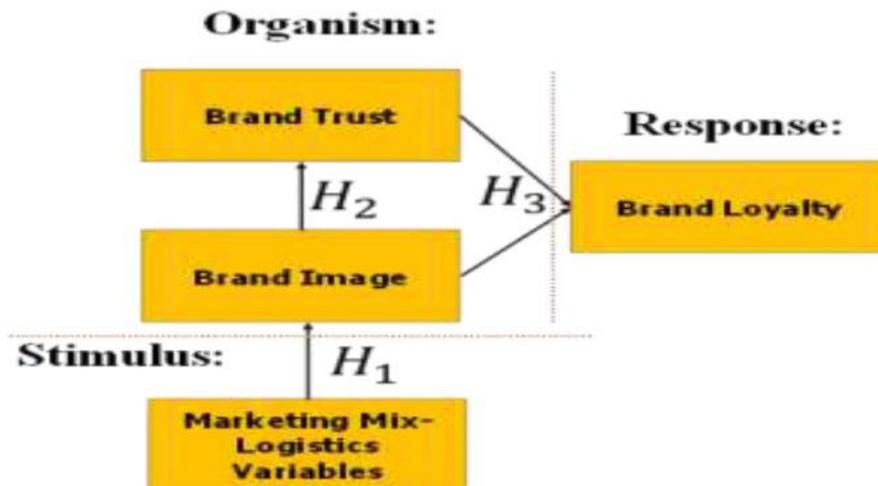


Figure 1: The Stimulus-Organism-Response (SOR) Conceptual Model for Cosmetics Brand Study

### Methodology:

This research attempts to study the antecedent factors influencing brand perceptions of consumers in the use of cosmetics products, and the consequence in terms of brand loyalty. The researchers acknowledge that these phenomena can be examined objectively in search for single-, structural truth revealed by statistical analysis. Thus, a positivism paradigm is adapted, which exploits questionnaire-based survey method in data collection. The data were collected based on conveniencebased sampling criterion, by means of distributing the survey online, and requesting the response online.

The sampling population is targeted based on an attempt to study the implication for the new start-up of Lanadene brand, such as to what extent Lanadene brand is used and the comparative perception with other brands. Thus, the sampling is focused on the Mae Fah Luang University's campus. A four-part questionnaire for the study was developed along with the demographics by the researchers in order to measure the research variables. In the questionnaires, six of the items were designed to examine brand image according to the theory of Kirmani and Ziethaml 1993, etc.; four of the items were designed to brand loyalty according to the adaptation of five level of brand equity from Moiescu. O. 2006, etc; three of the items were developed to Brand trust according to the perceptive on brand loyalty of He, Li and Harris 2012, etc.; and twenty-five items were included to the traditional marketing mix 4Ps (Product, Price, Place and Promotion) by Lambert, D. M., and Harrington, T. C. 1989, etc.

### Result:

The results are presented in numerous sections. First, the sampling profile is discussed, followed on the second, by the research quality assessments on both the reliability and validities. Correlations and structural equation modeling (SEM) analyses provide the inferential analyses. Sampling Profile: The majority of the survey participants are female, at 62.7 per cents; also 54.9 per cents in age group 20-less than 25, and 60.8 per cents as students, and 58 per cents as residents of Chiang Rai, purchasing from the shops at 80.4 per cents, and 86.3 per con habitual purchase of international cosmetics brands at 86.3 per cents.

### Measurement Quality Assessments:

The measurement quality assessments are evidenced by the reliability index and the different aspects of validity, in terms of construct validity, content validity, convergent validity and discriminant validity. These evidences are shown in the quality assessment tables below.

Reliability index is indicated by Cronbach Alpha exceeding 0.80 the highly reliable threshold (Tan, 2019). The construct validity and the content validity are reflected in the questionnaire items shown in the tables below, under the guidance of the construct definition and the topicality context of the research. Pilot assessments were also carried by the researchers by testing with the actual consumers of cosmetics products, the researcher with reasonable competencies in research methodologies and the cosmetics sales and manufacturing organization. To obtain statistical evidences, both convergent validity and discriminant validity were shown in the tables below.

In particular, the convergent validity is established by the total variance explained (TVE) in exceeding 0.50, the factor loading of the items over 0.70 (those below 0.70 were deleted and thus were not included in further statistical analyses), and reliability index over 0.80 (Tan, 2019). The discriminant validity is established also by the square root of TVE exceeding the cross-correlation coefficients (Tan, 2019).

Table 1: Measurement Quality Assessment for Needs Recognition and Information Search

| Needs recognition and information search:  | Factor Loading |   |
|--|----------------|---|
| Before I buy the product, first thing is look for the product information.   | 0.822          | Reliability = 0.810 (Cronbach Alpha)  |
| Before I buy the product, I look for the usage and benefit of the product.   | 0.737          | KMO of sampling adequacy = 0.800  |
| Before buying the product, I check the price of the product.   | 0.734          | Bartlett's test of sphericity:<br>Approx. Chi-Square = 162.572, df = 10, sig. = 0.000 |
| I check the availability of the product before buying the product.   | 0.732          |   |
| I check the promotional sales of the product.  | 0.725          | TVE = total variance explained = 0.5746   |
| I compare the price before purchasing the product. (deleted due to < 0.7 on factor loading)  | 0.656          | Square (TVE) = 0.758  |
| I usually investigate the review of the product on social media such as in website or blog. (deleted due to < 0.7 on factor loading) | 0.479          |   |

Table 2: Measurement Quality Assessment for Product

| Product   | Factor Loading |  |
|---|----------------|--|
| The brand I usually purchased is the high-quality product.                                    | 0.696          | Reliability = 0.869(Cronbach Alpha)  |
| The brand I usually purchased has wide varieties of cosmetic products for different purposes. | 0.705          | KMO of sampling adequacy = 0.872   |
| The brand I usually purchased describes the content of ingredients properly.                  | 0.768          | Bartlett's test of sphericity:<br>Approx. Chi-Square = 266.318 df = 15, sig. = 0.000 |
| The brand I usually purchased properly describes the direction of the product usage.          | 0.845          | TVE = total variance explained = 0.60989   |
| The brand I usually purchased is well known in the region I live.                             | 0.728          |  |
| The brand I usually purchased is reliable.  | 0.671          | Square (TVE) = 0.7809  |
| The packaging of brand I usually purchased is attractive.                                     | 0.710          |  |
| The packaging of brand I usually purchased is attractive.                                     | 0.770          |  |

Table 3: Measurement Quality Assessment for Price

| Price:   | Factor Loading |   |
|--|----------------|---|
| Price of the brand I usually purchased is reasonable   | 0.743          | Reliability = 0.862 (Cronbach Alpha)  |
| Price of the brand I usually purchased is quite obviously different from other cosmetics brands in the market that I know. | 0.714          | KMO of sampling adequacy = 0.886  |
| The brand I usually purchased offers competitive prices.   | 0.808          | Bartlett's test of sphericity:<br>Approx. Chi-Square = 234.4, df = 15, sig. = 0.000 |
| Price of the brand I usually purchased is definitely a value-for-money.  | 0.818          | TVE = total variance explained = 0.59342  |
| The brand I usually purchased offers attractive pricing.   | 0.781          | Square (TVE) = 0.7703   |
| The pricing of the brand I usually purchased give me no hesitation to make decision on its purchased.                      | 0.756          |   |

