

Comparative Mental Workload Assessment of Work Arrangements for Call Center Agents

**Charlene H. Ballad, Sheeno F. Dasmariñas, John Margel A. Otalla,
Rhea Ann G. Perez, and Maria Louise C. Valenzuela**

Industrial Engineering Department
Technological Institute of the Philippines – Manila
363 P. Casal St., Quiapo, Metro Manila, Philippines
mchballad@tip.edu.ph, msfdasmarinas@tip.edu.ph, mjmaotalla@tip.edu.ph,
mragperez@tip.edu.ph, mmlcvalenzuela@tip.edu.ph

Janina Elyse A. Reyes

Professor of Industrial Engineering Department
Technological Institute of the Philippines
363 P. Casal St., Quiapo, Metro Manila, Philippines
jereyes.ie@tip.edu.ph

Abstract

With the repercussions of the pandemic continuously affecting the different parts of the world, the emergence of varying work arrangements became vital for industries. Implementation of work-from-home, office-based, and a combination of both work arrangements are necessary to deal with the restrictions imposed by the government. The researchers conducted the study to compare the mental workload of the call center agents among their work arrangements. The researchers used Slovin's Formula to calculate the sample size using a 5% margin of error. For assessing the mental workload of the Call Center Agents associated with their work arrangements, the researchers utilized the NASA Task Load Index. It is found that the mental workload of work-from-home call center agents is just high, with a mean weighted rating of 72.16 compared to the very high mental workload of call center agents working office-based and in combined work arrangements, with the mean weighted rating of 77.53 and 79.60, respectively. Furthermore, to determine if the work arrangements, types of call center agent, types of service, and work shifts of the call center agents have a certain effect on their mental workload, the researchers conducted the Analysis of Variance Tests. As a general result, no main effects and significant interaction of all the factors to the call center agents' mental workload were found, thus, combination of all these factors are what makes the mental workload high and very high.

Keywords

Call Center Agents, Work Arrangements, Mental Workload, NASA Task Load Index, and Analysis of Variance

1. Introduction

With the magnitude of the COVID-19 pandemic, there is an urgent need not to return to business-as-usual when the crisis is over (Gössling et al., 2020). However, it has been almost three years since the pandemic began. The people have to adapt to the changes and set new usual ways of living. In the first year, the impact of the COVID-19 pandemic in the Philippines was so worst that it landed the country's GDP at its lowest point since 1947. It could be because the spread of the virus infection in that year was quick that it had to restrict businesses from operating and its citizens from roaming around the streets. Given the drastic impact on the economy, the government had to find ways to cope with the damages. Thus, in 2021, the government gradually calms its restriction down by allowing limited business operations done office-based.

One of the significant industries massively hit by the pandemic is the IT-BPO. It is also one of the industries that benefited from the loosened restrictions. They can also be considered a pioneer industry that adapted to the new normal in terms of work arrangements flexibility, as they placed their employees and call center agents in a work-from-home arrangement. Since the restrictions have loosened up, they were also allowed to operate on-site and enable call center

agents to work office-based and a combination of both work arrangements. However, only limited employees are permitted.

1.1 Objectives of the Study

This study aims to assess the mental workload of the call center agents who are in a work-from-home arrangement, those who are still in an office-based arrangement, and the call center agents who are now working in both arrangements. The assessment shall enable the researchers to provide complex recommendations to improve the performance of the call center agents and BPO companies in general, as it's one of the thriving fields even in the face of COVID-19 virus; through this study, other companies can use this as part of decision making to make their company more ready for any other reason of work and business flow disruption, may it be nature or man-made disruptions, in the future.

1. Convene the data subjects to the work arrangement strata of call center agents—office-based set up, work-from-home arrangement, combined work arrangement, and those who have worked in an office before and now in a work-from-home arrangement.
2. Determine the preferences of the call center agents towards working arrangements and schedules.
 - 2.1 *If they prefer their current working arrangement.*
 - 2.2 *If their schedules overlap the boundaries between life and work.*
3. Compare the performance rate of employees in every work arrangement subjected to their mental workload assessment.
 - 3.1 *How their current working arrangement affects their performance output?*
 - 3.2 *If there would be any changes in performance output and mental workload if assigned in their preferred working arrangement.*
4. Set a proposal regarding assigning call center agents with a suitable working schedule and arrangement that would decrease the mental workload utilizing the NASA TLX tool and ANOVA tests.

2. Review of Related Literature and Studies

Nowadays, work-from-home arrangements have become the new norm for the employees of the IT industry since the rise of the COVID-19 pandemic around the world. Many businesses have adopted this because it can reduce the employees' commuting time, control their hours in working, increase job satisfaction, and improve work-life balance during pandemic. Nevertheless, having a work-from-home arrangement compared to working from the office can affect the employees' productivity (Gibbs et al. 2021). Based on their findings, employee characteristics, children at home, and office work can impact an employee's work from home productivity. In addition, conducting tasks in a virtual environment is more complex than working from the office because the time spent directly is more diminutive than interacting with co-workers and the higher-ups. Thus, focusing swill is more likely to be diverted, which leads to declining productivity. Furthermore, children at home can also impact the employees' productivity, especially during pandemic since schools were closed for them. Nithya et al. (2021), stated that despite IT employees' benefits from working at home, obtaining an unhealthy lifestyle could also happen. Affecting the employees' mental health and any relationship they have can be affected because working from home might remove the gap between the life and work of the employees. According to the 45% of the respondents surveyed, one of the biggest problems they face is difficulty focusing on work because of the noise coming from the family members and various activities from their neighborhoods. Furthermore, unexpected visitors might pop up on the employees' doorstep, and family members who think the employee can just easily do the home-related tasks can be considered distractions.

It is also important to assess the mental workload of employees especially those who work from home as it may affect their work performances. In a study of Dasmarias et al. (2020), they assessed the mental workload of the work-from-home employees by which IT-BPO was the second among the top four industries they found to have the major number of work-from-home employees during the COVID-19 pandemic, found to be having a very high mental workload. Despite that, in the article of Call Center Agents' Job Burnout and Its Influence on their Job Satisfaction During the COVID-19 Pandemic in the Philippines (2021), the agents that are working during the pandemic is still occurring and are still having a high level of job satisfaction and still finding their work engaging amidst the job burnout. Given that the employers are in check of the agents' mental health and workload. According to Montalbo (2016), the study that was conducted to determine the burnout level of the call center agents in Manila are different based on the age group.

The younger employees are more likely to experience stress and burnout as they are not fully trained to handle emotional stress that are coming from frustrated callers. Even though they are well trained to the technical training, skills such as controlling and handling emotional stress are not provided prior to their training. Being new to the environment will add more stress and pressure to satisfy customer needs and show a good performance to the company. While as the tenured and aged workers are more likely to handle the stress better as they have already experienced the working environment for a long period of time and was able to cope with the constant changes of customer service. The researchers will have to take note of that as it contradicts a little bit with Magaya Aiken Dale (2021), the level of burnout between the younger and older call center agents are on the same level. Though there is a higher tendency for males to experience depersonalization caused by burnout than female agents.

In a figure presented in the study of Akanji (2016), they categorized emotional labor intensity, work standardization, work overload, monitoring intensity, customer stress, job control, and scripted dialogue as “Themes emerging as factors causing call center stress”. On the brighter side, financial benefits can also be a major factor that could reduce the stress faced by the employees at the work place. Though they met their Key Performance Indicator (KPI), a high percentage expressed their dissatisfaction on the level of compensation offered to the agents (Bolaji 2018). Florian Ederer and Gustavo Manso (2013), have written on their previous research in economics shows that compensation based on the pay-for-performance principle is effective in inducing higher levels of effort and productivity. On the other hand, research in psychology argues that performance-based financial incentives inhibit creativity and innovation. Still, relaxation is the best stress management technique on call center agent, it is also recommended to do physical exercise and have a good time management. With relaxation, physical exercise and good time management, the morale and confidence of call center agents increased (Shobri et al. 2013). On a side note, cooperation and competition use as an analysis to develop and analyze the productivity of call center agents in China by doing a one-day workshop and daily practices (Tjosvold et al. 2014). Proving that workshops can also be a positive thing for the employees given that it would be shouldered by the employer, limiting financial stress to the employees.

On a deeper level, the researchers have also taken note of some of the articles about process improvement. In a study entitled “Real-time Predictive Routing”, described methods, apparatus, and systems designed or created to direct customer communication to the best agent who is more knowledgeable to the customer’s needs or problems. In this study, it also talked about predetermined work threshold that will be based on the hours worked by the agents divided by the logged in time of the agents. Call-routing ability and efficiency is said to be one of the most important things to remember in proving a better service to the customers of BPO companies. Mistakes such as routing or connecting the customers to overloaded agents will just add to the mental workload of the agent and aside from that, will have a hard time to prepare to help with the client’s difficulty or troubles (Conway et al. 2017). Another invention that the researchers know can be part of the strategy of the company to increase efficiency and effectiveness, and lessen the mental workload of the agents, is through “Customer Portal of an Intelligent Automated Agent for a Contact Center.” This portal includes the customer profile and/or customer’s database. Wherein a memory includes instructions that when executed by the processor, causes to transmit a command to direct the customer to an automated agent that is made of artificial intelligent engine, that can also aid in the detection of emotion during the conversation of the customer and agents, which will show other databases with similar problems that might help to solve the customer’s problems or queries faster. Though this study is about an automated agent for a BPO company, the researchers believe that this could also be another great invention that a lot of companies can incorporate to their work system and method to lessen the mental workload of the agents, such invention can solve trivial problems of the customers so that the agents can focus on customers who needs certain attention from a working live agent (Riahi et al. 2019).

Aside from the process improvement implementations the employers can do, according to Khan, M. A. S., & Du, J. (2014), turnover in call centers is a big problem that managers face nowadays. Psychologists note that many young individuals employed in call centers are vulnerable to burn-out stress syndrome (BOSS), symptoms of which include constant exhaustion, sleeplessness and variation of the body’s 24-hour biological pulse. This is a big contributor to their mental workload. Lastly, in the article of Michael Atkin and Laura Kewley (2020), a complaint has been received by the president of a local union BPO Industry Employees Network, about employees are sleeping in the training and recruitment area and that there is just one shower available. Concerned that workers are being forced to choose between working in hazardous circumstances and working at home and not even being paid enough.

3. Methods

The researchers used the Slovin’s Formula to determine the sample size needed to accurately assess the mental workload of the call center agents based here in the Philippines. A probability sampling method of simple random

sample. With the equation $n = N / (1 + Ne^2)$; n = sample size, N = population size, e = margin of error. The margin of error used is 5% with confidence level of 95% and population size of 1.3 million people. With that, the computed sampling size is at least 400 individuals.

The NASA-TLX did not provide categorical interpretation for the mean weighted rating of the mental workload. To provide clear interpretation on the level or amount of mental workload that the subjects have, the researchers used the scale interpretation presented in Table 1—authored by DiDomenico and Nussbaum (2008); Şeker (2014) as cited in Campoya, Fabian & Hernandez, Juan & Maldonado, Aide & González-Muñoz, Elvia. (2020). The scale interpretation is also used to interpret the scale percentages resulted from the survey of six subscales from all the work arrangements.

