

COGNITIVE ERGONOMIC ANALYSIS OF PROFESSIONALS IN INDUSTRIAL DESIGNER
APPAREL (Case Study: Designer at PT. Kurnia ASTASURYA)

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ABSTRACT (80-100 words)

PT. Kurnia ASTASURYA (Garment Industry) is a company engaged in garment industry, the company manufactures a wide - range clothing products. Based on the identification of problems at the time of regular time and over-time workers should work with the maximum conditions. The high level of demand and often performed over time in PT. Kurnia Astasurya, resulting in employees working to make mistakes, it is due to the high mental workload accepted by the workers..

The purpose of this study was to determine the performance of workers in the process of designing clothes, as an input to the system work better and more effective for the company. The method used for solving this problem is to utilize Cognitive Analysis Methods SWAT (Subjective Workload Assessment Technique) to measure the mental workload of workers (designers).

From the data processing, analysis and discussion of the results of research on the mental workload of workers (designers) on the designing part, that the mental workload conditions workers are; 10% of workers with lower mental workload load, 40% with mental workload medium load, and 40% of workers experiencing mental workload over load. So it can be concluded that the workload for the designers at PT Kurnia Astasurya, the majority experiencing mental workload is quite high. from analysis of individual prototype, the result that the majority of respondents (designer) has a prototype of "T" and partly prototype character "E" and "S".

Key words: Cognitive Ergonomic, SWAT Methods, Process Design.

1. INTRODUCTION

1.1. Background

The development of science and technology that has so rapidly become a supporting factor for the realization of a mature business plan and achieve the vision and mission of a company. textile or garment sector contributes considerably against the Indonesian Nation economic development. PT. Kurnia Astasya was officially established in 1988 with only 10 employees. An idea, skill and hard work all together to form a strong foundation in starting a business, until then grew to a machine and modern facilities, skilled and employed about 850 people as well as strong marketing network in the nation. The company is located in Jalan Leuwigajah No. Cimahi 66/236 - 40 532, Bandung, West Java. PT. Kurnia Astasya is a company engaged in the textile or garment industry.

At the time of regular time workers of PT. Kurnia Astasya must work with the maximum, as well at the time over time. This makes the possibility of workers made a mistake becomes bigger. This error can reduce the yield of the manufacturing process due reject goods, thereby increasing production costs due to rework or even goods can not fulfill the demand on time, and will eventually hurt the company. From the above background there are significantly more experienced by some people in parts division Designing clothes or often spelled words '**Designers**', which in part has the burden of mental work is quite high due to the work required to always think of innovative high enough, because pressured by the owner, where the owner is the boss or leader and pressured also by some other parts such as the marketing department as part of the in demand by the market demand of diverse types and forms, not only that but the designing part is also required to be early for designing a clothing design by production, where the production section must be in accordance with the schedule because it must match market

demand. And sometimes part of this design is also often a difficulty, namely the launch of the dress model sudden, this is due to see the existing market in the field. Sometimes that was scheduled launching shirt type B but a crowded market that suits the type A which has been launching earlier but stock exhausted, at the time and even then should soon be making / designing the clothes of type A because it is driven by market demand is high enough,

Below is the big picture or overall for the distribution of products throughout Indonesia for a period which must be met by the company PT Kurnia Astasya schedule, the request must be in accordance with the wishes of the market, especially in terms of shape or design.

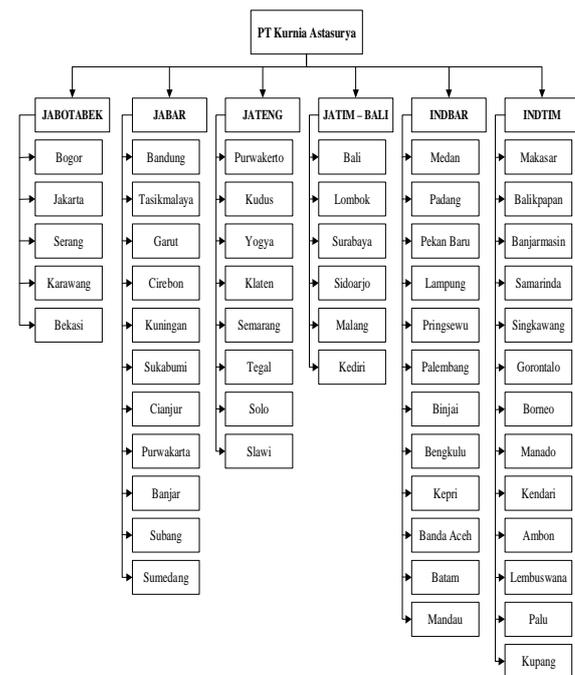


Figure 1. Market Distribution of PT. KA

2. THEORETICAL BACKGROUND

2.1 Definitions Ergonomics

Ergonomics is the use of information, ability, skill, and human limits to tool design, machine, method, system, tasks, organization, and environmentally efficient,

comfortable, safe, healthy, and effective (ENASE) for the creation of a maximum of productivity and quality of life height (Pulat, BM 1997).