Table 4: Measurement Quality Assessment for the Living Compound of Place (Result of Exploratory Factor Analysis)

| Living compound of Place:  | Factor Loading |   |
|--|----------------|---|
| The brand I usually purchased can be seen anywhere within area where I live.             | 0.939          | Reliability = 0.863 (Cronbach Alpha)<br>KMO of sampling adequacy = 0.50   |
| The brand I usually purchased can be seen anywhere even outside of the area that I live. | 0.939          | Bartlett's test of sphericity:<br>Approx. Chi-Square = 84.991, df = 1, sig. = 0.000<br>TVE = total variance explained = 0.88137<br>Square (TVE) = 0.938 |

Table 5: Measurement Quality Assessment for the Strategic Location, Choice and Accessibility of Place (Result of Exploratory Factor Analysis)

| Strategic Location, Choice and Accessibility of Place:   | Factor Loading |  |
|--|----------------|--|
| The outlets of the brand I usually purchased are easily accessible.                                | 0.849          | Reliability = 0.833 (Cronbach Alpha)   |
| The brand I usually purchased are easily available most of the time I visit the shop.              | 0.844          | KMO of sampling adequacy = 0.805   |
| The outlets of the brand I usually purchased are situated in strategic locations i.e. supermarket. | 0.824          | Bartlett's test of sphericity:<br>Approx. Chi-Square = 151.938, df = 6, sig. = 0.000 |
| The brand I usually purchased has abundant choices displayed in the shop.                          | 0.755          | TVE = total variance explained = 0.67049<br>Square (TVE) = 0.8188                    |

Table 6: Measurement Quality Assessment for Promotion

| Promotion:  | Factor Loading |  |
|---|----------------|--|
| The brand I usually purchased has many promotions to create or induce my interest.        | 0.778          | Reliability = 0.851(Cronbach Alpha)  |
| Promotion of the brand I usually purchased creates more awareness of the products.        | 0.842          | KMO of sampling adequacy = 0.835   |
| The brand I usually purchased often have attractive special promotion.                    | 0.822          | Bartlett's test of sphericity:<br>Approx. Chi-Square = 205.816, df = 10,<br>sig. = 0.000 |
| Salesperson of the brand I usually purchased are enthusiastic in explaining the products. | 0.736          |  |
| The advertisement of the brand I usually purchased always catches my attention.           | 0.0.785        | TVE = total variance explained = 0.62953<br>Square (TVE) = 0.793                         |

Table 7: Measurement Quality Assessment for Brand Trust

| Brand Trust:  | Factor Loading |   |
|---|----------------|---|
| I trust the brand that I usually purchased because it is made by professional institution.                          | 0.882          | Reliability = 0.883 (Cronbach Alpha)  |
| I trust the brand that I usually purchased because it has the strict quality control and appropriate certification. | 0.9192         | KMO of sampling adequacy = 0.736  |
| I trust the brand that I usually purchase because products meet my cosmetic needs.                                  | 0.8993         | Bartlett's test of sphericity:<br>Approx. Chi-Square = 162.664, df = 3,<br>sig. = 0.000 |
|   |                | TVE = total variance explained = 0.81022<br>Square (TVE) = 0.9001                       |

Table 8: Measurement Quality Assessment for Brand Loyalty

| Brand Loyalty:  | Factor Loading |   |
|---|----------------|---|
| I often stick to the brand I usually purchased if no other brands can match in various aspects such as product quality, pricing or promotion. | 0.748          | Reliability = 0.786 (Cronbach Alpha)  |
| I always keep speaking good terms of the brand that I usually purchased.  | 0.778          | KMO of sampling adequacy = 0.787  |
| The brand that I usually purchased is always my first choice in cosmetic products.  | 0.791          | Bartlett's test of sphericity:<br>Approx. Chi-Square = 105.273, df = 6, sig.<br>= 0.000 |
| Even if the price of the brand that I usually purchased may fluctuate in price, I would not intend to switch to the other brands.             | 0.807          | TVE = total variance explained = 0.61034<br>Square (TVE) = 0.781                        |

Table 9: Measurement Quality Assessment for Brand Image

| Brand Image:  | Factor Loading |  |
|---|----------------|--|
| The cosmetic brand that I usually purchased gives me the better self-image.   | 0.898          | Reliability = 0.937 (Cronbach Alpha)   |
| The cosmetic brand that I usually purchased supports my confidence in public.   | 0.857          | KMO of sampling adequacy = 0.910   |
| The cosmetic brand that I usually purchased matches my personality.   | 0.877          | Bartlett's test of sphericity:<br>Approx. Chi-Square = 493.123, df = 15,<br>sig. = 0.000 |
| The cosmetic brand that I usually purchased gives me the positive outlook in the public.  | 0.920          |  |
| The cosmetic brand that I usually purchased matches the aesthetic look of my job lifestyles.  | 0.843          | TVE = total variance explained = 0.76512   |
| The cosmetic brand that I usually purchased ensures my skin are beautifully taken care, leading to positive acceptance in the public. | 0.851          | Square (TVE) = 0.874   |

After the quality assessments of the survey instrument, correlations and structural equation analyses were conducted. The correlations analysis shows that there are positive relationships for the actions taken in needs recognition and information searching, and the various logistics-marketing mix variables.

Thus, indirectly or directly, the consumers who have obtained some levels or scopes of information clarity tend to perceive positively on the logistics-marketing mix variables. This insight is generally not addressed and not discussed in the extant literature, and thus is an important contribution.

Hypotheses validation: Hypotheses H1, H2 and H3 are shown supported by means of structural equation modeling (SEM) analysis. Figure 2 depicts the analyzed structure, which illuminates the significant relationships among the constructs. The right-hand-corner digit explains the percentages of the variance explained for the construct, as a result of the predictors with arrows pointing towards it. For instance, brand trust can be explained at 50% of its variance by brand image, price and promotion, with standard regression coefficients at 0.50, 0.21 and 0.16, respectively. For brand loyalty, 65 percentages of its variance can be explained by brand trust (beta = 0.42), brand image (beta = 0.20), product (beta = 0.15) and promotion (beta = 0.24). As to brand image, its 28 percentage of variance can be explained by predominantly promotion (beta = 0.28) and product (beta = 0.33). Clearly, brand image and brand trust are the two important mediators between marketing mix, especially product and promotion, and brand loyalty, which signifies that brand perceptions of consumers, in terms of image and trust, are vital.

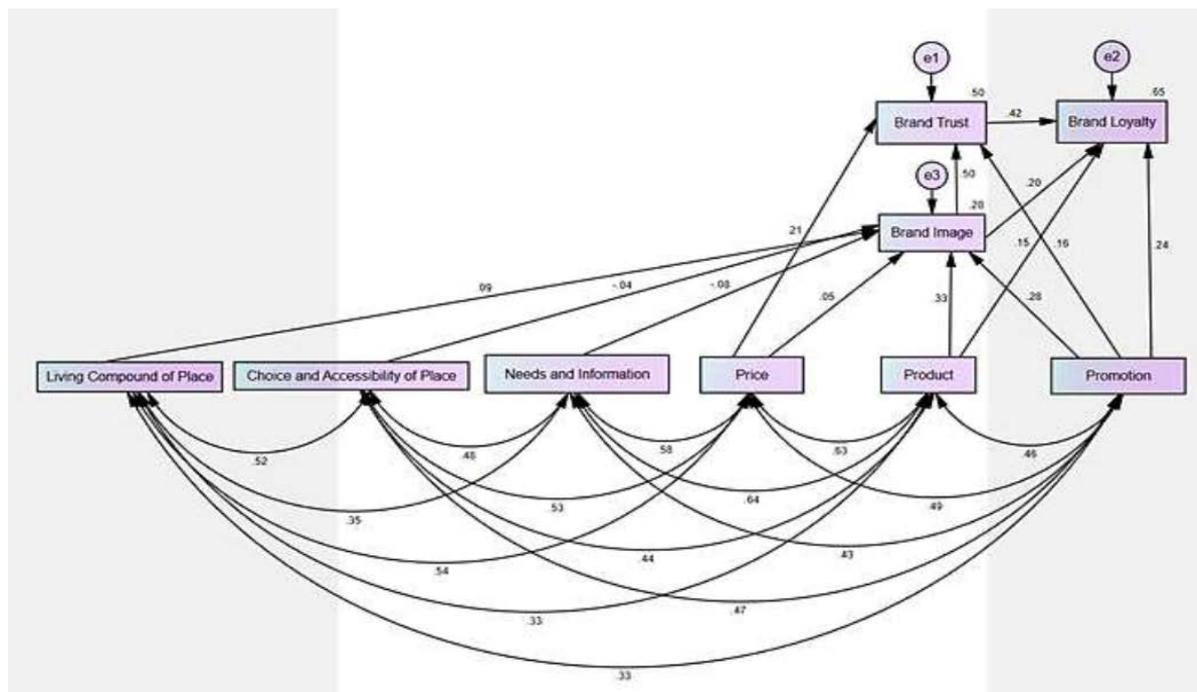


Figure 2: Structural Equation Model of Lanadene Cosmetics Brand Perceptions

The structural equation model (SEM) statistics show an absolute model fit: evidenced with  $p$  not significant at 0.440, and CMIN/DF below the upper threshold of 5 (Tan and Anomasiri, 2017; Tan, 2019) and RMSEA (root mean square error of approximation) at 0.000. The incremental fits are also evidenced by NFI (normed fit index) at 0.983, CFI (comparative fit index) at 1.00, and other indexes near 1.0 (Tan and Anomasiri, 2017; Tan, 2019).

### Comparative Study:

The following table summarizes the results of either T-test and ANOVA tests of the control variables. The color-coded highlights indicate the significance of differences. Lanadene is MFU (Mae Fah Luang University) brand, which scores the lowest across all the constructs studied, especially in product and logistical distribution. In the career domains, there are no significant differences between the student and the working categories, except the “otherwise” category without any specific clarification, and thus, the researchers have no idea what the “otherwise” means. The “otherwise”, nevertheless, scores the lowest in the career control variable. Also, the residents of Chiang Rai perceive at higher level in the availability in the living compound of place – namely the products can generally be seen whether within or outside the area where the respondents live. In terms of age, those of age 40 or above score the lowest of all the constructs studied.

Table 10: The results of T-test and ANOVA tests

|                      |                 | Needs and Information | Product | Price | Living Compound of Place | Strategic Location, Choice and Accessibility of Place | Promotion | Brand Trust | Brand Loyalty | Brand Image |
|----------------------|-----------------|-----------------------|---------|-------|--------------------------|---|-----------|-------------|---------------|-------------|
| Lanadene             | Lanadene        | 3.54                  | 3.24    | 3.37  | 3.23                     | 3.16  | 3.57      | 3.63        | 3.78          | 3.45        |
|                      | Otherwise       | 3.95                  | 3.71    | 3.57  | 3.41                     | 3.59  | 3.46      | 3.88        | 4.00          | 3.71        |
| Brand Country Origin | National        | 3.61                  | 3.42    | 3.40  | 3.25                     | 3.51  | 3.52      | 3.71        | 3.78          | 3.55        |
|                      | International   | 3.92                  | 3.67    | 3.56  | 3.40                     | 3.52  | 3.47      | 3.86        | 3.99          | 3.69        |
| Purchase Channel     | Online          | 3.98                  | 3.61    | 3.71  | 3.07                     | 3.43  | 3.69      | 3.92        | 4.00          | 3.67        |
|                      | Shop            | 3.86                  | 3.64    | 3.50  | 3.45                     | 3.54  | 3.43      | 3.82        | 3.96          | 3.67        |
| Gender               | Female          | 4.07                  | 3.75    | 3.60  | 3.40                     | 3.48  | 3.55      | 3.95        | 4.06          | 3.66        |
|                      | Male            | 3.54                  | 3.41    | 3.44  | 3.32                     | 3.58  | 3.35      | 3.64        | 3.801         | 3.68        |
| Resident             | Chiang Rai      | 3.81                  | 3.68    | 3.56  | 3.40                     | 3.47  | 3.51      | 3.94        | 3.95          | 3.62        |
|                      | Not CRai        | 3.97                  | 3.72    | 3.37  | 2.55                     | 3.31  | 3.04      | 4.00        | 4.25          | 3.97        |
|                      | Otherwise       | 4.00                  | 3.55    | 3.56  | 3.54                     | 3.71  | 3.57      | 3.67        | 3.94          | 3.68        |
| Career               | Student         | 3.90                  | 3.72    | 3.64  | 3.52                     | 3.56  | 3.54      | 3.98        | 4.03          | 3.71        |
|                      | Working         | 4.01                  | 3.68    | 3.51  | 3.33                     | 3.46  | 3.57      | 3.84        | 4.11          | 3.833       |
|                      | Otherwise       | 3.38                  | 2.93    | 2.96  | 2.65                     | 3.42  | 2.82      | 3.00        | 3.13          | 2.95        |
| Age                  | 16-Less than 20 | 4.16                  | 4.06    | 3.74  | 3.45                     | 3.77  | 3.45      | 4.03        | 4.12          | 3.84        |
|                      | 20-Less than 25 | 3.88                  | 3.68    | 3.59  | 3.38                     | 3.46  | 3.56      | 3.94        | 4.05          | 3.73        |
|                      | 25-Less than 30 | 3.98                  | 3.62    | 3.58  | 3.44                     | 3.48  | 3.31      | 3.96        | 3.92          | 3.61        |
|                      | 30-Less than 40 | 3.77                  | 3.59    | 3.52  | 3.85                     | 3.60  | 3.54      | 3.40        | 3.71          | 3.75        |
|                      | 40 or Above     | 3.49                  | 2.98    | 2.98  | 2.85                     | 3.57  | 3.28      | 3.18        | 3.53          | 3.20        |

