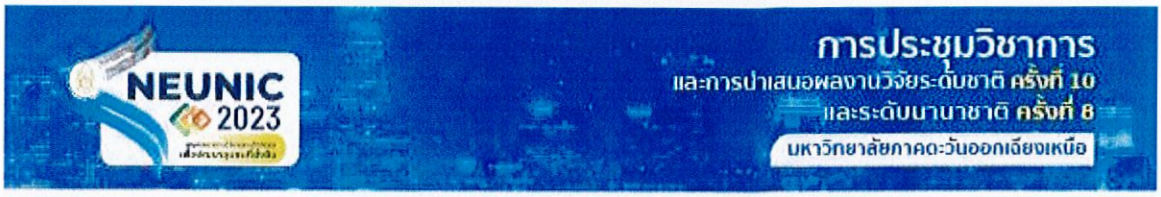
NEUNIC 2023

NEU มหาวิทยาลัยภาคตะวันออกเฉียงเหนือ NORTHEASTERN UNIVERSITY

การประชุมวิชาการ
และการนำเสนอผลงานวิจัยระดับชาติ ครั้งที่ 10
และระดับนานาชาติ ครั้งที่ 8
"การพัฒนางานวิจัยและนวัตกรรมเพื่อพัฒนาชุมชนที่ยั่งยืน"

The 10th National and the 8th International Conference on Research and Innovation : Research and Innovation Development for Developing Sustainable Communities

International Conference



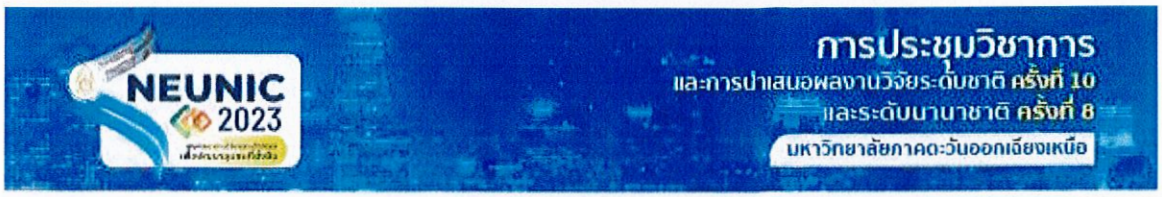
Schedule

The 10th National and the 8th International Conference on Research and Innovation: Research and Innovation Development for Developing Sustainable Communities

Sunday, 28 May 2023

Time	Activities
09.00 – 09.30 a.m.	Registration with QO-Code via Online System
09.30 – 10.00 a.m.	Opening Ceremony - Video Presentation of Northeastern University - Video Presentation Introducing Co-hosts - Report Speech by Dr. Theenida Bunthorawan, Vice President for Academic Affairs - Opening Ceremony by Assistant Professor Dr. Kanok-on Boonmee, President of Northeastern University - Introducing the Institutes as Co-hosts and Shield Award Ceremony
10.00 – 11.00 a.m.	Special Lecture on title **"Research and Innovation Development for Developing Sustainable Communities"** by Professor Dr. Supachai Patumnakul, Deputy Permanent Secretary of the Ministry of Higher Education, Science, Research and Innovation
11.00 - 11.30 a.m.	Lecture by 3 Keynote Speakers
11.30-12.30 a.m.	Lunch Break
12.30–16.30 p.m.	Oral Presentation of Each Group
16.30 p.m.	Closing Ceremony

* Schedule may be subject to change as appropriate.



Project Title	The 10th National and the 8th International Conference on Research and Innovation: Research and Innovation Development for Developing Sustainable Communities
Type of the Project	National and international conference
Responsible Office	Research and Academic Service Office, Northeastern University
Date	Sunday, May 28, 2023

1. Rationale

The area development with distributing the prosperity to regions and communities is the importantly main direct towards to the country reform by creating the strength for the people in communities to develop their hometown as the community context and needs. The main point in the community development as the Thai people worship due to the King Rama 9's thought in '**explosion from inside**' meant that to create the strength for the community people for the development target to the first meet the ready conditions for developing, and then extend to external communities. It is not to take the prosperity or the people from outside communities to enter communities without the preparation or self-setting. Do not offer while the receivers have not been ready to extremely utilize. This idea is relating to the goal of causing the sustainable development goals: SDGs as the universal principles, aiming to help solve the facing global problems, such as poverty, inequity, global warming and peace. Additionally, it is to supplement the idea of 'not to leave anyone behind'. The targets included 17 items, covering: 1) eliminating every type of poverty in every area, 2) terminating starving to achieve sustainable food and raising the nutrition level and promoting the sustainable agriculture, 3) creating the guarantee of people