Table 1. Scale Interpretation

Low	Medium	High	Very High
0-25	26-50	51-75	76-100

Following the procedures, researchers then determine if there is a correlation between the given information, which is the six subscales; and also undergone ANOVA testing of the six subscales, work arrangements, type of call center, type of service, and work shift. About data gathering procedure, the researchers did content analysis of the other qualitative studies that the researchers believe will help them to better understand the topic they chose to pursue. Analysis of the different studies and literatures found on the chapter 2, Review of Related Literature and Studies. Aside from that, quantitative or statistical analysis of the responses from the survey conducted from the sampling size. Lastly, interpreted the graphs in the study using words. The study also used these kinds or types of data:

- **Primary Data** - the researchers used statistical analysis through conducting survey questionnaire to collect original or primary information that might or will support the statement of the problem.
- **Secondary Data** - the researchers maximized the use of electronic resources. The internet used to gather articles and journals to support the primary data in terms of mental workload of the call center agents, known as the secondary data.

4. Presentation, Analysis and Interpretation of Data

4.1 Data from the Respondents

A survey questionnaire was made and disseminated for respondents to answer. In terms of which work arrangement they currently have, most of them are in a work-from-home arrangement, followed by those who work office-based with almost a half lesser than those in WFH set-up, while the rest are working both remotely and in-office. The reason was because of the COVID-19 pandemic. It has forced the government to stop operations in an office-based arrangement in the first year of the pandemic. Although office-based procedures are now allowed, they are still restricted to accommodate of approximately 50% percent of the capacity. That is why only a few of them are in either both arrangements or in office-based alone.

Those call center agents assigned in inbound calls to take the majority among all the respondents, with 78%, while only 22% were assigned to take the outbound calls. Moving forward to the service type that the respondents have, the majority of the call center agents, with 68.4% in total, serves invoice while the rest do non-voice. The BPO company in the Philippines caters mainly to the international market. Among the top companies that the respondents are working at are Concentrix, Alorica, Teleperformance, TaskUs, Accenture, Sitel, Telus, and others, all of which are owned by international companies aside from Teleperformance. Although Teleperformance is a locally-established company, it still primarily caters to the global market. Given that, it is no surprise that the plurality of call center agents working from 12 midnight to 9 am. Since the companies' market is in western regions of the world, their time zone is opposite to the Philippines, so most of the call center agents' workforce has to work according to the western day time, resulting to the 48.2% of respondents having graveyard shift.

4.2 General Survey Questions

The researchers also included questions regarding the employees' thoughts and experiences with working from home compared to the office-based and combined work arrangements. It also contains questions that would help gather related data that could help analyze their current working experiences with all the possible influences or factors.

The survey results determined the top five companies with the highest numbers of employed call center agents. The Concentrix partakes 12.40% of the call center agents among the top five companies. Moreover, most of them agreed that their work was difficult even before the pandemic in terms of mental, physical, and temporal demand. The 77.2% of the call center agents also said that their usual work arrangement was affected by the pandemic and agreed that it makes their work harder. The 43.8% of the respondents say that the office-based work arrangement is more complex or stressful. Thus, 59% of them prefer to work from home rather than office-based despite the challenges of working from home. With the office-based work arrangement and combination of both, most call center agents find it difficult during a pandemic, while in work-from-home arrangements, they just find it normal. In addition, 94.50% of them work for five days, and 57.20% work eight hours per day.

Furthermore, 82.3% of the call center agents said that their days and hours of working are still the same even with the pandemic. On top of that, most call center agents think that working from home with the same schedule in an office-based work arrangement will be more convenient and less stressful. Additionally, 82.8% say that they have the resources to perform their job or tasks. However, 63.90% admit that there were times that the work demands higher yet they lack the resources to do well. Given that, most call center agents say that it makes them stressed.

4.3 Factors Affecting the Work of Call Center Agents

Working during the COVID-19 pandemic is very challenging for the employees. According to Gössling et al. (2020), given the magnitude of the COVID-19 pandemic, there shall be no urgency to return to business-as-usual even if it is over. However, operating the businesses takes the global economy to rise from this unfortunate event. Thus, with the urge to continue the business operations, the employees have to risk their lives by working on-site and dealing with multiple problems with working remotely. These problems shall be identified and the primary considerations to create a solution on how these problems would be solved. The researchers asked the respondents to provide the factors they think affect their pandemic working experience. There were multiple subjects that the respondents pointed out. However, there are five significant factors that they all agreed affecting their pandemic working experience during the COVID-19 pandemic such as:

- Poor internet connection
- Lack of resources
- Discomfort
- Not much guidance from colleagues and leaders
- A lot of distractions

4.4 Essential Resources for Work-from-Home Employees

As most of the call center agents are found to be working remotely, the researchers considered identifying the essential resources that would help the call center agents perform their tasks at home effectively and efficiently. The tools and equipment to perform the tasks are entirely provided for those working on-site or office-based. However, it differs for those who work from home and has a combination of both work arrangement. Although many companies provide the essential equipment for the agents to perform their tasks, they still find their set-up lacking. With more resources to perform the duties satisfactorily, will reduce the factors that negatively affect their pandemic working experiences. With that, the Wi-Fi connection is the top consideration that these agents think is essential for working remotely. Note that the BPO is a tech industry where high-speed internet connectivity is necessary to provide the business' services. Additionally, they also consider a computer set as the general essential resource. It is no surprise as this is one of the primary tools that call center agents shall have. They also mentioned some resources subject to one of the factors affecting their pandemic working experiences—ventilation. To summarize, all the equipment in the office-based environment shall be present in their work from the home set-up.

4.5 Suggestions for Improvement

Based on the survey that the researchers conducted, there are many suggestions from the workers to have an efficient, effective, and productive work arrangements that can be recommended to the company and workers. According to the result of the survey, majority of the respondents suggest that the working schedule should be changed or fixed in order for them to be productive enough. Most of them do not have a flexible working schedule and their sleeping routine is affected. Additionally, acquiring a proper working equipment for most of the workers who are currently in a work-from-home arrangement, it is the most important thing that the company must provide to be followed by the support system, stable internet connection, good environment, allowance for internet connection and electricity bill, and

backup internet connection too. As well as transportation support and change in office layout for when office-based arrangements. There are other suggestions coming from the survey such as the freedom of the workers to choose which work arrangement they want to have, as well as compensation, implementation of safety protocols, and lastly, mental health plan for employees.

4.6 NASA TLX - Six Subscales

To fulfill objective 3.2, the researchers had to utilize a tool on how they can assess the mental workload of the call center agents. The NASA Task Load Index (TLX) was then used to determine BPO agents' mental workload relative to their work arrangement. Categorically, the researchers presented figures consisting of the six subscales results required in the given assessment tool—NASA TLX.

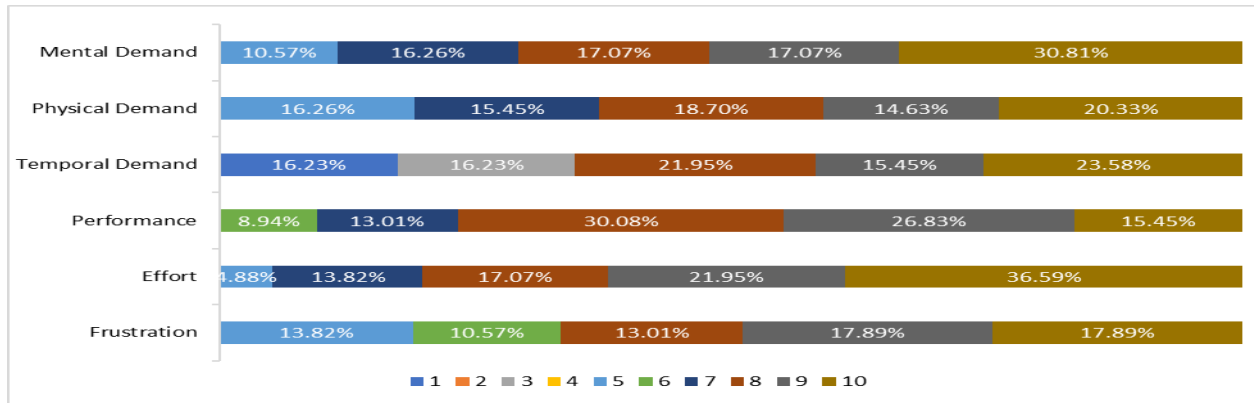


Figure 1. Six Subscales of Office-based Call Center Agents

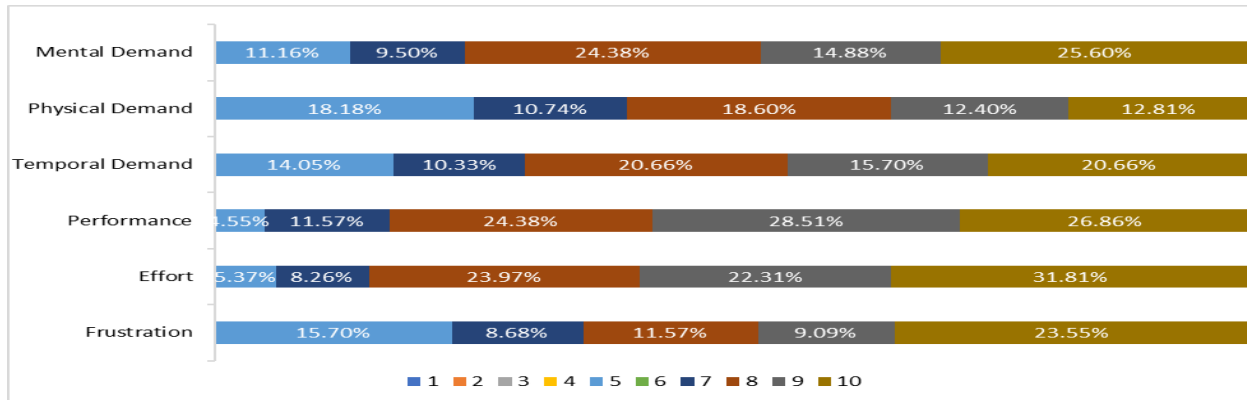


Figure 2. Six Subscales of Work-from-Home Call Center Agents

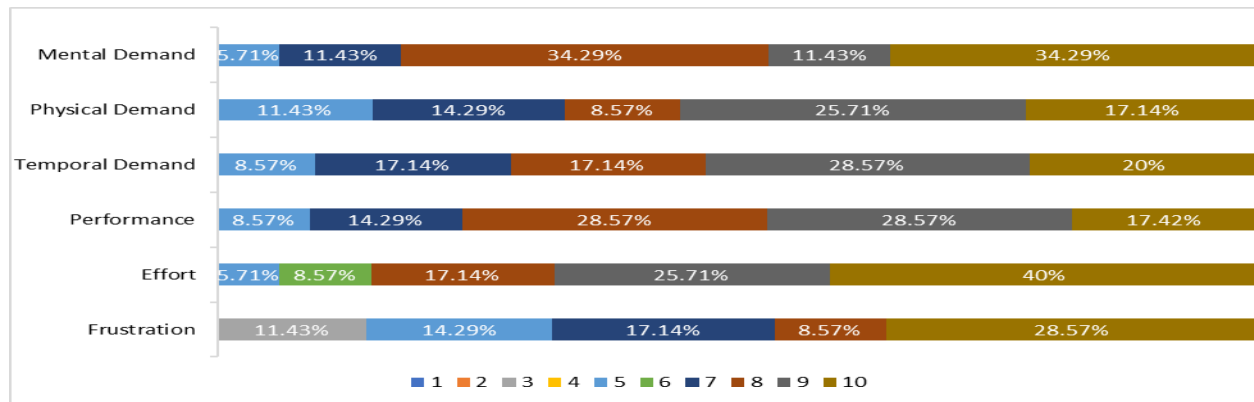


Figure 3. Six Subscales of Call Center Agents who has Combination of Work Arrangement

Table 2. Mean of Six Subscales per Work Arrangement

Six Subscales	Work Arrangement (Mean)		
	Office-based	Work-from-Home	Combination of Both
Mental Demand	80.88	77.27	84.57
Physical Demand	74.4	65.41	70.29
Temporal Demand	75.76	72.23	78.86
Performance	80.08	84.38	81.71
Effort	84.64	82.64	86.86
Frustration	67.52	65.29	66.57

Unlike the data shown in Figures 1 to 3, Table 2 presents the mean of six subscales. In this case, instead of showing the percentages per scale, the data per subscale were converted from percentages to exact number of people who voted for that and then multiplied to their appropriate level. Note that a score of 1 is equal to 10, 2 is to 20 and so on and so forth, an increase of ten per scoring level to the six subscales. Generally speaking, working as a call center agent with any work arrangement is mentally demanding. The mental demand they have working with their respective work arrangement is considered very high, with all means being above 75. Although the mental demand is very high, the physical demand in each work arrangement appears to be just high. However, it is still disturbing that despite them working all day on their seats, the demand physically is still at a high level.

The call center agents with the only office-based arrangement and combination of both arrangements have very high temporal demand. Only the work-from-home call center agents have high temporal demand. Nevertheless, all are still above medium level. Furthermore, when it comes to performance, despite the high to very high demand mentally, physically, and temporally, and despite having a work-from-home arrangement compared to working from the office can affect the employees' productivity (Gibbs et al., 2021), they are still able to perform at a very high level. Even the 'Effort' subscale presents very high data for each work arrangement, meaning all exert very high effort to do their tasks. Although both the performance and effort are at very high levels, the two are uncorrelated. Hence, despite giving too much effort, it does not equate to having a satisfactory output. And with the COVID-19 pandemic, with so many challenges that hinder us from moving, it is no surprise that without considering their work arrangement as all are products of the pandemic, their level of frustration is high.

4.7. Mean Weighted Rating

In using the NASA Task Load Index, the researchers also used the help of 15 Pairwise comparison and with that, calculated the mean weighted rating in which the final calculation for mental workload of the subjects, the call center agents, can be calculated.

Table 3. Mean Weighted Rating of Call Center Agents in All Work Arrangements

Mean Weighted Rating Worksheet	
Work Arrangement	\bar{x} Weighted Rating (Mental Workload)
Office-based	77.53
Work-from-Home	72.16
Combination of Both	79.60

**Weight is the tally of 15 point pairwise comparison, mean raw rating is the mean of the rating given by the sample size, and adjusted rating is the product of the weight and mean raw rating. The sum of adjusted rating is then divided by 15 to get the mean of weighted ratings.*

Office-based

Sum of Adjusted Rating Column = 1162.88

\bar{x} Weighted Rating = [(Sum of Adjusted Rating)/15] = 77.53

With the result of the mean weighted rating for the office-based call center agents which has 77.53, hence, their mental workload is considered very high (see Table 1 and Table 3).

Work-from-Home

Sum of Adjusted Rating Column = 1082.33

\bar{x} **Weighted Rating = [(Sum of Adjusted Rating)/15] = 72.16**

With the result of the mean weighted rating for the work-from-home call center agents which has 72.16, hence, their mental workload is at high level (see Table 1 and Table 3).

Combination of Both

Sum of Adjusted Rating Column = 1193.98

\bar{x} **Weighted Rating = [(Sum of Adjusted Rating)/15] = 79.60**

As shown in Table 3, the mean weighted rating of call center agents working in both arrangements is 79.60. Therefore, the amount of their mental workload is very high.

4.8 ANOVA Tests

To test if there is a presence of significant effect of one variable to another, ANOVA tests were conducted. Primarily, the independent variables used for the tests were the mental workload or the mean weighted rating of the call center agents per work arrangement, type of call center agent, type of service, and work shift.

Table 4. ANOVA – Type of Call Center Agents

ANOVA - MWL Weighted Rating					
	Sum of Squares	df	Mean Square	F	p
Work Arrangements	80.2	2	40.1	0.0894	0.916
Type of Call Center	145.8	1	145.8	0.3252	0.589
Work Arrangements * Type of Call Center	26.0	2	13.0	0.0290	0.972
Residuals	2690.6	6	448.4		



Figure 4. Interaction Figure for Type of CCA

Table 5. ANOVA – Type of Service

ANOVA - MWL Weighted Rating					
	Sum of Squares	df	Mean Square	F	p
Work Arrangements	103.88	2	51.94	0.1125	0.895
Type of Service	25.40	1	25.40	0.0550	0.822
Work Arrangements * Type of Service	9.26	2	4.63	0.0100	0.990
Residuals	2770.09	6	461.68		

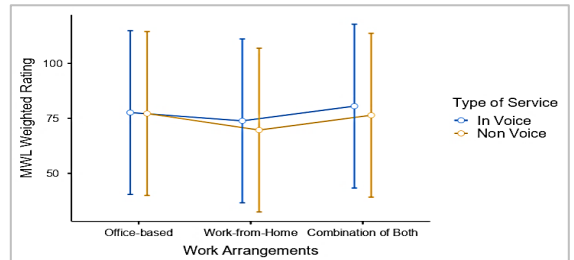


Figure 5. Interaction Figure for Type of Service

Table 6. ANOVA – Work Shift

ANOVA - MWL Weighted Rating					
	Sum of Squares	df	Mean Square	F	p
Work Arrangements	137.1	2	68.5	0.1493	0.863
Work Shift	102.0	2	51.0	0.1111	0.896
Work Arrangements * Work Shift	97.1	4	24.3	0.0528	0.994
Residuals	4132.1	9	459.1		

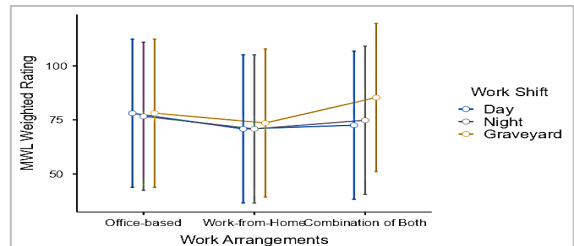


Figure 6. Interaction Figure for Work Shift

With all the three P-values being above 0.05 presented in Table 4, Table 5, and Table 6, hence the null hypothesis is valid. It also means that neither of any work arrangement and any type of call center agent, type of service, and work shift have main effects on the mental workload of the call center agents nor when the two factors are combined. Summarized result for the MWL weighted rating and work arrangements for the type of call center, type of service,

and work shift is presented in Figure 4, Figure 5, and Figure 6. Thus, there is no main effects or significant interaction between the factors but, when all are combined, it results to the high to the very high mental workload of the call center agents. Meaning to say if one factor is only to be considered, there will be no significant result to be found however, when looking at the factors and data holistically, then the result will be more significant.

Table 7. ANOVA – NASA-TLX Six Subscales Rating

ANOVA - NASA-TLX Six Subscales Rating					
	Sum of Squares	df	Mean Square	F	p
Work Arrangements	84.2	2	42.1	0.0889	0.915
NASA-TLX Six Subscales	1566.1	5	313.2	0.6611	0.657
Work Arrangements * NASA-TLX Six Subscales	135.9	10	13.6	0.0287	1.000
Residuals	8527.9	18	473.8		

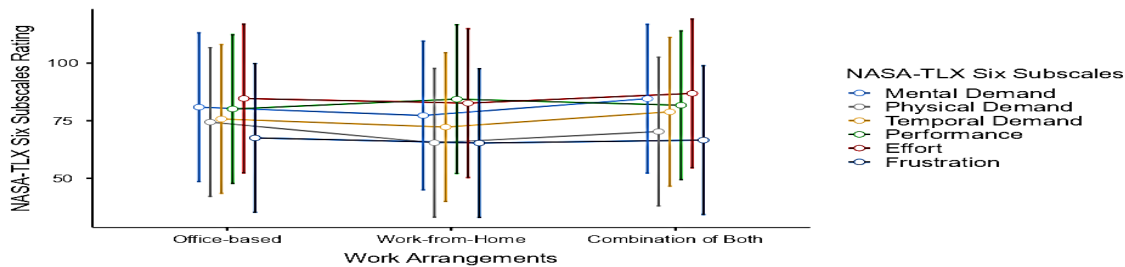


Figure 7. Interaction Figure for Six Subscales

Table 8. Estimated Marginal Means of Work Arrangements and NASA-TLX Six Subscales

Estimated Marginal Means - Work Arrangements * NASA-TLX Six Subscales					
NASA-TLX Six Subscales	Work Arrangements	Mean	SE	95% Confidence Interval	
				Lower	Upper
Mental Demand	Office-based	80.9	15.4	48.5	113.2
	Work-from-Home	77.3	15.4	44.9	109.6
	Combination of Both	84.6	15.4	52.2	116.9
Physical Demand	Office-based	74.4	15.4	42.1	106.7
	Work-from-Home	65.4	15.4	33.1	97.7
	Combination of Both	70.3	15.4	38.0	102.6
Temporal Demand	Office-based	75.8	15.4	43.4	108.1
	Work-from-Home	72.2	15.4	39.9	104.6
	Combination of Both	78.9	15.4	46.5	111.2
Performance	Office-based	80.1	15.4	47.7	112.4
	Work-from-Home	84.4	15.4	52.0	116.7
	Combination of Both	81.7	15.4	49.4	114.0
Effort	Office-based	84.6	15.4	52.3	117.0
	Work-from-Home	82.6	15.4	50.3	115.0
	Combination of Both	86.9	15.4	54.5	119.2
Frustration	Office-based	67.5	15.4	35.2	99.9
	Work-from-Home	65.3	15.4	33.0	97.6
	Combination of Both	66.6	15.4	34.2	98.9

Based on the Table 7 and Table 8, it is determined that there is no significant effect and that the means of observation grouped by work arrangements are the same. In relative to that, there is also no significant effect and the means of observation grouped by the NASA-TLX six subscales are just the same. Moreover, there is an absence of interaction between the two factors. This is because, the mental workload assessed through the NASA-TLX six subscales of the three work arrangements yield a similarly close weighted rating among the three. Meaning, the study just proved that there is a high mental workload (72.16) for the call center agents who have work-from-home arrangements while a very high mental workload for office-based (77.53) and combination of both work arrangements (79.60); The study can provide to the employers that the work-from-home arrangement is more preferable than other work arrangements and can increase the performance of the employees and productivity of the company with emphasis on proper implementation and process management. In figure 7 and table 8, shown are the interaction between the marginal means of the work arrangements and the NASA-TLX six subscales. The figures are presented graphically and helped

the data to be understood easily, as well as the tables provided the upper and lower bound for the marginal means for easier analysis and better understanding.

4.9 Correlation Test

Correlation test was also conducted to know if the six subscales correlate to each other. The result of correlation amplifies the result of the survey in terms of the six subscales and pairwise comparisons (Table 9 and Table 10).

Table 9. Pairwise Pearson Correlations

Correlational Hierarchy					
No.	Correlation	P-Value	Significant or Not Significant	Pairwise	
1	0.9997	0.015	Significant	Mental Demand	Effort
2	0.9994	0.023	Significant	Physical Demand	Frustration
3	0.999	0.028	Significant	Mental Demand	Temporal Demand
4	0.9977	0.043	Significant	Temporal Demand	Effort
5	0.6022	0.589	Not Significant	Temporal Demand	Frustration
6	0.5732	0.611	Not Significant	Physical Demand	Temporal Demand
7	0.5667	0.616	Not Significant	Mental Demand	Frustration
8	0.547	0.632	Not Significant	Effort	Frustration
9	0.5368	0.639	Not Significant	Mental Demand	Physical Demand
10	0.5166	0.654	Not Significant	Physical Demand	Effort
11	-0.591	0.597	Not Significant	Performance	Effort
12	-0.61	0.582	Not Significant	Mental Demand	Performance
13	-0.644	0.555	Not Significant	Temporal Demand	Performance
14	-0.996	0.057	Not Significant	Physical Demand	Performance
15	-0.9986	0.034	Significant	Performance	Frustration

Table 10. Correlation Scale Interpretation

Correlation Coefficient Value	Indication
Between +/- 0.8 to +/- 1.0	High Correlation
Between +/- 0.6 to +/- 0.79	Moderately High Correlation
Between +/- 0.4 to +/- 0.59	Moderate Correlation
Between +/- 0.2 to +/- 0.39	Low Correlation
Between +/- 0.1 to +/- 0.19	Negligible Correlation

The table 9 shows the summary via Pairwise Pearson Correlations and table 10 for the scale interpretation. From numbers 1 to 10, all the paired subscales tested for correlation are positive thus, are directly proportional to each other while the rest are inversely proportional to each other. Additionally, from numbers 1 to 4 and 15, we have significant positive high correlation. Meaning, the paired subscales namely: Mental Demand to Effort, Physical Demand to Frustration, Mental Demand to Temporal Demand, and Temporal Demand to Effort, are all significant and positively have high correlation to the study of factors affecting the mental workload of the call center agents across varying work arrangements. This result is also proven along the responses gathered from the respondents thus, ensuring that data gathered and result are coherent and accurate.

Overall, with the nature of the job that call center agents have, it is expected that their high to very high mental workload results from the very high mental demand which involves effort, for it to be achieved. That is why proper management of the schedule and effective call routing for the agents are recommended. As well as limiting unnecessary range of motion to avoid frustration. As far as answering calls are required, they will have to seat for a very long time that is why ergonomic chairs and table are recommended to decrease the frustration agents will have to experience. Furthermore, the contribution of how fast they can finish the task is related to the effort they exert and as well as how mentally demanding the task at hand. With that, it is highly recommended for the employers to keep their employees in check and always try to come up with process improvements especially with the call routing or number of calls that is being patched through the agents. In addition to trainings and workshops that if all will be achieved, will result to the decrease of mental workload for the employees and increase productivity for the company.

5. Conclusion

In the survey conducted, 60% of the call center agents are now working from home, and 31% are still office-based, while only 9% are under the work arrangement of the combination of both. Assessment of the mental workload of the subjects is conducted through NASA TLX six subscales, namely Mental Demand, Physical Demand, Temporal Demand, Performance, Effort, and Frustration. Combination of both work arrangements yields the highest mental workload mean weighted rating of 79.60, followed by office-based work arrangement of 77.53, and finally, work-from-home with a 72.16 mean weighted rating. The work-from-home arrangement having the lower mental workload weighted rating among the three work arrangements proved why 59% of the respondents prefer to have this work arrangement. Though no main effects and significant interaction among the MWL weighted rating and other factors such as type of call center agents, type of service, work shift, and six subscales are found when compared one by one, the collective of these factors are the reason for the high up to the very high mental workload of the agents.

Overall, helping or making the employees like their schedule can be a factor in boosting performance. With that, the researchers proposed a working schedule for those who have a combination of both work arrangements, which has the highest mental workload. The main recommendation is to at least have one-day office-based and four days of work-from-home, from the five days a week normal work schedule, and it's up to the employees if they want to work overtime. This is preferred to alternating work arrangement of office-based and work-from-home weekly because the majority of the respondents believe that not all should be present at the company and employees should be scheduled accordingly, also to lessen the adverse effects of COVID-19.

5.1 Recommendations

The study revealed the mental workload of call center agents from the three work arrangements. It has also provided test results regarding the status quo of the call center agents among their respective types of service and type of call center agent. Thus, the researchers formulated recommendations and are hereby presented:

1. Since most of the respondents prefer working from home, and with the re-arising of COVID-19 cases in the Philippines, the management should consider transferring their agents in a remote setup. Moreover, it is also found out that the performance of work-from-home call center agents is the highest among the call center agents in all of the work arrangements. Furthermore, call center agents working from home have the only 'high' level of mental workload while the rest have 'very high'. Additionally, no main effects and interaction between the given factors that affect the mental workload of the call center agents have been found out. Thus, there is no reason to primarily provide the call center agents a particular work arrangement depending on their type of service and what type of call center they have or are, to lessen their mental workload.
2. The provision of complete essential equipment, especially computer sets, working desks, and high-speed internet, is highly encouraged to help the call center agents working remotely perform their tasks at a satisfactory level with less chance of getting stressed out, frustrated, and anxious. It is also to help lessen the physical demand of working from home as it shows on Table 2. As there is no evidence provided in the study showing why even working from home is physically demanding, it is recommended for future researchers to further research on this kind of topic to amplify the findings of this study.
3. If the management ever wants to push the office-based working arrangement, it will be better if they provide shuttle services for its workers. Mass transportation is not enough to accommodate the number of workers working on site, and limited passengers are only allowed inside.
4. When opting to provide a combination of work arrangements, the management should provide the specific recommendations stated in numbers 2 & 3. Keeping in mind the recommendation stated in the last paragraph of the conclusion, which states that having at least 1 day of office-based and 4 days of work-from-home would be the most ideal than alternate weekly of work arrangements.

The researchers also adopted some of the recommendations from the study: "Ergonomics Assessment on the Mental Workload of Work from Home Employees" of Dasmariñas et al. (2020), as they are also related to the study.

References

- Agnes, F. M. , The Burnout Level of Call Center Agents in Metro Manila, Philippines. Retrieved from https://www.academia.edu/27625803/The_Burnout_Level_of_Call_Center_Agents_in_Metro_Manila_Philippines?auto=download, 2016.
- Akanji, B.O, A Case Study on Occupational Stressors and Effective Stress Management Interventions from A Call Center Perspective. *International Journal of Research Studies in Management.* , 2016. Retrieved from <http://repository.elizadeuniversity.edu.ng/jspui/handle/20.500.12398/800>
- Andrea M. S., Caryl J. B., Aron B., Regelyn C. Call Center Agents' Job Burnout and Its' Influence on their Job Satisfaction During the COVID-19 Pandemic in the Philippines. 2021. Retrieved from https://www.researchgate.net/publication/352523851_Call_Center_Agents'_Job_Burnout_and_Its'_Influence_on_their_Job_Satisfaction_During_the_COVID-19_Pandemic_in_the_Philippines
- Bolaji, T.O.O. Some Elements of Ergonomics at Play in A Typical Call Center. *Proceedings of MAC* 2018.
- Conway, K., Gustafson, D., Brown, D., Gates, M.G., Skeen, W.D., Joyce, B. Real-Time Predictive Routing. 2017. Retrieved from <https://patents.google.com/patent/US9565312B2/en?q=call+center+workload&before=priority:20210101&after=priority:20110101>
- Dasmariñas, S., Otalla, J.M., Perea, K., Reyes, J.E. Ergonomics Assessment on the Mental Workload of Work from Home Employees. *Proceedings of the International Conference on Industrial Engineering and Operations Management.* 2020.
- Gibbs, M., Mengel, F., & Siemroth, C, Work from Home & Productivity: Evidence from Personal & Analytics Data on IT Professionals. Bfi.uchicago.edu. 2021. Retrieved from https://bfi.uchicago.edu/wp-content/uploads/2021/05/BFI_WP_2021-56.pdf
- Magaya, A. D. , Predictors of Psychological Well-Being among Call Center Agents. 2021 Retrieved from <http://article.sapub.org/10.5923.j.ijap.20211101.01.html>
- Natarajan, Nithya, Prabadevi, P., & Yogalakshmi, M, Work From Home Situation and Work Life Balance of It Employees During Covid-19 Pandemic Period -A Case Study Approach. *Journal of Huazhong University of Science and Technology.* 50. 1-10. 2021.
- Riahi,A., Ristock, H.W.A, Customer Portal of An Intelligent Automated Agent for A Contact Center. 2019. Retrieved from <https://patents.google.com/patent/US10171659B2/en?q=call+center+workload&before=priority:20210101&after=priority:20110101>
- Shobri, Razali M.Z., Razali N.A. The Influence of Stress Management Techniques on Employees Retention: A Study on Call Center Agents in Malaysia. 2013. Retrieved from <http://www.ipedr.com/vol64/005-ICHHS2013-W10009.pdf>
- Tjosvold, Chen, Huang, Xu , Developing Cooperative Teams to Support Individual Performance and Well Being in a Call Center in China. 2014. Retrieved from <https://link.springer.com/article/10.1007/s10726-012-9314-6#citeas>

Biographies

Charlene H. Ballad is a college graduate of Bachelor of Science in Industrial Engineering at Technological Institute of the Philippines -Manila. She is a Certified Lean Six Sigma Yellow Belter (CLSSYB), a former member of Junior Philippine Institute of Industrial Engineers (JPIIE), and a former member of Inhinyera- an organization in her school that promotes empowerment for women in engineering field.

Sheeno F. Dasmariñas a BSIE graduate from the Technological Institute of the Philippines (Manila), former member of Junior Philippine Institute of Industrial Engineer (JPIIE).

John Margel A. Otalla is a BSIE graduate from the Technological Institute of the Philippines Manila- former member of the Junior Philippine Institute of Industrial Engineer (JPIIE).

Rhea Ann G. Perez is a graduate of Bachelor of Science in Industrial Engineering from Technological Institute of the Philippines. She was a former treasurer of Industrial Engineering Department Student Council, and a former member of Junior Philippines Institute of Industrial Engineers (JPIIE), and Inhinyera (an organization in her school that promotes empowerment for women in engineering field).

Maria Louise C. Valenzuela is a graduate of Bachelor of Science in Industrial Engineering from T.I.P. She is currently a former member of Junior Philippines Institute of Industrial Engineers (JPIIE), and Inhinyera (an organization in her school that promotes empowerment for women in engineering field).

Janina Elyse A. Reyes is an Associate Professor at the Technological Institute of the Philippines Industrial Engineering Department. She earned her bachelor's degree in Industrial Engineering and Operations Research at University of the Philippines Diliman, Masters in Engineering Management at Mapua University in Intramuros, Manila.