## Discussion:

The structural equation model illuminates a stimulus-organism-response (SOR) structure, which integrates some of the logistics-marketing mix variables as the antecedent roles in influencing the organism perceptions of consumers. The SOR structure fits into the strategic intention of branding, which embeds in it an important stimulus-response capability that drives the consumers to repeat purchases (Hull, 1943; Tan, 2018a;b). Two important organism constructs are brand trust and brand image, and they are hierarchical in nature. The logistics-marketing mix variables involve the need for the cosmetics organizations to consider the role of information, which is key logistical variables, and in particular, the logistical information relating to utility of cosmetics products, product information, the availability and promotional issues should be operationally focused upon. The similar SOR structure was also identified in Kamkayan and Tan (2015) by using the concept of marketing 3.0, in terms of brand identity, brand integrity and brand image. Nevertheless, this research extends the works of Kamkayan and Tan (2015) and includes, specifically, brand self-image theory or identity-congruence (Tan, Sitikarn and Anomasiri, 2018; Tan and Sitikarn, 2018), which supports the confidence level of consumers, a feeling of positive outlook in the public and feeling of appropriate matches in areas of, for instance, the aesthetic look of job lifestyles and personality.

The brand image, being explained by logistics-marketing mix variables, highlights that brand image is a result of a network of information being kept in consumer memory about a brand that is caused by a set of associations (Loken and John, 1993). As depicted in the structural equation model, the significant associations come from product and promotion, i.e. the quality and variety of choices of products, the socially responsible actions taken by the cosmetics organizations in terms of ethical and caring labeling in explaining the content of ingredients and the direction of product usage, and packaging clarity and attractiveness.

The promotional focuses should be holistic in nature, involving the enthusiastic attitude of salesperson in explaining the products, the eye-catching attractions of the advertisement, and the overall power of promotion to promote awareness, induce interests and catch the attention of consumers. In this way, the role of marketing mix, represented as important association variables for influencing brand image (Kamkayan and Tan, 2015), can be reasoned as a result of consumers perceiving

differentiation of the cosmetics products as stimulated by marketing mix initiatives (Boulding, Lee and Staelig, 1994).

### **Conclusion:**

This research validates the effectiveness of stimulus-organism-response (SOR) model as suitable framework for brand management, and the comparative study also provides some scopes of insights to help new start-up LANADENE in further developing and improving its brand. Brand managing is important especially brand is predominantly intangible in nature (Lehmann, Keller and Farley, 2010), and as explained and illustrated in Tan (2018a, 2018b), brand management should be prioritized in three domains or levels, namely the stimulus, the organism and the response. Although LANADENE aims for a bigger role in the national market, but its new start-up is currently focus as testbed in the university campus, and also in some sales offices in Bangkok. The comparative context thus needs to be constrained within the university campus so that the management team of LANADENE can better able to make sense of it. There are numerous findings that are critically important. First of all, an effective brand management, whether for LANADENE or for more international brands, stimuli play important role, and this research highlights the interrelationships of the various logistics-marketing mix stimulus factors, but the product and promotion strategies of brand are obviously having significant weights. The logistical issues should focus on the availability, choices of products and the strategic locations where consumers can find the brands of their preferences. Secondly, the brand marketers should realize that these brand stimuli, in terms of logistics-marketing mix strategies and offers, should be consistent with the intended and formed brand perceptions of the consumers. Two important brand perceptions of consumers are brand image and brand trust. Brand image is obviously associated with the consumers' experiences with the various aspects of the stimuli, but most importantly, should also contain a strategic element that is shown by the brand capability to help the consumers form positive images in front of public and is able to help in their career presentation. The identity-induced image is also highlighted in Tan et al. (2018) and Kamkayan and Tan (2015). Thirdly, brand loyalty is shown to be directly impacted upon by both brand image and brand trust, but is also heavily influenced by the continuous promotional commitment of the brand organizations. It is also learned from this research that promotion should actively embrace and integrate the other aspects of the logistics-marketing mix, such as by use of people and Internet as seamless platform for creative promotion. Fourth, indirectly or directly, the consumers who have obtained some levels or scopes of information clarity tend to perceive positively on the logistics-marketing mix variables. This insight is generally not addressed and not discussed in the extant literature, and thus is an important contribution. Thus, it is important the brand marketers stress on information visibility and the professional presentation of it. Fifth, based upon the lower sampled proportion of consumers who are currently using LANADENE, in comparison to their other preferred brands, of majority international origins, and from the fact that promotion is a significant important determinant to brand loyalty, it is important promotion should be actively and creatively managed and implemented by the new start-up like LANADENE. Besides, promotion is a single important factor that influences positively on both brand image and brand trust. Thus, the role of promotion should actively be pursued.

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## BIOREMEDIATION OF DISTILLERY SPENT WASH (MELANOIDIN)-A NOBLE APPROACH<sup>4</sup>

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### Abstract:

Melanoidin from distillery spent wash are natural condensation products of sugar and amino acids produced by non-enzymatic Maillard amino-carbonyl reaction taking place between the amino and carbonyl groups in organic substances. From environmental aspects melanoidins are very important due to their structural complexity, dark colour and offensive odor, which pose serious threat to soil and aquatic ecosystem. This causes the problem, like reduction of sunlight penetration, decreased photosynthetic activity and dissolved oxygen concentration whereas on land, it causes reduction in soil alkalinity and inhibition of seed germination. Bioremediation is an ecofriendly technology for treating chemical spills and hazardous waste. It is considered highly desirable to exploit the biodegradation potential of soil microorganisms from polluted sites. Application of microorganisms like, *Aspergillus niger*, *Leuconostocs* sps, *Bacillus* sps, *Staphylococcus aureus* and *Pseudomonas aeruginosa* will be the cost effective biotechnology for treatment of water polluted by spent wash containing melanoidin. Experimental studies revealed that the individual organisms and their mixed consortia degraded the 75 to 80% concentrated spent wash, after the optimization of various physicochemical parameters the mixed consortia exhibited enhanced activity as compared to the individual cultures alone. The treated effluents were characterized by COD reduction, HPLC analysis.

**Keywords:** Melanoidin, *Aspergillus niger*, *Leuconostocs* sps, Consortia, Distillery Spent Wash, HPLC.

### Introduction:

Distillery spent wash is the residual liquid generated during alcohol production. It has been observed that a typical cane molasses based distillery generates 15 L of spent wash effluent per liter of ethanol produced. Around 212 distillery units in India generate more than 30 billion liters of spent wash annually [7]. The most important characteristic of spent wash is it is strongly acidic, dark brown colored hydrophilic viscous liquid waste with strong objectionable odour. Dark brown color of spent wash is mainly because of the presence of polymeric melanoidin pigments formed by the non enzymatic amino carbonyl reaction means Millard reaction [31]. Melanoidins are recalcitrant due to presence of caramel. Antioxidant natures of the pigments make them toxic to many microorganisms, including those present in waste water treatment processes. Agricultural land loses their fertility due to disposal of the spent wash directly into river. It also harms the aquatic system as its colored pigments reduce photosynthetic activity and depletes the dissolved oxygen in the water bodies. Spent wash polluted water has high biological oxygen demands, chemical oxygen demands, low pH, obnoxious smell.

To reduce the dark color, acidic PH, High BOD, high COD it is considered highly desirable to exploit the biodegradation potential of soil microorganisms from polluted sites

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microorganisms from the contaminated site. As such polluted soils can facilitate selection of biodegradative capability in microorganisms and may act as reservoir of selective communities capable of degrading pollutants.

### Materials and Methods:

**Materials: Sample Collection:** Distillery effluent was collected from different Distillery division of Odisha. The contaminated soil was collected from the site nearby the distillery unit. The soil was collected by scraping the top layer of soil and subsurface soil and packed in an air tight sterile PP bags.

**Isolation of Organism by Enrichment Technique:** As described by Kumar et.al, 1998 and some research Microorganism screening was done by enrichment the tubes showing decolorisation were subsequently sub cultured four times and isolation of microbial culture was carried out on minimal salt glucose medium by spread plate technique. The pure culture of different microbial isolates S1-S5 were maintained on minimal salt glucose agar medium containing 5% spent wash [7]

**Standard Melanodin Preparation:** Standard melanoidin which is dark brown colored was prepared in laboratory by heating 1M glucose with 0.5M of glycine at 90°C and pH-5.5 for 6 hr using hot air oven [39]. The absorption maxima for standard melanoidin were measured at 450nm by double beam Spectrophotometer (Shimadzu) and a standard dose curve was prepared. For heating at 90°C Hot air oven was used. Striking feature was that the absorption maxima of spent wash measured was also at 450nm. Hence the further degradation studies were performed at 450nm.

**Degradation Studies:** For mixed consortia loopful of pure culture of each isolate *Pseudomonas aeruginosa*, *Aspergillus niger*, *Streptococcus* sps, *Bacillus* sps and *Staphylococcus aureus* from minimal salt spent wash agar media plate was transferred in 100 ml minimal medium with 60% and spent wash in 500 ml flask and incubated at room temperature to study the degradation ability. After 10 hr interval, 5ml aliquot was withdrawn for assaying degradation. Non inoculated minimal salt medium and minimal medium with 60% and spent wash were used as a blank and control respectively [7]. Isolates showing excellent results were selected for further study. Same procedure was followed for *Aspergillus niger* and *Pseudomonas aeruginosa*. **COD and BOD Measurement:** Chemical and Biological oxygen demand of the samples before and after the treatment were determined using potassium dichromate and Winkler's method respectively [31].

**Biochemical and Morphological Studies of the Isolates:** Biochemical and microbial characterization of the isolates was done according to standard protocols [14]. Species identification was supported by VITEK 2 System at Bac-test laboratory Nasik. **Optimization of Physicochemical Parameters:** Various parameters were optimized to achieve better degradation and COD removal activity by mixed consortia. In previous studies the same was performed for *Staphylococcus aureus*, *Aspergillus niger*, *Pseudomonas aeruginosa*. To study the effect of externally added carbon source on degradation activity and COD reduction activity 1g% each of glucose, fructose, maltose, sucrose and starch was added separately in minimal salt medium containing 60% spent wash [7].

Optimum glucose concentration required for color removal and COD reduction by the isolate was determined by taking glucose concentrations in the range of 0.1-1.0%. To study the effect of various nitrogen sources, ammonium chloride, ammonium sulphate, peptone, yeast extract and casein hydrolysate were added in the minimal medium at 0.4 g% concentration. Effect of pH on the degradation activity was determined by using the spent wash medium adjusted to pH values within the range of 4 to 9. Optimum temperature required for decolorisation was determined by incubating the isolate in the culture medium at different temperatures within the range of 25 to 45 °C. Different concentrations of spent wash such as

20, 40, 60, and 80% supplemented in the mineral medium as optimized above, were inoculated with the isolate and maximum spent wash concentration utilized by mixed consortia for decolorisation. Different concentrations of spent wash such as 20, 40, 60, and 80% supplemented in the mineral medium as optimized above, were inoculated with the isolate and maximum spent wash concentration utilized by mixed consortia for decolorisation and degradation was studied.

**HPLC Analysis:** HPLC Analysis was carried out and about 25  $\mu$ l of sample was injected to the HPLC unit, mobile phase was acetonitrile: water in the proportion of 44:55ml (v/v) +1.0 ml glacial acetic acid +0.5g of sodium acetate 3H<sub>2</sub>O, pH of the system was 5.2. Flow rate of the system was 0.8ml/min changes in the peak length were the clue for the degradation of melanoidin in spent wash.

**Biodegradation Studies:** Decolorisation was followed by spectrophotometric measurements at 450nm, which is  $\lambda_{max}$  of melanoidin and spent wash. The effect of various sugars as externally added carbon source in the spent wash medium on decolorisation and COD reduction activity was studied.

Decolorisation was found to be more in presence of all carbon sources used with respect to control, and was found to be maximum in the presence of glucose.

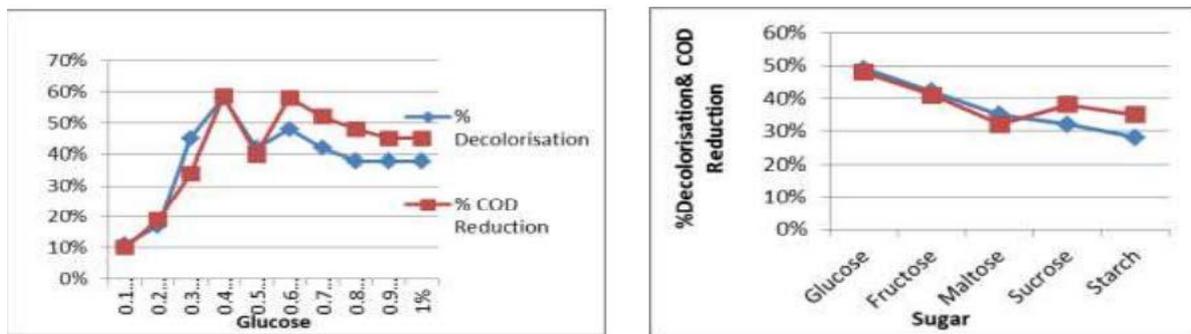


Fig 1: Effect of Different Concentration of Glucose on % Degradation and COD Removal and Effect of Different Types of Sugars on % Degradation and COD Removal

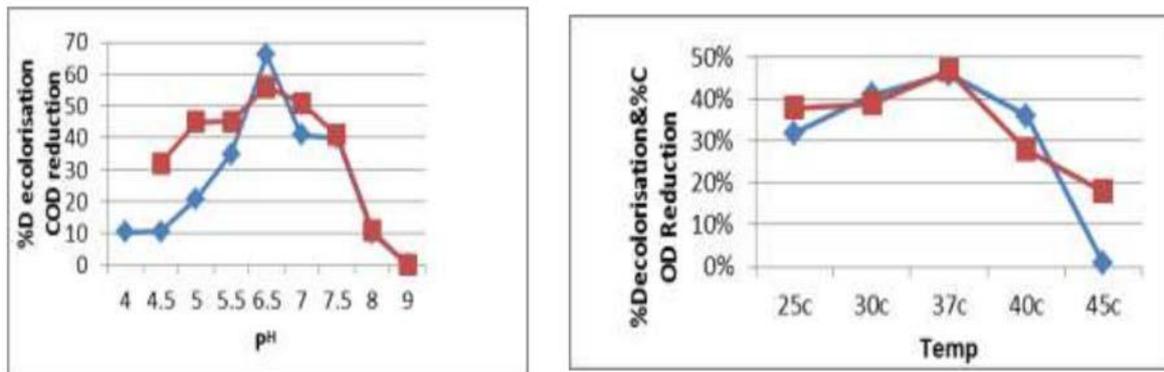


Fig 2: Optimum pH range for decolorization COD and COD removal and Optimum temperature for decolorization and removal

Table 1: Percent Reduction in Color and COD of Treated Spent Wash under Optimum Performance.

| Time (hr) | % Decolorisation | %COD Reduction |
|-----------|------------------|----------------|
| 24        | 25               | 28             |
| 48        | 38               | 41             |
| 72        | 58               | 59             |

Whether or not melanoidin is the main component responsible for color in the spent wash was confirmed by HPLC analysis.

Table 2: HPLC Profile of Melanoidin Degradation Study

| Sample              | Retention time | Area    | Height | Concentration |
|---------------------|----------------|---------|--------|---------------|
| A(Before treatment) | 2.423          | 1180608 | 50575  | 100.0000      |
| B(48Hr treatment)   | 2.435          | 1084859 | 46092  | 100.0000      |
| C(72 Hr)            | 2.699          | 895421  | 45650  | 87.3203       |

After spectrophotometric observations further analysis of degraded spent wash was performed by HPLC. Various peaks of degraded spent wash using mixed consortia were compared to the peaks of standard melanoidin as good results were obtained by mixed consortia. The observed changes in peaks of IR spectra analysis with respect to control indicate the conversion of complex compound in to simple forms .An important structural feature of melanoidin is the presence of conjugated C=C and C=N bonds which imparts color these polymers .The above four bacterial and one fungal strain employed during the present research work might have brought about the cleavage of ethylinic C=C and Azomethine C=N linkages. This conjugation may be broken down due to enzymatic oxidation. This is very significant from the toxicological implications of discharging spent wash effluent in the water bodies.

Optimisation of Physicochemical Parameters: Glucose in 0.4% concentration as carbon source was found to be optimum for decolorizing activity and above 0.58% glucose there was decreasing in decolorizing activity. This effect might be due to the acidic conditions produced in the medium after incubation by all organisms, inhibiting to the microbial growth. There was no effect of externally added organic and inorganic nitrogen on decolorisation efficiency. Nitrogen from the spent wash might be sufficient for the growth of the mixed consortia from the data it is clear that the mixed consortia were utilizing nitrogen from spent wash contents. Maximum decolorisation and COD reduction was found within the pH range of 6-6.5 the preferred range for the growth of the mixed consortia .Temperature range of 37°C was found to be suitable for activity of the isolate (Fig 4).The medium composition was optimized as (g/l, glucose-4; KH<sub>2</sub>PO<sub>4</sub>-0.2; MgSO<sub>4</sub>- 0.009; pH-6.5, and temperature of 37°C. Under the optimum conditions mixed consortia were able to decolorize the spent wash by 59% and COD reduction by 57% after 72hr of incubation for 80% spent wash.

Percent reduction in color and COD of treated spent wash under optimum performance conditions are shown in Fig.1 to Fig.2.

### Results and Discussion:

As the melanoidin content molasses spent wash is highly recalcitrant waste product. Treatments of Distillery spent wash [18] by physical and chemical methods are found mainly unsuitable on industrial scale [34].It is now realized that microbial treatment provides safer, more efficient and less expensive alternative to physico-chemical methods for decolorisation, degradation as well as mineralization of spent wash.

Degradation of melanoidins was also confirmed by spectrophotometric analysis as decrease in optical density of melanoidin at its  $\lambda_{max}$ ; appearance of new peak in the spectra with respect to control was the clue for suggesting effective degradation. Physicochemical analysis of the spent wash effluent before and after treatment with the mixed consortia is presented in the table.

Table 3: Physicochemical Analysis of the Spent Wash Effluent Before and After Microbial Treatment

| Sr No | Parameters             | Before treatment | After treatment |
|-------|------------------------|------------------|-----------------|
| 1     | Color                  | Dark Brown       | Light Brown     |
| 2     | Odor                   | Strong pungent   | Mild            |
| 3     | PH                     | 4-4.3            | 6.5             |
| 4     | BOD(mg/L)              | 60,540           | 34,350          |
| 5     | COD(mg/L)              | 95680            | 43500           |
| 6     | Total sugar(mg/L)      | 12,3000-90,000   | 700-1300        |
| 7     | Total dissolved solids | 7800             | 1600            |
| 8     | Iron(mg/L)             | 124              | 80              |
| 9     | Magnesium(mg/L)        | 2550             | 240             |
| 10    | Sulphates (mg/L)       | 980              | 770             |
| 11    | Free chlorides(mg/L)   | 7000             | 650             |
| 12    | Phosphorus(mg/L)       | 4850             | 400             |
| 13    | Oil and Grease(mg/L)   | 174              | 170             |

Appreciable reduction in case of most of the parameters were observed, especially color, BOD, COD, etc. This is very significant from the toxicological implications for discharging spent wash effluent in the water bodies.

Several researchers have investigated the role of microbial community in the degradation of melanoidins in the spent wash. *Bacillus* and *Xanthomonas* in immobilized form are reported to degrade the color causing material in the spent wash [12]. Most of the bacterial strains like *Pseudomonas*, *Acetobactor*, *Aeromonas* sp. are reported to be capable of degrading some of the recalcitrant compounds in the an aerobically digested distillery spent wash. In a two stage bioreactor using *Pseudomonas putida* and *Aeromonas* sp. has achieved color and COD reduction by 60 and 44.4% respectively [12].

The fungus *Corriolus hirstus*. The fungus *Corriolus hirstus*, exhibited ability to decolorize melanoidin by 74% in GPY medium [19]. White rot fungi *Phanerochaete chrysosporium*, decolorised MSW (6.25% v/v) supplemented with glucose 9.25g/L) by 85% after 10 days of incubation. *Lactobacillus hilgardii* is reported to decolorize melanoidin solution 28%. In all of these cases 0.4-3% sugar either glucose or sucrose with essential nutrients were added and decolorisation required 7-10 days also the spent wash concentration was less. *Pseudomonas aeruginosa* used in this work was capable of giving 55% & 57% reduction in color and COD respectively with 80% spent wash within 72hr with externally added glucose 0.5%.

The indigenous isolate *Aspergillus niger* used in this work was capable of giving 58% & 57% reduction in color and COD, respectively with 60% and 80% spent wash. Within 72hr with externally added dextrose 0.4%.

While mixed consortia was capable to give 59% decolorisation and 57% COD removal for 80% spent wash with externally added glucose 0.4%. Use of mixed consortia for decolorisation of 90% and 100% spent wash in progress. Better decolorisation was observed with 20%, 40% and spent wash using the above strains like *Pseudomonas aeruginosa*, *Aspergillus niger*, *Streptococcus* sps, *Bacilli* sps and by mixed consortia.

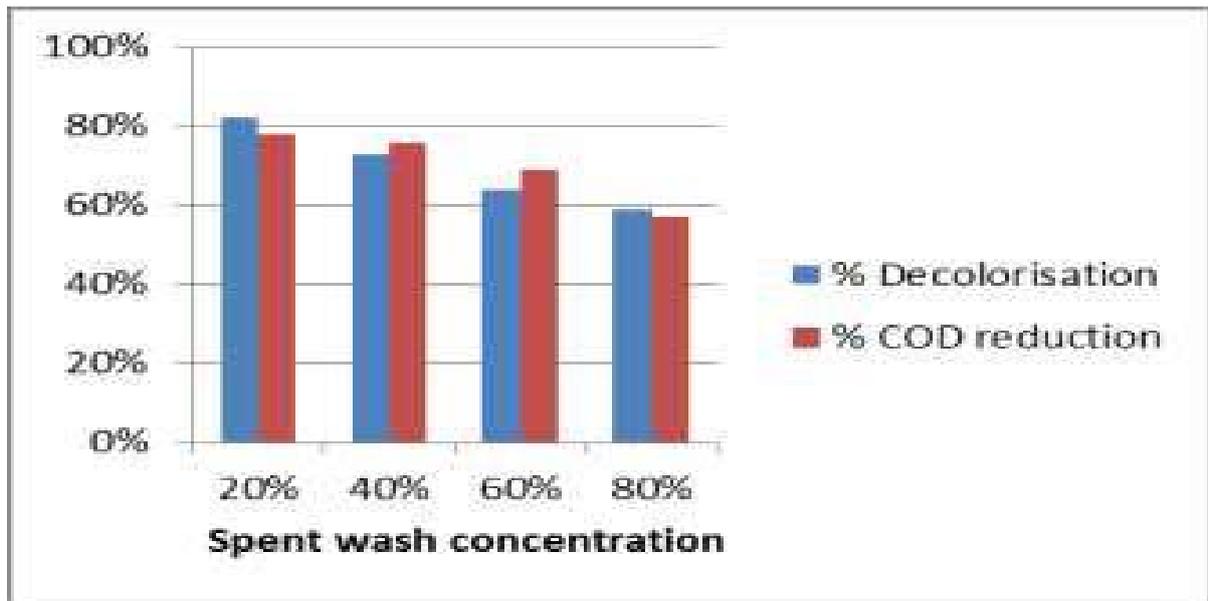


Fig. 5 Optimization of Spent Wash Concentration for Degradation by Mixed Consortia

Addition of readily available external carbon source was found to be necessary for metabolism of microbes in the spent wash medium. Although spent wash contains huge amounts of sugar but its easily metabolisable carbon content is almost negligible [18]. Growth pattern of the isolate with respect to color removal indicated that within first 24 hr growth was initiated but without any decolorisation, but after 24 hr gradual increase in growth with decolorisation was observed up to 72 hr.

This effect can be explained as during initial phase organism utilizes easily metabolisable carbon source added to the medium and later on begins to degrade spent wash components for carbon source [18]. When both decolorisation and COD reduction were monitored as a function of time, the results showed that with the increasing decolorisation activity there was notable COD reduction and it was profound between 24-72 hr.

The probable mechanism of decolorisation and COD reduction might be through enzymatic degradation as sugar oxidase, and manganese dependant peroxidase have been reported for microbial degradation of melanoidins [38]

### Conclusion:

Mixed consortia were found to be more efficient in decolorization of 60% spent wash along with melanoidin degradation in comparison to earlier reports. As the highly concentrated spent wash is decolorized by the above strains and mixed consortia this approach can be further exploited to develop a cost effective, eco-friendly biotechnology package for the treatment of concentrated distillery spent wash.

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# Author Guidelines

## Authors' Guide

### For Paper Submission and Manuscript Preparation

#### General Instructions

The Nimitmai Review accepts research papers, academic articles, and review articles written in Standard British or American English, not a mixture. Poorly written English may result in rejection or return of the submission for language editing.

The articles must fall within the aim and scope of the Journal, that is, humanities and social sciences as a priority and their related fields.

Research or academic papers must be 4000-6000 words in length inclusive of references, tables, graphs, charts, and figures.

**For research papers**, the author is advised to include all elements of the structure below:

- **Title** of paper must be clear, concise, and informative, all in uppercase, not exceeding 15 words or within three typeset lines.
- **Abstract** (150-200 words) Abstracts must include sufficient information for readers to judge the nature and significance of the topic, the adequacy of the investigative strategy, the research results and conclusions. The abstract should summarize the major results of the work and not merely list topics to be discussed. It is an outline or brief summary of your paper in a well-developed paragraph, should be exact in wording, and understandable to a wide audience.
- **Keywords** (3-5), immediately after the abstract, keywords are for indexing purposes, and ideally should be different from the title.

- **Introduction** This section provides necessary background of the paper and a brief review the existing knowledge, and importance of the problem.
- **Literature Review** Discussion of the research work of others in the field or topic area and how your work will enhance and contribute to the field. Citation of work by others should follow APA (6<sup>th</sup> edition) style e.g. Zutshi, B., Prasad, S.R. and Nagaraja, R., (2010) asserts that...; Mo Yan (2005: 170) also speaks highly of...
- **Methodology** This section indicates clear research objectives, conceptual framework(s) (if any), research question(s), hypotheses, population and sample, research instruments, and the data collection process. This section provides clear steps used in conducting your research. It means all procedures need to be described in sufficient detail to allow someone to replicate it.
- **Results and Discussion** This section covers the analysis of the data. It should include statistics in tables, charts, graphs, or pictures analyzed against hypotheses or in answering the research question(s) in quantitative research, or descriptive analyses of categories in qualitative research. **Results** are purely descriptive. **Discussion** describes and interprets the findings, placing them in a bigger context, relating them to other work(s) and issues outlined in the Introduction.
- **Conclusion and Recommendations** This section summarizes your study's key findings and implications. It should not be long and repetitive, but capture the essence of the study discussed in all previous sections. It should briefly cover the limitations of your research and suggested future direction for further research.
- **For academic articles**, there are no set rules. We recommend the structure below:

## 1. Introduction

## 2. Discussion

### 2.1 subheading

## 2.2 subheading

### 3. Conclusion

The author is advised to follow a logical, understandable point of argument. Break your main argument into sub-headings and present them in an outline at the end of the Introduction.

- **References** List all the sources you have cited in the body of your research. It states the author/s of the source, the material's year of publication, the name or title of the source material, as well as its electronic retrieval information, including the date it was accessed, if these were gathered from the Internet.

**For book or article reviews**, the author should adhere to a 3-section structure as follows:

- **Bibliographic entry** Please follow a 3-headings format. For example.

#### BOOK REVIEW

#### **First, Break All the Rules: What the World's Greatest Managers Do Differently**

Author: Curt Coffman

1230 Avenue of the Americas, NY: 2016

Paperback, 276 pages; ISBN – 0-684-85286-1

- **Summary of the content** Give a clear synopsis of the main points of the book. This section may include credibility/authority of the author in the field (if applicable). What the main purpose of the book is, who is the target audience, and how the author convinces the reader to agree with his main points.

- **Critical evaluation** This is the most important part of a book/article review. Your role is to critique and make an argument about the merit of the book—to show the reader your view on how successful the author

accomplished what he or she was intending to accomplish in writing this book or article.

- The length of a book review is not to exceed 1200 words

## **Submission Guide**

Authors are welcome to submit their manuscripts at any time via our online submission system at <http://www.ojs.ipacific.ac.th/index.php>

All submissions will be given an initial check by our editorial team, within **6-8 weeks after submission date** you will be notified of the initial check result.

**Articles being currently considered for publication by other journals will not be accepted by the Nimitmai Review.**

**If the author withdraws or sending a manuscript to other journals any time after the manuscript has been sent to peer review till the final decision, the Journal will charge the author a penalty fee for its time and resources spent. The authors must always pay the page charge even if the withdrawal is permitted.**

## **Specific Instructions:**

- **Format** The preferred format for the text and tables of a manuscript is MS Word DOC.
- **Paper size** Manuscripts must be typed double-spaced on A4 size paper, a single column format.
- **Margins** Use a 1-inch (2.54 cm) margin on all sides of each page—left, right, top, and bottom
- **Spacing** Double space lines throughout the paper including appendices, footnotes. Exceptions: Triple or quadruple spacing can be done around equations. Single or one-and-a-half spacing can be done in tables or figures.

Indent the first line of every paragraph a standard – Tab key space (1/2 inch).

- **Font Size and Type.** Georgia font (14 pts. bold for title; 12 pts. for author(s) and affiliation; 12 pts. bold for headings and subheadings; and 12 pts. for text)

- **Titles** should be no more than three typeset lines.

- **Headings** should be in bold type, in 14 point Georgia. First-level headings should be aligned to the left with initial caps. One line space should separate headings from the preceding text.

- **Subheadings** Italicize the subheadings in the bold type, single-spaced; in 12 point Georgia.

- **SUB-HEADING ONE** Bold, Left, UPPERCASE HEADING

- **Sub-heading Two** Bold, Left, Capitalize Each Word

- **Sub-heading Three** Indented, bold, Capitalize Each Word

- **References** The Journal uses American Psychological Association (APA) style (6<sup>th</sup> edition).

- Include only those sources you have cited in your paper.
- Exceptions are personal communications, classical religious works such as the Bible or the Qur'an, and classical works. These do not need to appear in the References list.
- Position the first line of each reference flush left, with subsequent lines wrapping with a 1/2-inch (hanging) indent.
- Organize the list in alphabetical order according to the first letter beginning each entry. Usually, the author's last name is the first piece of information in each entry. Use initials for the author's first/middle names.

- Use the following format for your reference list:

1. Dellana, S., Collins, W., and West, D. (2000). Online education in a management science course – effectiveness and performance factors. *Journal of Education for Business*, 76, 43 – 48.

2. Sekaran, U., (2000). *Research methods for business: A skill building approach*. (3<sup>rd</sup> Ed). John Wiley & Sons, NY.

3. Stewart, D. W. (1981). The Application and Misapplication of Factor Analysis in Marketing Research. *Journal of Marketing Research*, 18(2), 51-62.

#### - **Tables and Figures**

- Line drawings should be of high resolution and high contrast. For color or grayscale photographs (halftones), use a minimum of 300 dpi (.TIFF or .JPG).
- Provide captions to figures
- Use the table function of Microsoft Word.
- Figure and tables should be placed as close as possible to where they are mentioned in the text

- **Page Numbering:** Number all pages of the paper, beginning with the title page. The number is in the bottom right corner (1 inch from right and 1/2 inch from the bottom page edges).

#### **Publication Charge**

- **The new fee shall be in effect by institute announcement.**

#### **SUBMISSION PREPARATION CHECKLIST**

As part of the submission process, authors are required to check off their submission's compliance with all of the following items, and submissions may be returned to authors that do not adhere to these guidelines.

1. The manuscript must not have been published or submitted elsewhere for consideration. (A brief explanation will be necessary to clarify this matter.)
2. The submitted file is in **Microsoft Word** document file with a single column format.
3. Where available, URLs for the references must be provided.
4. Research or academic papers must be **4000-6000 words** in length inclusive of references, tables, graphs, charts, and figures.
5. The text must be double-spaced; (a 12-point font Georgia; italics rather than underlining except for URL addresses); and all

illustrations, figures, and tables must be placed within the text at the appropriate points, rather than at the end.

6. The text adheres to the stylistic and bibliographic requirements outlined in the Author Guidelines.
7. Attached to all submitted articles must be a **150-200 words abstract, Keywords** (3-5) and a statement containing the author's present academic or nonacademic position and an address where he or she may be contacted by the editors or interested readers. Authors should place their names on the cover page but the name should not appear on headers or elsewhere in the body of the article. Full contact details for the corresponding author, including email, mailing address and telephone numbers should also be provided. As the Nimitmai Review is a peer reviewed journal, the author must be follow the instructions about Ensuring a Blind Review.
8. Make sure that there are no grammatical, spellings, or content errors in articles prior to submitting to the Nimitmai Review.
9. The Nimitmai Review uses American Psychological Association (**APA**) style (6<sup>th</sup> edition).
10. Please register as **Author** for paper submission online.