with good health and promoting the good welfare for everybody in all ages, 4) creating the guarantee in everybody's education with comprehensiveness and equity and encouraging the opportunity for lifelong education, 5) achieving the equity among sexes and supplementing the power for female and young girls, 6) creating the guarantee in managing water and health hygiene for everybody with the sustainable people management, 7) creating the guarantee for everybody enabling to reach the sustainably modern power with cheapness, 8) promoting continued, comprehensive and sustainable economic growth, full employment, productive and have a sustainable job for everyone, 9) building a durable infrastructure, promote comprehensive and sustainable industrial development and foster innovation, 10) reducing national and international inequality, 11) making cities and human settlements inclusive, safe, resilient and sustainable, 12) ensuring a sustainable pattern of production and consumption, 13) taking urgent action to combat climate change and its impact, 14) conserving and sustainable use of oceans, seas and marine resources for sustainable development, 15) protecting, restoring and supporting sustainable use of terrestrial ecosystems, forest management, fight desertification, stop the degradation of soil and restore soil conditions and stop the loss of biodiversity, 16) promoting the peaceful and inclusive society for sustainable development, letting everyone have access to justice, building the effective institution, responsible and covering all levels, 17) strengthening operational mechanisms and revitalize global partnerships for sustainable development. The 17 sustainable development goals emphasize on inclusive development, focus on transformative and integrated development that every country has problems that must be put into practice, not just poor countries that the sustainable development goals are shared at all levels from global to local and enabling all parts of the world to learn from each other.

The research and innovation development by combining the academic knowledge, research together with the ability and needs of the community in the area context is an important mechanism for driving the economy, social and community development, education promotion, maintaining traditions and culture, and the environmental conservation. This point will bring the people and the country to be liberated from various traps, such as medium-income countries and the trap of inequality, social trap and the imbalance of development, etc. In addition, the research and innovation help the community and society to be potential to handle with the

effects of various changes in the world, whether technology, climate changes, globally physical characteristics, business models and the public health changes, etc. It also helps to increase the competitiveness for the community to strength and sustainable and lead to develop the country for the stability, prosperity and sustainability in accordance with the goals of the 20-year national strategy (2017-2036) and the target of Thailand 4.0.

Northeastern University is a private university in the Northeastern region that is outstanding and has been evident for a long time. According to a popular words, N E U (good, smart, public-minded) stands for N: Nurturing Merit Principles (good) virtue E: Excellence (good) excellence in production Graduates, academic research, arts and culture and U: United Publicness (Public Mind), consciousness for the whole and being a university for the communities. The National and International Academic Conference and Research Presentation under the title **"The 10th National and the 8th International Conference on Research and Innovation: Research and Innovation Development for Developing Sustainable Communities"** is to increase the quality of research and innovation that are important propulsion of national development. A forum is for the exchange of research knowledge among students, researchers and academics as well as strengthening academic jointly aiming to create a body of knowledge and apply research and innovation results. It is also for sustainable community development and to build communities that can be self-reliant and sustainable in the future.

2. Objectives

2.1 To disseminate body of knowledge from research results and innovation from public and private educational institutions both at national and international level.

2.2 To provide a forum for presenting research results and innovation to the public and exchanging knowledge and experiences between researchers and general interested people both at national and international level.

3. Goals

3.1 Quantity

1) 100 of conference participants and presenters

- Graduate students or those who have graduated in the country
- Lecturers, academics, researchers in higher education institutions and interested agency from public and private sectors in the country

2) The goals of articles for presenting and publishing

- 80 of national research articles
  - NEU Staff 15 Articles
  - General Interested people 65 Articles

  With total number of 80 Articles
- 20 of international research articles
  - NEU Staff 5 Articles
  - General Interested people 15 Articles

  With total number of 20 Articles

3) 100 of conference participants without presentation

- Undergraduate and graduate students in higher education institutes from public and private universities
- Lecturers, academics, researchers, administrators, and general interested people

3.2 Quality

To give opportunities for students and academic staffs for presenting research results and exchanging knowledge

4. The Operation

4.1 The Conference Process

4.1.1 The patterns of conference

1) Academic lecture by Keynote speakers

2) Research presentation of lecturers and graduate students (Oral Presentation)

4.1.2 The duration of the conference process and activities

1. Full Paper Registration and Submission: March 1, 2023

Early Bird Registration Deadline: March 31, 2023

2) Full Paper Submission Deadline: May 10, 2023

3) Final Edited Paper Submission Deadline: May 15, 2023

4) Announcement of Accepted Articles: May 17, 2023

5) Academic Conference Research Presentation: May 28, 2023

4.1.3 The groups of research

1) Researches from lecturers, academics, researchers and interested people

2) Theses / Independent studies of graduate students from public and private institutes which are parts of education (completed or pending studies) and have never been presented in any conferences or publications.

