Analyzing Mental Workload of Remote Worker by Using SWAT Methodology (Case Study: Remote Software Engineer)

A H Zulfany¹, R S Dewi¹, and S G Partiwi¹
¹Sepuluh Nopember Institute of Technology, Surabaya, Indonesia
hasnaalmira@gmail.com

Abstract. Telecommuting or "working from home" is a new option for working systems that exist in the industrial era 4.0. Software Engineer is responsible for creating web-based applications using programming languages. Physical interaction at work is very minimal because the main key to the work of a Software Engineer is cognitive ability. Therefore, intellectual skills need to be considered as a tool for analyzing human performance. This study aims to measure the mental workload of remote workers by using SWAT method. SWAT will describe the multidimensional model of workload which consists of three elements, (1) Time Load, (2) Mental Effort Load, and (3) Psychological Stress Load. The objects observed were 54 Software Engineers with various fields. At first the determination of the value of mental workload was carried out, sorting 27 SWAT cards, and processing data using SWAT software. Validity and reliability tests were also conducted. From the measurement of mental workload using SWAT, it was found that 6 of 54 respondents have a maximum workload (value of 100). Development and Operations Engineer has the lowest mental workload value of 15.8.

1. Introduction
Telecommuting, commonly known as "working from home" or remote working, is an option for new work patterns offered by a company to its employees in the industrial era 4.0. In the Asian region, Indonesia itself is the third largest country in terms of the number of workers who choose to become remote workers, which is 34% after India with 56% and Malaysia with 53%[1]. The field of computers, information systems, and mathematics occupies the second position of the industry which implements a teleworking work system with a percentage increase from 2012 to 2016 of 3%. This is in line with the trend of remote working which is also supported by growing communication and information technology so that workers can do work and communication using internet, computer and telephone[2].

This rapidly growing field of information technology has caused motor or manual power capabilities covered in physiological skills to be no longer used as the only tool to analyze human work performance. Because on the other hand, consideration of intellectual and cognitive skills is also increasingly needed[1]. To provide a solution to this problem, Cognitive Ergonomics is present as one part of Ergonomics which studies human interaction in its working system comprehensively-integral[4].

A low level of certainty from the work of a remote worker can result in varying working hours. In some cases, the inability of a remote worker to solve his problems can affect his daily life. This shows that the remote worker is experiencing a mental workload. The mental workload is defined as the condition experienced by the remote worker in carrying out its duties where there are only mental resources under limited conditions. Because the ability of people to process information is very limited, this will affect the level of work performance that can be achieved.
In this study, we will discuss one of the professions that are gaining popularity using the remote work system, the Software Engineer. Software Engineer is a profession whose job is to create web-based applications using programming languages. Physical interaction carried out by a Software Engineer is limited to struggling with electronic devices. While the main thing that is the key to the work of a Software Engineer is the ability of the mind, memory, and other things related to knowledge. In addition, the rapid growth of technology used in the work of a Software Engineer also requires them to learn continuously if they don't want to be left behind by the new frameworks created to simplify the work.

Research related to mental workload measurement by using SWAT method has been done by some researchers. Saputra[3] uses a Subjective Workload Assessment Technique (SWAT) to carry out an Analysis of the Effects of Phases of Time on Aircraft Pilots Mental Workloads. Initially, SWAT was designed to analyze the mental workload in the aerospace field. Grant [6] conducted an Exploration of the Psychological Factors Affecting Remote-E-Workers' Job Effectiveness, Well-Being, and Work-Life Balance without making quantitative measurements of the mental workload of remote workers.

This study aims to analyze measurements in order to quantify the mental workload of Software Engineers using the SWAT method that will provide a simple and easy subjective scaling to quantify the workload of various activities that must be performed by a worker. SWAT will also describe the work system as a multi-dimensional model of workload consisting of three dimensions or factors, namely (1) Time Load (T), (2) Mental Effort Load (E), and (3) Psychological Stress Load (S).

2. Literature review

2.1. Teleworking
Gray et al. [6] states that teleworking is remote work from superiors or from conventional workplaces, in a proportion of significant work time. Teleworking can be done in full time or part time. This work often involves electronic information processing and always involves the use of telecommunications. In the end, there was an explicit requirement regarding the definition of telework where work was supported by information and communication technology (ICT).

There are several advantages of teleworking work system, (1) Autonomy or independence, Harpaz [7] reveals that in any work structure, the absence of direct supervision can increase the level of individual responsibility within the organization and is no exception to a telecommuter; (2) Flexible working hours; and (3) Improving time management capabilities, where telecommuting causes opportunities to make jobs less distracted or disturbed, and so on. But there is also some disadvantages include (1) The lack of feeling that you own a company, where this will be further compounded by a comparison between teleworking workers and workers on site; (2) Isolated feelings, where there is a study that states that the telecommuters report an isolated experience and have difficulty returning to social activities after doing their work as a telecommuter; and (3) Requires self discipline, which is related to the existence of autonomy towards his own life.

2.2. Software Engineer
Reported in Computer Science Online [8], it is stated that Software Engineers are one of the most professional fields most needed in the United States. As a branch of computer science, software engineers include the development and construction of computer system software and application software. Knowledge of programming languages, software development, and computer operating systems are the three main components of the Software Engineer field [8].

In terms of profession or position in the profession, Software Engineer has 11 professional branches, namely as follows[10].
- Project Manager, in general, serves as the main person in charge of software engineering projects.
- System Analyst, tasked with analyzing, designing, and implementing information systems.
- System Engineer, has the responsibility to involve the determination, construction, maintenance and support of technical infrastructure.
• Mobile App Developer, the main task of Mobile App Developer is to create, maintain, and implement code to develop applications and cellular programs that meet the needs and requirements of clients using computer programming languages.
• Front End Engineer, has the responsibility to produce, modify and maintain a website and user interface web application.
• Back End Engineer, is responsible for managing data exchange between software users and servers.
• Quality Assurance Engineer, is someone who monitors every phase of the software development process to ensure the quality of the design, ensuring that the software complies with the standards set by the developer's company.
• UI/UX Designer, tasked with making visual aspects so users feel comfortable using the application. However, the most important thing that must be resolved is how to make users able to complete their needs when using the application.
• Development and Operations Engineer, work in system management, deployment, and operations as a continuous, automated process.

2.3. Subjective Workload Assessment Technique (SWAT)
The procedure for applying the SWAT method consists of 2 stages, namely the scale development and the assessment stage (event scoring)[11].

2.3.1. Stage scale development. At the scale of development stage, there are 27 combinations of mental workload levels sorted by 27 combination cards from the lowest workload sequence to the highest. The method used to sort this combination is to follow the perceptions of each worker.

The first step is prototyping and determining the use of the type of scale for each respondent through the Kendal Coefficient of Concordance analysis. The second is the Axiom Test which is intended to assess the validity of additive models from the data. The third is Scaling Solution which is a scale calculation process that will be used by each respondent[3].

In SWAT there are three methods for interpreting the final SWAT scale namely Group Scaling Solution (GSS), Prototyped Scaling Solution (PSS), and Individual Scaling Solution (ISS)[11]. In GSS, data from all respondents will be averaged and the conjoint scaling algorithm will produce a scale based on that average. Furthermore, the scale will be used jointly by all respondents. Meanwhile in PSS, respondents were grouped according to the results of prototyping and the three groups would have their own SWAT scale. Whereas in the ISS, the respondent's data was analyzed separately and the SWAT scale was derived for each individual respondent.

The criteria for making these three scales are determined by the Kendal’s Coefficient of Concordance. If the coefficient value is ≥ 0.75, it can be said that the agreement index in the preparation of cards among respondents is relatively similar and homogeneous. Thus the GSS is used. If the coefficient value is < 0.75, PSS will be used, but this still has to be investigated through the Axiom Test.

The Axiom Test was conducted to test the suitability of the additive model and consistency with card sorting. If the violation of independence and joint independence is < 20, then Thus the scale development data can be handled using the PSS method to produce a SWAT scale. If violations of the axiom > 20, it must be done by the Individual Axiom Test to investigate whether the data on sorting the respondent's cards is considered to fulfill the basic characteristics of the additive model. If the results of the Individual Axiom Test show a violation of the independence and joint independence is < 20, then scale development data can be handled by the ISS method to produce a SWAT scale. If the results of the Individual Axiom Test still show violations of the axiom > 20, the respondent's data should be omitted.

2.3.2. Scoring event stage. The results of the sorting process at the scale development stage will then be transformed into an interval scale of workloads with a value range of 0-100. