An Ergonomic Approach to Design Restaurant Dinning Table During the Covid-19 Pandemic for Indonesian Society

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Abstract
In this Covid-19 pandemic situation, many people were worried and scared when they went outside their house. Because they could get infected by this virus, most people choose to stay at home rather than go outside. In Indonesia, the government has also made policies by implementing work, school, and college from home; not only that, but they also made policies in managing the culinary business, especially managing a restaurant during the Covid-19 pandemic. Unfortunately, not all restaurants in Indonesia already meet this health protocol; this is the main reason why people choose not to dine in at the restaurant. One way to apply health protocol on restaurant is by making an innovation or redesigning the table. By spread 100 questionnaires to the Indonesian Society regarding their view of the restaurant around their places and their needs on the restaurant table during this pandemic, we expected it could reduce their worry.
Keyword: Covid-19 pandemic, restaurant, restaurant table

1. Introduction
The Covid-19 pandemic has been running for half a year, and according to *Worldmeter.info,* more than 43 million people have been infected. More than 300 thousand people have been infected with more than 5 thousand cases of people infected every day in Indonesia. Because of this pandemic situation, the government implemented large-scale social restrictions by prohibiting people from going out without wearing masks. People must keep their distance wherever they are, and decreasing activities outside home such as school, work, and they even set up a visitor limit at the mall, recreation areas, restaurant, etc.

Based on *Kompas.com*, *a* restaurant permitted by the government could open for business, but there's a visitor limit. They only allowed 50% of the customer from the space provided. If the restaurant is located in the red zone, they only serve a drive-thru or take away order. Because of it, not many people want to dine in the restaurant, not only because of the visitor limit but also because of the restaurant's lack of health protocol equipment. People worried they could become infected by this virus, so they choose to have a meal at home or order some food via an online platform, based on *Tirto. id* there's an increase in online purchases around 38.3% during this pandemic situation.

This prohibition made to reduce public worried when dining in a restaurant. Product innovation is needed. Innovating or redesigning a restaurant table to meet with health protocols, we must pay attention to how this table could keep the distance between customer and waitress more than 1 meter and how it could prevent droplet splashed from to another customer. It could be another way to reduce public worried and suppress the spread of the virus at a restaurant to make another new virus spread cluster.

1.1 Objectives
This study aims to design a restaurant table that could meet the health protocol and customer expectations to reduce their worry when dining in a restaurant. To design a restaurant table with an ergonomics and anthropometrics approach, we must first know what the customer wants and what the customer needs. By fulfilling their wants and needs, we could design a good restaurant table for this Covid-19 pandemic situation.

2. Literature Review

2.1 Product Design

Design is the vehicle for a product change, and the more the products change, the more design will be needed. But it is not all good news; the failure rate for new products is another often-quoted business statistic (Baxter, 1995). Product design is the process of identifying a market opportunity, clearly defining the problem, developing a proper solution for that problem, and validating the solution with real users (Babich, 2018). So, product design is the process designers use to blend user needs with business goals to make successful products, optimizing the user experience in the solutions they make for their users.

2.2 Product Planning and Development

Product planning and development is a long-form dive into SWOT analysis, including identifying Strengths, Weaknesses, Opportunities, and Threats in any potential product. SWOT analysis gives an idea of why the company's product is suited to compete with others in the market and why others may not be competitive (Cameron, 2018). Product planning involves all of the internally focused decisions, steps, and takes necessary to develop a successful product. In other words, it involves everything it needs to do that will affect the product itself. In contrast, product development is the complete process of delivering a new product or improving the customer's existing one.

2.3 Ergonomics

Ergonomics is the scientific discipline concerned with understanding interactions among humans and other elements of a system and the profession that applies theory, principles, data, and methods to optimize human well-being and overall system performance (Jan Dul & Newmann, 2009). The commonly highlighted definitions of ergonomics are about the relationship between human safety and their work environments, such as mechanical systems and their job design. One factor of ergonomics is comfort. Comfort may be characterized by the ability to manipulate and control the device without undue muscle strain, pressure points, or other harmful ergonomic effects. Comfort is created from properly sized features located to fit the anatomy of the user (Price, et al., 2016).

2.4 Anthropometry

Anthropometry or anthropometrics is the study of human body measurements. At its most basic, anthropometrics helps scientists and anthropologists understand physical variations among humans (Adams, 2019). In the modern era, anthropometrics had more practical applications, particularly in the areas of workplace ergonomics. This theory is the Indonesian Society of an anthropometric table used to make or realize the product; this table is obtained from *Indonesia Ergonomics Association*.

Table 1. Anthropometry Table of Indonesian Society

Dimension	Information	5th	50th	95th
D1	Body height	117.54	152.58	187.63
D2	Eye height	108.24	142.22	176.2
D3	Shoulder height	96.6	126.79	156.99
D4	Elbow height	73.13	95.65	118.17
D5	Hip height	55.33	87.3	119.27
D6	The height of the vertebra	48.58	66.51	84.44
D7	Fingertip height	40.56	60.39	80.21
D8	High in a sitting position	60.93	78.1	95.28
D9	Eye-level in a sitting position	51.11	67.89	84.68
D10	Shoulder height in a sitting position	37.75	54.89	72.03
D11	Elbow height in a sitting position	10.84	24.65	38.47
D12	Thick thigh	3.75	14.7	25.65

Dimension	Information	5th	50th	95th
D13	Knee length	37.72	49.9	62.08
D14	Popliteal length	30.1	39.88	49.65
D15	Knee height	36.16	48.12	60.08
D16	Popliteal height	31.03	40.07	49.1
D17	Shoulder width	26.35	38.75	51.16
D18	The width of the upper shoulder	15.44	31.32	47.19
D19	Hip width	21.65	32.32	43
D20	Chest Thickness	9.73	19.22	28.71
D21	Belly Thickness	11.02	20.58	30.14
D22	Upper sleeve length	21.85	32.04	42.23
D23	Forearm length	26.66	40.53	54.4
D24	Length of the forward hand	48.36	66.18	84
D25	Shoulder-grip length forward	43.75	56.72	69.7
D26	Head length	10.77	17.91	25.05
D27	Head width	12.47	16.05	19.64
D28	hand length	11.64	17.05	22.47
D29	Hand width	3.69	9.43	15.17
D30	Foot length	14.59	22.73	30.87
D31	Foot width	6.29	9.14	11.98
D32	The length of the arm stretches to the side	111.41	152.71	194
D33	Elbow stretch length	57.17	79.88	102.59
D34	Height of hands grip in a standing position	138.32	185.76	233.2
D35	Grip height up in sitting position	80.24	113.42	146.61
D36	Length of Hands Grip	45.52	64.51	83.5

3. Methods

This study consisted of two phases, which are explained below:

3.1 Phase-1: Field Study

In this phase, a survey questionnaire was used for this study, and we conducted a survey twice. The first survey questionnaire was deployed to 100 people with different backgrounds, ages, occupations, etc. The questionnaire mostly consisted of what the people think of the restaurants around them during this pandemic situation. The second survey was deployed to 100 people, and the questionnaire mostly consisted of questions to develop the product to meet customer needs and wants.

3.2 Phase-2: Restaurant Dining Table Design

In this phase, based on the first phase of the survey questionnaire results, we will be designing a restaurant dining table using anthropometric data of the Indonesian Society.

4. Data Collection

4.1 Respondent View

Table 2 below presents the respondent's view regarding dining in restaurants during the Covid-19 pandemic.

Table 2. Respondent View

Questions	Respondents Answer	Percentage of Respondents (%)
Do your local restaurants meet health protocols?	Yes	43
	No	6
	Not all restaurants	51
How often do you go to the restaurant restaurants during the Covid-19 pandemic?	Never	12
	Sometimes	45
	Quite Often	30
	Often	10
	Very Often	3
How many people you usually invited when dining in a restaurant?	Never invited someone	7
	1-2 people	24
	3-4 people	53
	More than 5	16
On a scale of 1 to 5, how worried are you when dining in at a restaurant during the Covid-19 pandemic?	1	19
	2	22
	3	30
	4	23
	5	6

Based on Table 1, some of the restaurants haven't met the government's health protocol in Indonesia. According to *CNN Indonesia*, a person in charge of business, especially in the culinary sector, must adjust the distance between the seat and the table. It is more than 1 meter, strives for non-cash payment, and sets the number of visitors to avoid crowds, etc. Unfortunately, some of the respondents found that restaurants near their places haven't met the health protocol.

In the Covid-19 pandemic, there aren't many people went to the restaurant anymore; in fact, up to 12 people never went to a restaurant; although there are still some people who went to the restaurant very often, the majority of people decided to not go to the restaurant often during this Covid-19 pandemic. From the survey questionnaire's result, many people invited their friends or family when dine in at the restaurant; only around 7 people went to the restaurant alone. In this pandemic situation, many restaurants didn't allow a customer dining with a large group of people; some of them only allowed up to 4 or even 2 customers in the group. The number of worried people when dining at a restaurant and those who aren't are equal, but there are still 6 anxious people. And most of them felt normal when dining at a restaurant.

This result about the respondent view would become a reference to know what most Indonesian people feel when they went to restaurants on this Covid-19 pandemic.

4.2 Customer Needs

To determine the level of customer needs, we are using the Likert Scale. Table 3 below presents the respondent's need for restaurant tables during the Covid-19 pandemic.

Table 3. Customer Needs

No.	Requirement Matrix	Number of Respondents for Each Interest Scale				
		1	2	3	4	5
1.	The importance of product durability	0	0	15	31	54
2.	The level of importance of convenience to the product	0	0	4	15	81
3.	The level of aesthetic importance to the product	0	0	13	30	57

4.	The level of importance of safety to the product	0	0	0	12	88
5.	The importance of ease of use in the product	0	0	17	45	38
6.	The level of importance of product innovation	0	0	31	34	35

The following is a description of the scale from the table above:

- Scale 1 = unimportant
- Scale 2 = slightly important
- Scale 3 = moderately important
- Scale 4 = important
- Scale 5 = very important

5. Results and Discussion

5.1 Weight Value on Table of Customer Needs

It is essential to know which aspects are fundamental to the customer. It's necessary to calculate the Likert Scale of customer needs to design the table to meet customer needs and wants. The table 4 is the calculation result of the Likert Scale.

Table 4. Percentage Weighted Variable Importance Level

Variables	1	2	3	4	5	Total	Percentage
The importance of product durability	0	0	45	124	270	439	87.8%
The level of importance of convenience to the product	0	0	12	60	405	477	95.4%
The level of aesthetic importance to the product	0	0	39	120	285	444	88.8%
The level of importance of safety to the product	0	0	0	48	440	488	97.6%
The importance of ease of use in the product	0	0	51	180	190	421	84.2%
The level of importance of product innovation	0	0	93	136	175	404	80.8%

The following table shows the level of importance of customer needs, based on table 5.

Table 5. Level of Importance of Customer Needs

No.	Variables	Percentage
1	The level of importance of safety to the product	97.6%
2	The level of importance of convenience to the product	95.4%
3	The level of aesthetic importance to the product	88.8%
4	The importance of product durability	87.8%
5	The importance of ease of use in the product	84.2%
6	The level of importance of product innovation	80.8%

As we could see from the table above, most of the costumer things the essential variables or aspects is the product's safety with a percentage of 97.6%, so the products' safety is our number 1 priority. The second aspect we must pay attention to the convenience of the products with a percentage of 95.4%, to make a suitable product is by designing the product, so it's neither too high nor too low for the user. The third aspect is the aesthetic of the product with a percentage of 88.8%; in the modern era, most people prefer products with simple models but aesthetics rather than a lot of ornament. The fourth aspect is the durability of a product with a percentage of 87.8%. Applying this aspect to the product can be done using a strong material as a base material. The fifth aspect is the ease of use in the product, with a percentage of 84.2%. To realize this aspect is by putting the innovations or additional features where it won't bother consumers. And the last or the sixth aspect is the innovation of product with percentage 80.8%, even though this aspect is on the last places doesn't mean it's not essential. Still, it meant this product doesn't need a lot of innovation during this pandemic situation.

5.2 Sketch of The Restaurant Table During Covid-19 Pandemic

It is essential to realize the product's final sketch; it's needed to make a hand sketch of the product. The figure 1 is the hand sketch of the product.

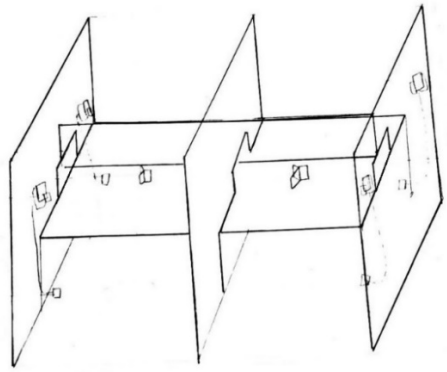


Figure 1. Hand Sketch of The Restaurant Table During Covid-19 Pandemic

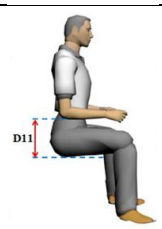
Above is the figure of hand sketch of the product. There are four acrylic bulkheads located on both sides of the table, and the table's center horizontally and vertically. There are three little holes on the bulkhead center so the waitress could pass the food to the customer and still kept their distance. There are two rotating standing for QR codes on the center of the table; it could be used for payment or accessing a virtual menu, so the customer doesn't need to touch the book menu or go to the cashier for payment transactions. And on the bulkhead, there were four hand sanitizers for each user, and they could use it by stepping on the pedals placed near their feet.

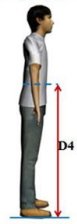
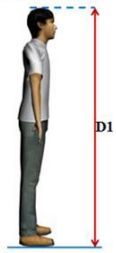
This sketch is just a preliminary overview, which will be redeveloped to fulfill the customer's wants and needs so that they wouldn't worry about a restaurant during this pandemic situation.

5.3 Anthropometric Data

Good design is a comfortable design. To make this product comfortable using a tall or short person, we need to make this product or table based on the anthropometric data. In this study, we are using the Indonesian Society's anthropometry data and adjusting the market table's size. The anthropometric data we're using can be seen in the table 6 below.

Table 6. Anthropometric Data

Component	Dimensions	Description	Percentile	Description (cm)	Looseness (cm)	Final Result (cm)
Table Width		Sleeve Length	5%	48.36	-5.86	42.5
Table Height		Elbow Height in Sitting Position	5%	88.6	- 8.6	80

Component	Dimensions	Description	Percentile	Description (cm)	Looseness (cm)	Final Result (cm)
Table Length		Elbow Length	95%	102.6	+ 42.4	145
Hand Sanitizer Position		Elbow Height	5%	73.13	- 0.17	70
Bulkhead Height		Body Height	95%	187.6	+ 0.4	188

5.4 Final Sketch of The Restaurant Table During Covid-19 Pandemic

The final sketch of this product was made using Autodesk Fusion 360 software; the final sketch was created based on references from the questionnaire results and hand sketch of the product. The figure 2 is the final sketch of the product and the description of its features.

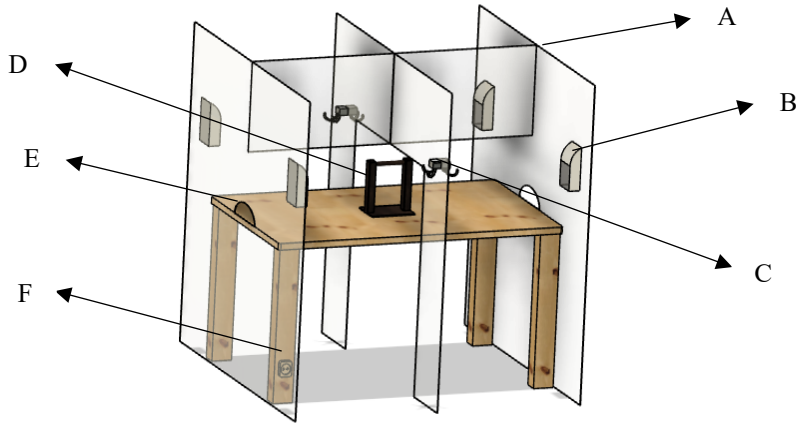


Figure 2. Final Sketch

The following is a description of the scale arrow above:

- A = Acrylic Bulkhead
- B = Hand Sanitizer
- C = Hanger
- D = Standing for QR Code
- E = Hole for Food Access
- F = Electric Socket

The final sketch table concept is similar to the hand sketch; it's just that there are more features added to the final concept. The bulkhead position is still the same as on hand sketch, four acrylic bulkhead which is located on both sides of the table, and on the center of the table horizontally and vertically. But there's only one standing for QR code on the center of the table, and it could be used by flipping the paper. There are four hand sanitizers and four hangers, too; both are attached to the bulkhead. The hand sanitizer can be used by using a sensor, not a pedal. And on the near end of the table feet, there are only two electric sockets. The table 7 is the dimension of the table.

Table 7. Table Dimension

No	information	Dimension (mm)	Tolerance (mm)
1	Table Length	1450	± 5
2	Table Width	880	
3	Table Height	800	
4	Table Thickness	40	
5	Table Leg Length	90	
6	Table Leg Width	70	
7	Centre Bulkhead Length (Horizontal)	1450	
8	Centre Bulkhead Length (Vertical)	1480	
9	Bulkhead Width	1450	
10	Bulkhead Height	1880	
11	Bulkhead Thickness	30	
12	Bulkhead Hole Height	10	
13	Length of Hand Sanitizer	130	
14	Width of Hand Sanitizer	130	
15	Height of Hand Sanitizer	180	
16	Length of QR Code Standing	220	
17	Width of QR Code Standing	160	
18	Height of QR Code Standing	233	
19	Support Tube Diameter	20	
20	Electric Socket Length	82	
21	Electric Socket Width	72	
22	Hanger Length	3	
23	Hanger Width	13	

5.5 Validation

In conducting the validity test, SPSS (Statistical Product and Service Solutions) software can be used with the Pearson Bivariate correlation testing technique. In determining whether an item is valid or not, a significant correlation coefficient test is usually carried out at a significant level of 0.05. An item is considered valid if it has a significant correlation to the total score. The total score is the sum of all items. The following is the basis for decision making in the validity test by comparing the calculated r-value, the r table value, and the significant value with a probability of 0.05.

1. If r count> r table, then the questionnaire's question or statement has a significant correlation to the total score (the item is declared valid).
2. If r count <r table, then the questionnaire's question or statement does not have a significant correlation with the total score (the item is declared invalid).

The following is table r-value, which can be seen in Table 8

Table 8. r-value Distribution Table

N	*The Level of Significance*		N	*The Level of Significance*	
	5%	1%		5%	1%
3	0.997	0.999	38	0.32	0.413
4	0.95	0.99	39	0.316	0.408
5	0.878	0.959	40	0.312	0.403
6	0.811	0.917	41	0.308	0.398
7	0.754	0.874	42	0.304	0.393

N	*The Level of Significance*		N	*The Level of Significance*	
	5%	**1%**		**5%**	**1%**
8	0.707	0.834	43	0.301	0.389
9	0.666	0.798	44	0.297	0.384
10	0.632	0.765	45	0.294	0.38
11	0.602	0.735	46	0.291	0.376
12	0.576	0.708	47	0.288	0.372
13	0.553	0.684	48	0.284	0.368
14	0.532	0.661	49	0.281	0.364
15	0.514	0.641	50	0.279	0.361
16	0.497	0.623	55	0.266	0.345
17	0.482	0.606	60	0.254	0.33
18	0.468	0.59	65	0.244	0.317
19	0.456	0.575	70	0.235	0.306
20	0.444	0.561	75	0.227	0.296
21	0.433	0.549	80	0.22	0.286
22	0.432	0.537	85	0.213	0.278
23	0.413	0.526	90	0.207	0.267
24	0.404	0.515	95	0.202	0.263
25	0.396	0.505	**100**	**0.195***	0.256
26	0.388	0.496	125	0.176	0.23
27	0.381	0.487	150	0.159	0.21
28	0.374	0.478	175	0.148	0.194
29	0.367	0.47	200	0.138	0.181
30	0.361	0.463	300	0.113	0.148
31	0.355	0.456	400	0.098	0.128
32	0.349	0.449	500	0.088	0.115
33	0.344	0.442	600	0.08	0.105
34	0.339	0.436	700	0.074	0.097
35	0.334	0.43	800	0.07	0.091
36	0.329	0.424	900	0.065	0.086
37	0.325	0.418	1000	0.062	0.081

Based on Table 8, the distribution of the r-value that has been obtained, then the calculation of the validity test using SPSS software with the Pearson Correlation testing technique on the 6 criteria for the level of importance of the product. After that, the t value will be seen and compared with the r table's value, where the value of r the table is 0.195. The validity calculation can be seen in Figure 3.

Correlations

		Daya_Tahan	Kenyamanan	Estetika	Keamanan	Kemudahan	Inovasi	Total
Daya_Tahan	Pearson Correlation	1	.236*	.185	.137	.321**	.282**	.583**
	Sig. (2-tailed)		.018	.065	.173	.001	.004	.000
	N	100	100	100	100	100	100	100
Kenyamanan	Pearson Correlation	.236*	1	.237*	.338**	.238*	.172	.514**
	Sig. (2-tailed)	.018		.017	.001	.017	.086	.000
	N	100	100	100	100	100	100	100
Estetika	Pearson Correlation	.185	.237*	1	.044	.244*	.147	.588**
	Sig. (2-tailed)	.065	.017		.661	.014	.145	.000
	N	100	100	100	100	100	100	100
Keamanan	Pearson Correlation	.137	.338**	.044	1	.077	.227*	.364**
	Sig. (2-tailed)	.173	.001	.661		.447	.023	.000
	N	100	100	100	100	100	100	100
Kemudahan	Pearson Correlation	.321**	.238*	.244*	.077	1	.547**	.737**
	Sig. (2-tailed)	.001	.017	.014	.447		.000	.000
	N	100	100	100	100	100	100	100
Inovasi	Pearson Correlation	.282**	.172	.147	.227*	.547**	1	.724**
	Sig. (2-tailed)	.004	.086	.145	.023	.000		.000
	N	100	100	100	100	100	100	100
Total	Pearson Correlation	.583**	.514**	.588**	.364**	.737**	.724**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	
	N	100	100	100	100	100	100	100

Figure 3. Results of Validity Testing with SPSS

The table 9 is the conclusion of the r count and r table.

Table 9 Final Result of Validity Test

Variables	R-Value	R Table	Result
The importance of product durability	0.583	0.195	Valid
The level of importance of convenience to the product	0.514	0.195	Valid
The level of aesthetic importance to the product	0.588	0.195	Valid
The level of importance of safety to the product	0.364	0.195	Valid
The importance of ease of use in the product	0.737	0.195	Valid
The level of importance of product innovation	0.724	0.195	Valid

Based on the validity test's final results, it can be concluded that the data for each variable is valid.

6. Conclusions

To conclude, we have done systematic steps to gathering information that is needed for this product. We believe that customer satisfaction is our main goal in making this product especially in this pandemic era, we want to reduce the risk of people being exposed to the virus by using our product. First, we spread the first questionnaire to 100 respondents about their view or thought regarding dining in restaurants during the Covid-19 pandemic. From the questionnaire, we know there are still a few restaurants that didn't meet with health protocol, and a lot of people feel worried if they are going to dine in at a restaurant. From the survey questionnaire's result, a lot of people invited their friends or family when dine in at the restaurant; only around 7 people went to the restaurant alone. And from the second questionnaire, we spread the questionnaire to 100 respondents about their needs and what they thought best for the restaurant's table during this Covid-19 pandemic.

Based on the questionnaire results that have been distributed, the majority of respondents want restaurant tables with high-security aspects and realize it. The table's design to be surrounded by acrylic bulkhead with a little bit of innovation by attached hand sanitizer for sterilized their hands before eat and hanger can also be used to hand their mask or cap, also put standing for QR code and electric socket on the table. By adjusting to the anthropometric data we make our products comfortable and in accordance with people's daily use.

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Biographies

Monica Aprillita is a 19-year-old student in the Industrial Engineering Department at Tarumanagara University since 2019. While studying, she also joins two Work programs from IMADUTA; the first is BAKSOS or Social Service, and the second is IEGTS or Industry Engineering Goes to School. In her first year, she joins IDEAS Indonesia Studentpreneur BATCH 6 contest, and in her third year, she joins the IEOM contest.

Cherry Atmodjo is a 19-year-old student in the Industrial Engineering Department at Tarumanagara University since 2019. She actively joins an organization, namely UKM MARSIPALA (Mahasiswa Teknik Pencinta Alam) as a secretary.

Michael Kartawijaya, a student of industrial engineering at Tarumanagara University, started studying in 2019. While studying, I joined many organizations from IMADUTA (the Tarumanagara University Industrial Engineering Student Association) to join the Work Program, one of which was IMADUTA CUP. I joined a Catholic organization called ADHYATMAKA, and now I am the administrator of the ADHYATMAKA day for engineering student representatives.

Nicholas Adrian Nathaniel is a student in the Industrial Engineering Department at Universitas Tarumanagara since 2019. He actively joins IMADUTA (Ikatan Mahasiswa Teknik Industri as the Hubanlem (Hubungan Antar Lembaga) division since 2020.

Lina Gozali is a lecturer at the Industrial Engineering Department of Universitas Tarumangara since 2006 and a freelance lecturer at Universitas Trisakti since 1995. She graduated with her Bachelor's degree at Trisakti University, Jakarta - Indonesia. She got her Master's Degree at STIE IBII, Jakarta – Indonesia, and she recently got her Ph.D. at Universiti Teknologi Malaysia, Kuala Lumpur – Malaysia in 2018. Her apprentice college experience was in the paper industry at Kertas Bekasi Teguh, the shoe industry at PT Jaya Harapan Barutama, and the automotive chain drive industry at Federal Superior Chain Manufacturing. She teaches Production System and Supply Chain Management Subjects. She researched the Indonesian Business Incubator for her Ph.D. She has written almost 70 publications since

2008 in the Industrial Engineering research sector, such as Production Scheduling, Plant Layout, Maintenance, Line Balancing, Supply Chain Management, Production Planning, and Inventory Control. She had worked at PT. Astra Otoparts Tbk before she became a lecturer.

Frans Jusuf Daywin was born in Makasar, Indonesia on 24th November 1942. is a lecturer in the Department of Agricultural Engineering at Faculty of Agricultural Technology Bogor Agricultural University since 1964 conducted teaching, research, and extension work in the field of farm power and machinery and become a professor in Internal Combustion Engine and Farm Power directing and supervising undergraduate and graduate students thesis and dissertation and retired as a professor in 2007. In 1994 up to present as a professor in Internal Combustion Engine and Farm Power at Mechanical Engineering Program Study and Industrial Engineering Program Study Universitas Tarumanagara, directing and supervising undergraduate student's theses in Agricultural Engineering and Food Engineering Desain. In 2016 up to present teaching undergraduate courses of the introduction of concept technology, research methodology, and seminar, writing a scientific paper and scientific communication, and directing and supervising undergraduate student's theses in Industrial Engineering Program Study at the Faculty of Engineering Universitas Tarumanagara. He got his Ir degree in Agricultural Engineering, Bogor Agricultural University Indonesia in 1966, and finished the Master of Science in Agricultural Engineering at the University of Philippines, Los Banos, the Philippines 1981, and got the Doctor in Agricultural Engineering, Bogor Agricultural University Indonesia in 1991. He joined 4-month farm machinery training at ISEKI CO, AOTS, Japan in 1969 and 14 days agricultural engineering training at IRRI, Los Banos the Philippines, in March 1980. He received the honors "SATYA LANCANA KARYA SATYA XXX TAHUN" from the President of the Republic of Indonesia, April 22nd, 2006, and received appreciation as Team Jury from the Government of Indonesia Minister of Industry in Industry Start-Up 2008. He did several research and survey in the field of farm machinery, farm mechanization, agricultural engineering feasibility study in-field performance and cost analysis, land clearing and soil preparation in secondary forest and alang-alang field farm 1966 up to 1998. Up till now he is still doing research in designing food processing engineering in agriculture products. Up to the present he already elaborated as a conceptor of about 20 Indonesia National Standard (SNI) in the field of machinery and equipment. He joins the Professional Societies as a member: Indonesia Society of Agricultural Engineers (PERTETA); Indonesia Society of Engineers (PII); member of BKM-PII, and member of Majelis Penilai Insinyur Profesional BKM-PII.

Carla Olyvia Doaly is a lecturer in the Industrial Engineering Department at Universitas Tarumanagara graduated with my Bachelor's degree from Institut Teknologi Nasional Malang, which study the Industrial Engineering program, then continued my Master Degree at Institut Teknologi Bandung majoring in Industrial engineering and management and a special field of Enterprise Engineering. I am very interested in studying industrial engineering by doing research related to System Design and Engineering, Supply Chain Management, Operations Research and Analysis, Information System Management, Occupational Health and Safety, Facilities Engineering, Quality and Reliability Engineering

Lamto Widodo is a lecturer at Universitas Tarumanagara since 1994, joining the Mechanical Engineering Department. Involved as a team for the opening of the Industrial Engineering Department in 2004-2005. Starting in 2005, as a lecturer in the Industrial Engineering Department. Obtained a Bachelor's degree at the Sepuluh Nopember Institute of Technology Surabaya (ITS), then completed a Master degree at the University of Indonesia (UI) and graduated with the title Dr. at the Bogor Agricultural Institute (IPB). He is engaged in research and publication in the fields of Product Design and Ergonomics, Production Systems and Engineering Economics, and teaches at various universities in Jakarta. Has published nearly 30 publications in the field of Industrial Engineering research both nationally and internationally. Active in various professional organizations, especially in the field of Ergonomics (IEA), as well as active in the organization of the Indonesian Industrial Engineering Higher Education Cooperation Agency (BKSTI).