3) The six areas of national researches and theses/ independent studies;

- Education such as Education Administration, Curriculum and Teaching Development, Educational Measurement and Evaluation and Educational Innovation
- Health Sciences such as Nursing, Medicine, Public Health, Pharmacy, and Medical Technology
- Science and Technology such as Science, Engineering, Computers and Technology
- Humanities and Social Sciences such as Law, Arts, Political Science, Public Administration and Communication Arts
- Business Administration and Economics such as Business Administration, Tourism and Hotel Management and Economics
- Agricultural and Fisheries

4) The six areas of International Conference;

- Education (Education Administration, Curriculum and Teaching Development, Educational Evaluation, or Educational Innovation)
- Health Sciences (Nursing, Medicine, Public Health, Pharmacy, or Associated Medical Sciences)

- Science and Technology (Science, Engineering, Computer and Technological Information)
- Humanities and Social Sciences (Law, Arts, Social Sciences, Public Administration, or Communication Arts)
- Business and Economics (Business Administration, Hotel and Tourism Management, or Economics)
- Agriculture and Fisheries

4.1.4 Formats of Presentation

1) Oral Presentation: 15 minutes per article by Microsoft Power Point (10 minutes for a presentation and 5 minutes for a Q&A session)

2) Thai and English articles are accepted.

4.1.5 Full paper and abstract preparation

Researchers can register and submit articles at http://conf.neu.ac.th/

4.1.6 Registration fee

1) Registration fee (including bags and documents)

- The national article 2,500 baht
- The international article 4,000 baht

2) Early Bird Registration (within March 31, 2023)

- The national article 2,000 baht
- The international article 3,500 baht

3) No fee for Northeastern University staffs

4) Those who do not wish to receive documents can join the conference without paying registration fee.

4.1.7 Payment

Payment by wire transfer to Krung Thai Bank

Branch: Pratumuang Branch

Beneficiary Name: Northeastern University General Fund

Account No.: 425-6-026827

4.1.8 Conference schedule

Sunday, May 28, 2023 Time: 8:30 a.m. – 5:00 p.m.

4.1.9 Selection of outstanding research articles

The expert committee considers outstanding research articles by using average scores from experts. If the average score exceeds 90 points, it will be regarded as an outstanding article. The researcher whose research article is selected will receive a certificate and the author of articles in fields related to NEU academic and research journal. (TCI 2) can choose to publish in either the NEUARJ or the proceeding.

5. Conference Venue

Northeastern University

6. Expected results

6.1 The research, theses, and independent studies conducted by graduate students from public and private institutions are expected to be published.

6.2 Participants at the conference are expected to gain experience in presenting their research results to the seminar, while research presenters should strive to hone their presentation skills for research, thesis, or independent study.

6.3 Students and academics are expected to exchange knowledge between national and international levels.

6.4 Quality research, theses, and independent studies are encouraged to be published in an academically-acceptable format.

6.5 The academic works of Northeastern University are expected to be recognized and accepted at both national and international levels.

7. Performance consideration

Northeastern University, under the Operation Committee, reserves the right to consider and proceed as follows:

7.1 Considering the selection of presentation groups and types of presentations.

7.2 Selecting research results to be presented at the conference and to be included in the proceedings.

7.3 Disqualifying the right to present research results at the conference in the following cases:

1) The abstract does not adhere to the required form or format and has not been revised in accordance with the expert's recommendations.

2) Registration and payment of registration fees are either late or incomplete.

7.4 Final selection of works and judging is under the jurisdiction of the Operation Committee of Northeastern University.

Research and Academic Services Office

February 23, 2023

รายชื่อผู้เสนอผลงานวิจัยระดับนานาชาติ

International (IC) Total 20 Article

CODE	Name	Lastname	Title	University
IC-01	Atitarn	Thongchua	Modeling the Relationship between Organizational Competency, Core Competency, Leader Competency, Individual Competency and Organizational Performance	Sripatum University
IC-02	MissWipawee	Buaphan	The Effects of Cooperative Learning by using CIRC Techniques for Development of English Reading Comprehension through Tourism Reading Texts for Undergraduate Students of Sakon Nakhon Rajabhat University	Sakhon Nakon Rajabhat University
IC-03	Rotthasri Inthisit	(Thigkhapanyo)	SCHOOL ADMINISTRATIVE MANAGEMENT FOR THE ROYAL AWARDS AT A PRIMARY LEVEL: A GROUNDED THEORY RESEARCH	Sakhon Nakon Rajabhat University
IC-04	Supaweena	Luksup	THE DEVELOPMENT OF ENGLISH WRITING ABILITY USING PROCESS WRITING APPROACH OF UNDERGRADUATE STUDENTS	Northeastern University
IC-05	Saifhon	Sawat-uea	A Model of Transformational Leadership Development for Small Primary School Administrators in the Northeast Region	Sakhon Nakon Rajabhat University
IC-06	Pattarawan	Santaweesuk	The Development of Basic Arduino Learning Media via the Metaverse Application link to Tinkercad Application	King Mongkut's University of Technology Thonburi (Bangkok)
IC-07	Anurag	Navapornpaisarn	The Development of Bachelor of Technology Program of Automotive Technology Branch (Curriculum Revision B.E. 2566) of Mahachai Institue of	Technology Mahachai Institute of

CODE	Name	Lastname	Title	University
			Automotive Technology, corresponding with the 20-year National Strategy (B.E. 2561-2580) which according to the Standard Criteria for Undergraduate Course in B.E. 2565 and in Accordance with the Standard Framework for Bachelor Degree Qualifications of Technology Program in B.E. 2560.	Automotive Technology
IC-08	Thitimakorn	Namhong	EFFICACY OF STRONGYLOIDES STERCORALIS PEPTIDES ANTIGEN FOR SEROLOGY DIAGNOSIS	Suranaree University of Technology
IC-09	Tharika	Phumsathan	The Development of the Services of the Center of Vocational Manpower Networking Management Department of Energy Techniques Chaiyaphum Technical College	Northeastern University
IC-10	Panida	Yathongchai	MODEL OF TEACHER LEADERSHIP DEVELOPMENT IN LEARNING MANAGEMENT BASED ON PHILOSOPHY OF SUFFICIENCY ECONOMY IN EDUCATIONAL OPPORTUNITY EXTENSION SCHOOLS IN THE AREA OF RESPONSIBILITY OF THE OFFICE OF EDUCATION SECTOR 11	Sakon Nakhon Rajabhat University
IC-11	Mattika	Phalee	DEVELOPMENT MODEL OF TEACHER LEADERSHIP IN DIGITAL ERA ON INSTRUCTIONAL LEARNING IN PRIMARY SCHOOLS UNDER THE REGIONAL EDUCATION OFFICE NUMBER 11	Sakon Nakhon Rajabhat University
IC-12	Thanapha	Boonkopl	The Development of Teacher Development Program in Thai Learning Management to Enhance Students' Critical Thinking Under the Education Service Area Office, Mahasarakham	Northeastern University

CODE	Name	Lastname	Title	University
IC-13	Chalard	Chantarasombat	CREATIVE THINKING DEVELOPMENT PROGRAM FOR LEARNING ACTIVITY MANAGEMENT OF SECONDARY SCHOOL TEACHERS FOR ENHANCEMENT OF THE DOCTOR OF PHILOSOPHY PROGRAM	Northeastern University
IC-14	Phennapha	Luealai	The Effect of Leukocyte Telomere Length on Blood Pressure among Thai Adolescents	Institute of Nutrition, Mahidol University
IC-15	Lalinthorn	Marakanon	Comparison of Demand Forecasting Technique for Production Planning in Micro and Small Enterprise: A Case Study of Healthy Food Products	Thepsatri Rajabhat University
IC-16	Prayoon	Chaowaneenart	Correlation between Perceived Vocabulary Learning Strategies and English Learning Achievement among Grade 12 Students: A Case Study of a Small Sized Secondary School	Northeastern University
IC-17	Matee	Na-udom	The Causal Relationship Model of Effectiveness of Internal Quality Assurance in Primary Schools Area the Regional Education Office No.11	Sakhon Nakon Rajabhat University
IC-18	Theerasak	Komake	Physical Properties Change Due to pulsed electric field of flesh longan	Chiang Mai university
IC-19	Theeranat	Suwanaruang	Ivy gourd's Chlorophyll for Human Benefit	Kalasin University
IC-20	Chonvipa	Sulakkananurak	Factors Associated with Stress in Online Learning among College Students in Phranakhon Si Ayutthaya, Thailand	Phranakhon Si Ayutthaya Rajabhat University

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IC-15

Comparison of Demand Forecasting Technique for Production Planning in Micro and Small Enterprise: A Case Study of Healthy Food Products