The application of ergonomics are generally the activity of design or redesign. Ergonomics can play a role as well as the design work in an organization, such as the determination of the number of hours of rest, the election schedule for the change of working time, increasing the variety of work, and others. Ergonomics also provide an important role in improving the safety and health factors, as well as for the design and evaluation of products that can be easily applied (Nurmianto, 1996: 2).

2.2 Cognitive Ergonomic

Cognitive ergonomics, defined by the International Ergonomics Association "is concerned with mental processes, such as perception, memory, reasoning, and motor response, as they affect interactions among humans and other elements of a system.

Cognitive ergonomics is the discipline of making human-system interaction compatible with human cognitive abilities and limitations, particularly at work. Cognitive ergonomics utilises the knowledge emerging from the cognitive sciences on mental processes such as perception, attention, memory, decision making, and learning. The methods of these fields of research are applied to gain a better understanding of the factors that affect cognitive function. The practical aim is to improve work conditions and human performance, as well as safety and health, and to avoid human error and unnecessary load and stress. (Wikipedia; free encyclopedia)

2.2.1 Cognitive processes

In ergonomics and psychology, cognition refers to the mental processes that are involved in processing and handling information, i.e. encoding, maintaining, rehearsing, recalling, and transforming information in the human mind and brain. Human cognition can be divided into several

functions that underlie optimal human performance.^[3] It is important to recognise the cognitive functions that are relevant for a specific task or job, and to ensure that the working environment is suitable for these task requirements.

- **Sensation and perception** refers to perception of stimuli gathered through the senses such as sight, hearing, taste, smell, and/or touch. For example, in construction work one needs to hear the warning signals and in medical care one needs to be able to discern the symbols on the monitor.
- **Attention** is the stage where the processing is focused on certain aspects of perceived information or processing may be divided between two or several aspects. For example, in a control room one needs to notice if there has been a significant change in the situation; in a kindergarten a nurse may need to focus his/her attention on several children at the one time.
- **Working memory** includes a **short term memory** storage in which information is available for up to 30 seconds. It also refers to the processes with which information is actively rehearsed and manipulated in the mind. For example, a telephone operator has to rehearse the name of the desired person until she/he has connected the call, and a laboratory assistant needs to keep track of the order of locations when working with several samples.
- **Long term memory** is a permanent store for different kinds of information. Semantic memory refers to the storage of knowledge about the world, symbols, and concepts. Episodic memory contains information about events and episodes, whereas events in an individual's personal life are referred to as autobiographical memories. Procedural knowledge concerns 'knowing how' and skills. For example, all work requires specific knowledge of the field and specific skills, e.g. how to use a machine in a safe way, or how to organise a meeting.

These basic cognitive processes and representations are also relevant when one considers higher level cognitive functions such as **language comprehension and production** and **thinking processes** such as **problem solving, decision making** and **reasoning**. For example, the job of a communicator requires constantly reading and writing of texts, whereas a worker doing maintenance work has to follow guidelines that need to be read now and then. In addition, the need to solve problems and to make decisions varies between different tasks and occupations. Cognition also includes **learning** which refers to permanent or long lasting changes in knowledge and/or skills, that is relevant to all occupations. In cognitive science, **expertise** refers to some superior human ability in a complex cognitive task and can be considered to reflect maximal adaptation to a particular environment.

obtained through measurement becomes important. The basic concept of mental workload leads to the difference between the resources available to operators processing and resource requirements needed for the task. Basically, the mental workload explain the interaction between an operator who carry out the task and the task itself. In other words, the term workload illustrates the difference between the capacities of the human information processing system that is expected to satisfy the performance and capacity of actual performance.

Henry R. Jex mental workload defines as "the operator's evaluation of the attentional load margin (between motivated Reviews their capacity and the current task demands) while Achieving adequate task performance in a mission-relevant context" (Hancock, 1988: 11).

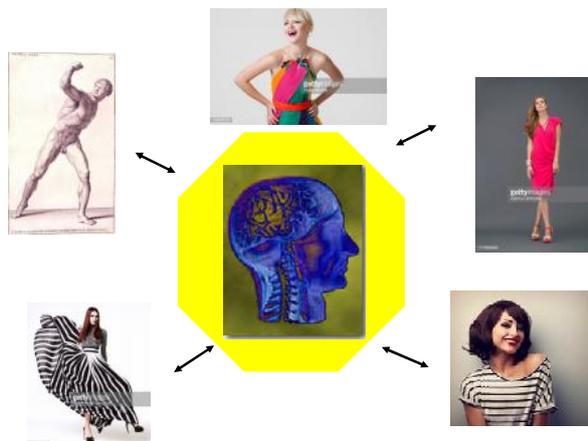


Figure 2. Minds and Brains are “Situatd”— in a Body and Environment with Artifacts and Tools — Cognitive ergonomics

2.2.2 Mental Workload

Workload experienced by a worker can be either physical load, mental and psychological burden arising from the work environment. The workload is designed in accordance with the capabilities and limitations of both physical and mental labor. Therefore, information on the workload

3. RESEARCH METHOD

Troubleshooting Flowchart

The troubleshooting steps on the analysis of mental workload measurement employees (designers) at PT. Kurnia Astasurya are as follows:

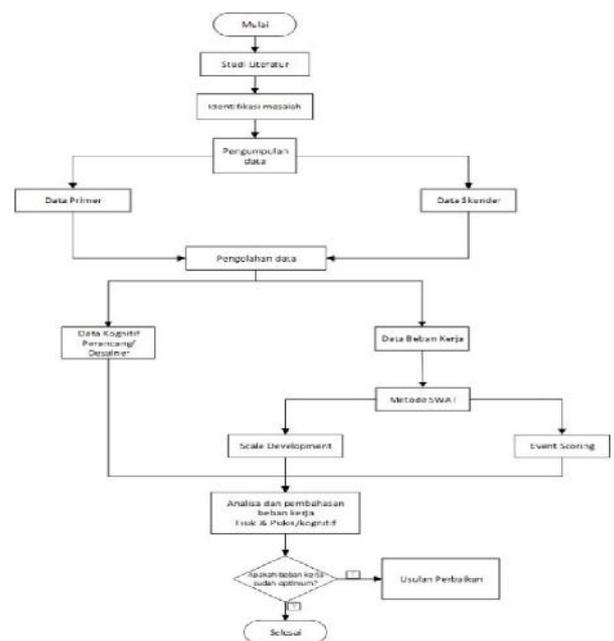


Figure 3. Flowchart

4. RESULT AND DISCUSSION

4.1 Scale Development Phase

At this stage will be sought scale that will be used for the event scoring. Event scoring used to determine the scale of the workload received by each of the workers who researched (Designer). Things to do before the specified scale that will be used is the determination of Kendall's agreement. If Kendall's coefficient > 0.75, then the scale used is the scale of the group and if Kendall's coefficient < 0.75 then use individual scale.

Here is Kendall's coefficient obtained from a software SWAT from 5 to data entry input:

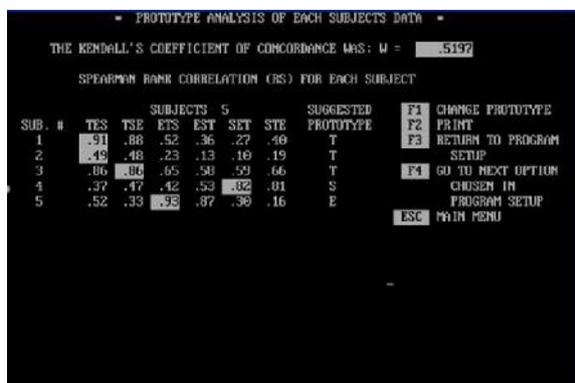


Figure 4. Koefisien Kendall's of Responden

From the above table it can be seen Kendall's coefficient obtained from the 5th respondent is 0.5197. With so scale used is the scale of the Individual. This was attributed to differences in perception perceived by respondents in sorting cards of each respondent. To obtain mental workload, the data processing is done by 'event scoring' of all activity performed, then the program will perform conjoint scaling algorithm that will produce a final scale.

as an example will be made assessment (scaling information) of the respondents (Designer) numbers 1;



Figure 5. Suggestion Prototype Responden 1.

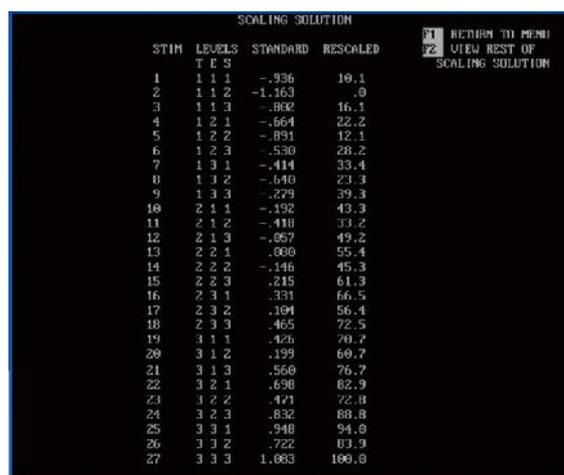


Figure 6. Scaling Solution Responden 1

For Respondent 2 (two) majority of the workers put the time factor that is equal to 70.06%. for Respondents three (3) a majority of workers put the time factor equal to the first and second respondents, but the percentage is different in the amount of 46.00%.

for the Respondents number four (4) percentage factor is greatest stress factor that is equal to 72.34%. In contrast to the respondents of the first, second, and third is where to respondents who previously was the most influencing factor is the time factor. for the Respondents 5 (five) percentage biggest factor is the effort factor that is equal to 84.71%.

4.2 Workload assessment phase (Event Scoring)

After all the final scale is obtained, then any activity undertaken by the worker be rated in accordance with a combination of T-E-S

(Time-Effort-Stress). The ratings given to workers on activities tailored to the final scale value each derived from SWAT software. Criteria at the end of the scale is divided into three parts, namely:

1. Lower Load: score 0-40
2. Medium Load: a score of 40.01 to 60
3. Over Load: a score of 60.01 to 100

Examples of scoring event.

Table 1. Event scoring for respondent number 1 (one)

Nama : Fera handayani									
Jabatan : Desiner									
Aktivitas	Beban Kerja						Skala	Kategori	
	Waktu (T)	Usaha (E)	Stress (S)	Individual	Beban Kerja				
1. Mencari informasi di luar	1	2	3	1	2	3	10,1	Lower Load	
2. Membuat Planning	1	2	3	1	2	3	72,8	Over Load	
3. Merundingkan masalah warna	1	2	3	1	2	3	100	Over Load	
4. Merundingkan masalah bahan	1	2	3	1	2	3	88,8	Over Load	
5. Menginovasi beberapa desain	1	2	3	1	2	3	100	Over Load	
6. Membuat sketsa perbagian	1	2	3	1	2	3	88,8	Over Load	
7. Membuat beberapa alternatif sketsa baju	1	2	3	1	2	3	72,8	Over Load	
8. Merundingkan sambar dengan pihak owner	1	2	3	1	2	3	100	Over Load	
9. Proses pemilihan alternatif	1	2	3	1	2	3	56,4	Medium Load	
10. Proses pembuatan sampel	1	2	3	1	2	3	100	Over Load	
11. Memeriksa hasil pembuatan sampel ke tempat pemersaan	1	2	3	1	2	3	45,3	Medium Load	
12. Mengirinkan hasil sampel ke departemen berikutnya dengan tepat waktu	1	2	3	1	2	3	83,9	Over Load	
13. Pemotretan sampel	1	2	3	1	2	3	83,9	Over Load	
14. Melihat data penjualan	1	2	3	1	2	3	55,4	Medium Load	
							1058,20		
							75,59	Over Load	

From the table above it can be seen that the first designer to have mental workload excess (over load), while the mental workload is perceived by the respondent No. 2 (two) of the activity is over load. Thus also felt by respondent number 3, while for workers (designers) number 4 (four) the whole activity is lower load. Overall mental workload perceived by respondents (designer) number 5 (five) of all activities is a medium load.

5. CONCLUSION

Based on data analysis and processing, can be summed up as follows:

- cognitive factors that influence or that influence the design division, which the designers are:

- Target Factors
- Factors of desire of different markets
- Owner Factor
- Wage Factors

Thus greatly affect the mental workload of each designer.

- The most dominant factor of mental workload perceived by the respondents is in terms of **time, effort** and then the last factor is the **stress factor**. In accordance with the data processing that is very influential in terms of time in completing each activity undertaken by the designers.

- After processing the data, analysis and discussion, it can be concluded that the burden of mental work received by workers is 10% to the workload of mental lower load, then 40% of workers with a workload of mental medium load and 40% of workers who have the burden of mental work over load. In terms of workload, lower load does not mean very well, but the annoying thing a worker at the design of which is the (designer), pressure she felt only a small part only, this will be a problem when designers did not get pressure - - so that it can lead to boredom, indecision, anxiety and others. and for mental workload with medium load levels or can be optimum load, preference workload conditions showed that the optimum conditions, so that in fact the mental condition of the designers working on this condition is the best condition.

- After scoring stage (event scoring) individually, because getting kendall's value is less than 0.75, then to the whole object under study can be seen the workload of each respondent with its scaling solution, it can be seen the number of respondents with mental workload lower load was as much as one person, while that has the burden of mental work medium load of two of the respondents, and 2 of the other respondents to the workload of mental over-load, due to the two respondents who have the burden of mental work over load So it can be concluded for the workload received by the designing part

is the designer at PT Kurnia Astasurya. for very light workload that only 10% of the total workload.

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