Adianto was born in Semarang, Indonesia on 29th April, 1955. Adianto completed his "Sarjana Fisika Degree" in 1982 from the Physics Department of the Faculty of Sciences and Mathematics, Gadjah Mada University, Yogyakarta. In 1978 when he got his Bachelor of Science in Physics (B.Sc.) he started working as a Staff of "Field of Nuclear Physics Laboratory"," Pure Materials Research Center and Instrumentation Yogyakarta", Atomic Energy Agency (BATAN). In 1986 to 1993 he received a scholarship from the Ministry of Research and Technology of the Republic of Indonesia to continue his studies in England at the Department of Electronic and Electrical Engineering, University of Salford, England. He received his M.Sc. degree in the field of Computer Instrumentation in 1988 and a Ph.D. degree in the field of Material Science in 1993. He returned back to Indonesia, then in 1994 he moved to Jakarta and appointed

as a "Head of Engineering and Advanced Technology", (Echelon IIIA) at "Nuclear Science and Technology Empowerment Center", Atomic Energy Agency, BATAN, Jakarta. In 2000 he was assigned to the Ministry of Research and Technology to serve as Assistant Deputy fpr Science Accreditation and Development Center (Echelon IIA) and in 2005 he was assigned as Assistant Director for Academic Affairs, to Organize Graduate Research in PUSPIPTEK Serpong. In 2008, he took early retirement as a Governmen Official to take a full time lecturer at Universitas Tarumanagara, Jakarta. Adianto started his profession as a lecturer in the Department of Mechanical Engineering, Faculty of Engineering, Tarumanagara University and the Department of Mechanical Engineering, Faculty of Industrial Technology, Trisakti University of Indonesia from 1994 until now. He has taught mathematics, mechatronics, English and physics, but Physics is the main subject he teaches. As a full-time lecturer at Universitas tarumanagara, in 2012 he was appointed as a Vice Dean for Academic and Student Affairs, Faculty of Engineering. In 2016, he was appointed as a Director for Student Affairs Universitas Tarumangara. During his profession as a researcher at the Atomic Energy Agency, the Ministry of Research and Technology and as a lecturer at Tarumanagara University, Adianto has published scientific and research papers of more than 35 titles at home and abroad.

Ahmad is currently active as a lecture at Industrial Engineering Department, Universitas Tarumanagara. Mr. Ahmad graduated his Bachelor's degree of Industrial Engineering at Universitas Islam Indonesia and his master's degree in University of Indonesia. He taught Operation Research and Modeling System.

Lithrone Laricha Salomon is a lecturer at Industrial Engineering Department of Universitas Tarumanagara since 2006. She graduated from Universitas Tarumanagara with a Bachelor's Degree in Mechanical Engineering. She continued her study and got her Master's Degree from Industrial Engineering Program at Universitas Indonesia. She teaches a subject related to quality management system such as Total quality management, Quality Control, Design of Experiment and Industrial Statistic. Besides teaching she also did some research and carrying out a number of community service activities in many places around Indonesia. She has written 40 publication on International and national proceeding and journal since 2007.

Agustinus Purna Irawan was born in Mataram - Musirawas, South Sumatera, August 28, 1971. Is a Lecturer at Universitas Tarumanagara and has served as Chancellor since 2016 until now. Obtained a Bachelor of Mechanical Engineering from the Faculty of Engineering, Gadjah Mada University (1995), a Masters in Mechanical Engineering from the Faculty of Engineering, University of Indonesia (2003), a Doctor of Mechanical Engineering from the Faculty of Engineering, University of Indonesia (2011), Professional Engineer (Ir) Mechanical Engineering from the Faculty of Engineering, Gadjah Mada University (2019) and Professor of Mechanical Engineering from the Ministry of Education and Culture (2014). The fields of scientific research and publication include: Product Design and Development, Strength of Materials, Natural Fiber Composites with implementation in the field of prosthesis and automotive components. Obtaining Research and Community Service Grants for Higher Education / Research and Technology BRIN / Untar / Others ≥ 100 titles; Patents: 7 and still in process: 4; Copyright: 9 books; Textbooks: 6 books; Book Chapter: 2 chapters; Scientific articles ≥ 100 titles. Obtained a Professional Certificate, namely the Educator Certificate, the Intermediate Professional Engineer Certificate (IPM) of the Indonesian Engineers Association (BKM PII) Vocational Engineer Association (BKM PII), and the ASEAN Engineer Certificate (ASEAN Eng.) From the ASEAN Federation Engineering Organizations (AFEO). He is active in education, various scientific activities, the world of business, professional associations, and various social activities. Received several awards: Best Graduate S2 UI GPA 4.00 cum laude (2003); First best Lecturer Kopertis Region III DKI Jakarta (2011); Best Presentation at the Seminar on Research Results of the Centralized Program, PUPT Dikti (2014); Honorary Member of The ASEAN Federation of Engineering Organizations, AFEO (2018); Best PTS Chancellor for the Academic Leader Award Program (2019).