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Abstract

The research objective was to examine the appropriate forecasting model which forecasted the demand for three types of healthy food products. These included almond milk, herbal juice, and baked pumpkin chips. The study of the appropriate forecasting model has been brought about by using time series forecasting and accuracy analysis using the historical data 24 weeks from August, 2022 to January, 2023 to analyze the results. The study found that using sales data in forecasting method by adopting Moving Average, Exponential Smoothing and Linear Trend Line methods in these three products had given the different results and compared forecast accuracy by Mean Absolute Percent Error (MAPE) to gain the best optimal demand forecasting method. Firstly, Exponential Smoothing was appropriate to forecast for almond milk with MAPE at 25.667%. Secondly, Linear Trend Line was appropriate to forecast for herbal drink with MAPE at 7.796%. Finally, Moving Average was appropriate to forecast for baked pumpkin chips with MAPE at 25.169%, respectively. The results obtained from this research can be used in the business planning, ordering raw materials, sales planning, workforce, and production planning in the future.

Keywords: Forecasting Technique Model, Time Series Forecasting, Demand Forecasting

1. Introduction

According to the health-conscious trend, a well-received trend from the consumers worldwide, has made a huge impact on healthy foods and drinks to become popular these days. Moreover, the market expansion after the international re-openings from COVID-19 pandemic and the intense competition in the same industry have caused many businesses to adjust several units. For instance, being an innovative organization, strategic cost management, and digital transformation etc. One of the most necessary things for the organizational adjustment is Demand Forecasting. Thus, this study primarily focuses on Micro and Small Enterprises (MSEs) as they are easier to adjust to the new marketing strategies and also more connected to customers. Moreover, they are able to rapidly analyze the needs of the customers, as well as creating marketing strategies to target a group of customers precisely and flexibly. That is why they are considered as an important gear for the economy.

The business model in this case study is located in Nakhon Pathom. It manufactures a variety of products which most of them are processed agricultural products and sold in both retail and wholesale in nearby areas. According to the study, the demands of the products fluctuate depending on each season in each year. Therefore, the sales in each period are not in the same amounts. Some of their products include almond milk, herbal drinks, and baked pumpkin chips etc. These products have unstable sale amounts that cause them in short supply and too much more dead stock than it should be frequently. In addition, there are no production plan and systematic inventory management in this business model. Hence, it is analyzed that they should primarily adopt demand forecasting strategy as a tool for helping the organization to be prepared with the instability that might occur in the future. This would help the business manager handle the change confidently, control the business process, and make strategic decision that can drive the business to the future growth.

Apparently, there are plenty of previous researches using the most precise sale forecasting method to forecast specific value or observed value in the future such as the demand forecasting in beverage industry (Wiwattanakornwong et.al.,2023), the forecasting model for export value of squid and products (Riansut, 2020), the forecasting model for promotional sales (Chiewpanich & Mokkhamakkul, 2019), the forecasting model for UHT milk sales volume (Luanghan, 2019), the forecasting of organic food products market opportunities (Jayakumar & Ezhilvani, 2018), the comparison of forecasting technique for improving the accuracy of sales forecast in plastic bottle manufacturing (Limlawan, 2022), the sales forecasting of perishable orange drink products

(Musora et.al.,2023), the sales forecasting of germinated brown rice of community enterprise (Pattrapon & Nujira, 2017). Besides, many studies prove that the forecasting method is used in many industrial fields. Therefore, it can be seen that the method is suitable for this study.

Having stated the source of the problem and the purpose above, the study of the appropriate forecasting model has been brought about by using time series forecasting and accuracy analysis. This method will be used as information in purchasing management so that the number of products matches with the customer's demands. Also, this can be used for sale, marketing, workforce, and production planning in the future.

2. Purposes

1) to examine the appropriate forecasting model which forecasts the demand for 3 types of healthy food products including almond milk, herbal juice, and baked pumpkin chips.

3. Research Methodology

The research methodology is organized as follows. First, the data collection, followed by the forecasting methods to find the appropriate technique. Finally, the Comparing forecast accuracy and conclusions are presented. (Gardner,1985, Johnson, 1988)

Data collection

The data in this study is collected from the sales or the demands of the three types of products in the business model which are almond milk, herbal drink, and baked pumpkin chips. From the sale revenue (baht) of the business in the case study between August, 2022 to January, 2023, in total 24 periods of time (weeks).

Forecasting methods to find the appropriate technique

The analysis of appropriate forecasting method in this study uses forecasting package software to find other statistics along with time series forecasting. There will be many MAPE values following each time used in moving average method. Then, the least MAPE value will be selected followed by Seasonal Factor and Adjusted Forecast to direct sales forecast in other periods of time. This will lead to the total forecasting result that which forecasting method has the most accurate forecasting sale. (Wofuru-Nyenke & Briggs, 2022).

Choosing a method or technique for forecasting depends on forecast time horizon, data availability, forecasting budget and availability of qualified personnel. For guidelines on choosing techniques for forecasting can be shown in table 1.

Table 1 Guidelines on choosing techniques for forecasting

Forecasting Techniques	Data Patterns	Forecasting horizon	Qualified Personnel
Moving Average	stable (without trend and temporality)	short	low
Weighted Moving Average	cycle or seasonality	short to medium	medium
Exponential Smoothing	cycle or seasonality	short	low
Simple Linear Regression Analysis (Time Series)	trends or seasonality	short to medium	medium
Simple Linear Regression Analysis (Casual Mode)	variable	short to medium	high
Holt-Winter method	both trend and seasonality	medium to long	medium

Comparing forecast accuracy.

Before comparing the forecasting models, each forecasting technique is used to obtain the best parameters using the past 24 weeks of sales data. This analysis of the most appropriate forecasting method compares the accuracy of each forecasting method with the least mistake by using the evaluation index such as MAPE. The Mean Absolute Percentage Error (MAPE) is one of the most commonly used KPIs to measure forecast accuracy.

4. Results and Discussion

The result of data collection and sales analysis

The data is collected from the sales of the three types of products which are almond milk, herbal drink, and baked pumpkin chips. The sale revenue (baht) between August, 2022 to January, 2023 in total 24 periods of time (weeks) are shown in Table 2. Results shown in Table 3 revealed that the average sale revenue per week of three products.

Table 2 Sale revenue per week (baht)

Period	Almond milk	Herbal juice	Pumpkin chips	Period	Almond milk	Herbal juice	Pumpkin chips
1	14,200	23,350	4,850	13	37,500	25,975	8,950
2	20,400	25,550	3,600	14	33,150	30,800	6,250
3	20,500	23,625	9,750	15	27,700	29,400	8,090
4	28,000	26,875	5,000	16	24,650	31,800	6,770
5	26,200	26,250	11,750	17	33,500	26,450	5,750
6	36,500	21,200	6,750	18	36,000	27,950	7,030
7	42,200	28,325	7,400	19	34,750	23,275	6,620
8	26,100	30,925	7,850	20	22,250	32,200	9,750
9	37,500	24,000	5,480	21	27,750	30,975	8,650
10	19,100	26,550	3,650	22	25,500	29,750	10,050
11	32,700	24,900	4,700	23	14,500	26,775	8,000
12	25,500	25,900	11,750	24	17,800	30,900	7,630

Table 3 Average sale revenue per week (baht)

Products	Almond milk	Herbal juice	Baked Pumpkin chips
Average sale revenue (baht)	27,665	27,238	7,336

The result of Time Series Plot creating by collecting sales of the three products in 24 periods of time into graphic plotting between periods and sales for preliminary analysis of the data distribution characteristics as shown in Figure1. According to the graph, the data has no trend and no seasonal pattern. Thus, Time Series Plot can be used along with Moving average, Exponential smoothing and Linear trend line methods.

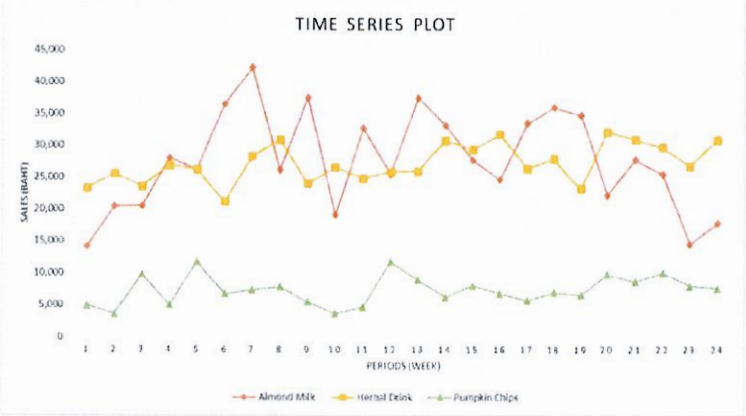

Figure.1 Time Series Plot

The result of the data forecasting

According to the study, the data of this study is the time series data by using Moving average, Exponential smoothing and Linear trend line methods. The results of these 3 types of products which are almond milk, herbal drink, and baked pumpkin chips are shown in Figure.2-4.

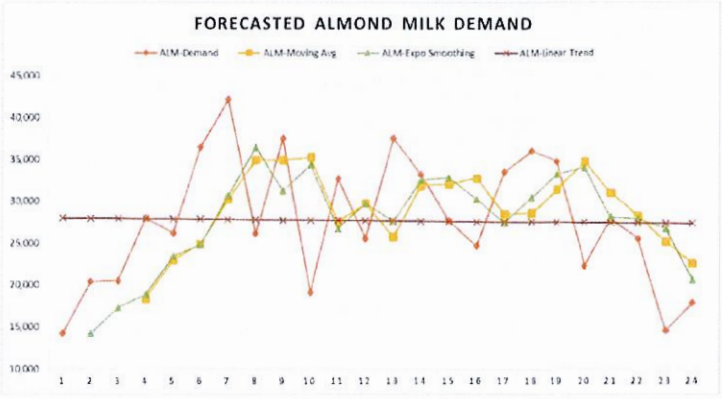

Figure.2 Forecasted almond milk demand

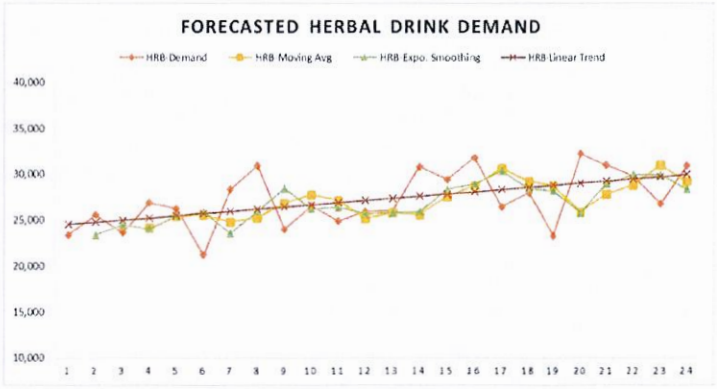

Figure.3 Forecasted herbal drink demand

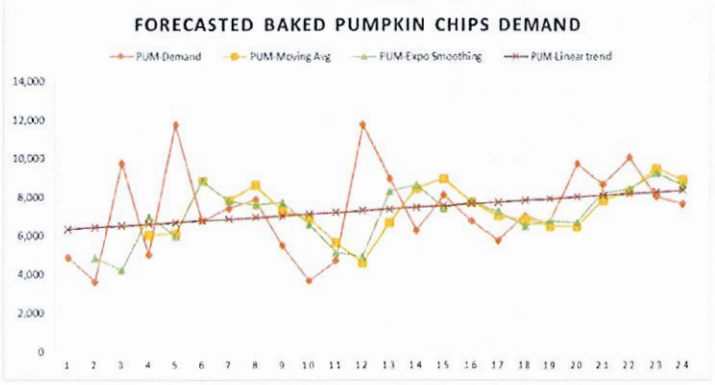

Figure.4 Forecasted baked pumpkin chips demand

Results shown in Table 4 revealed that this analysis of the most appropriate forecasting method compares the accuracy of each forecasting method with the least mistake by using MAPE index. The table of the Mean Absolute Percentage Error (MAPE) in forecast shows, that using sales data in forecasting method by adopting Moving Average, Exponential Smoothing and Linear Trend Line methods in these 3 products including almond milk, herbal drink, and baked pumpkin chips has given the different results. Firstly, Exponential Smoothing is appropriate to forecast for almond milk with MAPE at 25.667%. Secondly, Linear Trend Line is appropriate to forecast for herbal drink with MAPE at 7.796%. Finally, Moving Average is appropriate to forecast for baked pumpkin chips with MAPE at 25.169%, respectively.

Table 4 The most appropriate forecasting method compares the accuracy by using MAPE index

MAPE	Moving average	Exponential smoothing	Linear trend line
Almond milk	27.275%	25.667%	26.177%
Herbal juice	10.714%	9.633%	7.796%
Baked Pumpkin chips	25.169%	25.837%	26.167%

The result of using by many forecasting techniques which must be suitable for historical data and select the prediction technique with the smallest error value. Nevertheless, selecting an effective forecasting method needs to make statistic hypothesis testing whether it is efficient or not. The static error in the train set is analyzed if it is statistically acceptable. In case it is acceptable, the method is ready to be adopted in monthly, quarterly or yearly forecasting afterwards

The result of data evaluation regarding adopting such information in decision

According to the analysis of the static error in forecasting method as mentioned above, it is decided to use such a method as sale forecast for 8 weeks ahead in 3 products. The result shows that the sales of almond milk after forecasting are between 20,565 baht to 38,433 baht or 27,268 baht on the average. In addition, the sales of herbal drink are between 23,802 baht to 32,642 baht or 28,553 baht on the average. Moreover, the sales of baked pumpkin chips are between 4,950 baht to 7,866 baht or 6,963 baht on the average

As shown in the Table 5, the result of data evaluation regarding adopting such information in decision making by manager and five chiefs presents that the level of the total evaluation has 4.20 score (satisfied). The most rated unit is sales planning strategy followed by adequate information, the purchase management of raw material, accuracy of the result, workforce planning, as well as the ease of understanding the forecast, respectively.

Table 5 The result of data evaluation regarding adopting such information in decision

Index	Average	S.D.	Level
Sales planning strategy	4.80	0.45	Very satisfied
Adequate information	4.40	0.71	Very satisfied
The purchase management of raw material	4.20	0.45	Satisfied
Accuracy of the result	4.00	0.55	Satisfied
Workforce planning	4.00	0.71	Satisfied
The ease of understanding the forecast	3.80	0.45	Satisfied
Overall	4.20	0.55	Satisfied

5. Conclusions

This research examined the examine the appropriate forecasting model which forecasts the demand for 3 types of healthy food products including almond milk, herbal juice, and baked pumpkin chips. The study of the appropriate forecasting model has been brought about by using time series forecasting and accuracy analysis.

The study found that using sales data in forecasting method by adopting Moving Average, Exponential Smoothing and Linear Trend Line methods in these 3 products including almond milk, herbal drink, and baked pumpkin chips has given the different results. Firstly, Exponential Smoothing is appropriate to forecast for almond milk with MAPE

at 25.667%. Secondly, Linear Trend Line is appropriate to forecast for herbal drink with MAPE at 7.796%. Finally, Moving Average is appropriate to forecast for baked pumpkin chips with MAPE at 25.169%, respectively.

6. Recommendations

The study of the most appropriate method for sale forecasting in businesses shows that there are many techniques widely adopted by organizations. The given method in the study can be used in the analyzation and adapted in other time series that have similar movements. It can also be useful for time saving in the forecasting process as well as reducing mistakes in the forecast of new data.

However, there might be other factors to consider in real situation, Qualitative Forecasting Method such as bringing up the past experience of the CEO or the employees in consideration can help them in terms of production plan more effectively. This allows micro business owners to build up their businesses into medium and large businesses afterwards. Any countries with healthy medium and small businesses will lead to stable and strong economy system such countries

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8. References

Chiewpanich, T. & Mokkhamakkul, T. (2019). Forecasting model for promotional sales. *Research Journal Rajamangala University of Technology Thanyaburi*, 18(2). 31-40.

Gardner Jr., E. S. (1985). Exponential smoothing: The state of the art. *Journal of forecasting*. 4(1), 1-28.

Jayakumar, A., & Ezhilvani, C. M. (2018). Organic food products market forecast and opportunities. *International Journal of Research in Humanities, Arts and Science*, 2(2), 139-141.

Johnson, D., & King, M. (1988). *Basic forecasting techniques*, Butterworth, London.

Kongsap, P. & Kongsap, N. (2017). Forecasting supply of germinated brown rice: A case study of Ban-Noijomsri Enterprise, Sakon Nakhon province. *Phranakhon Rajabhat Research Journal (Science and Technology)*. 12(2). 92-108.

Limlawan, V., Jangruxsakul, S., & Wiwattanakornwong, K. (2022). Comparison of forecasting technique for improving the accuracy of sale forecast: A case study of plastic bottle manufacturing in Thailand. *Suthiparithat (Journal of Business and Innovation: SJBI)*, 36(2), 18-34.

Luanghan, I., (2019). Forecasting model for UHT milk sales volume by exponential smoothing. Proceeding of *the Conference on Industrial Engineering Network 2019* (pp.583-587). Thailand, July 21-24, 2019.

Musora, T., Chazuka, Z., Jaison, A., Mapurisa, J., & Kamusha, J. (2023). Sales Forecasting of Perishable Products: A Case Study of a Perishable Orange Drink. *Computer Science & Information Technology*, 13(4). 103-116.

Riansut, W. (2020) Forecasting model for export value of squid and products. *RMUTSV Research Journal*, 12(3), 537-551.

Wiwattanakornwong, K., Limlawan, V., Butrsai, S., Ninpan, N., Vannangkura, C., Thepkaew, A., Ngamdee, K., & Ploythummakun, P. (2023). Demand forecasting in beverage industry: A case study of business simulation game. *Suthiparithat Journal*, 37(1), 17-32.

Wofuru-Nyenke, O., & Briggs, T. (2022). Predicting demand in a bottled water supply chain using classical time series forecasting models. *Journal of Future Sustainability*, 2(2), 65-80.

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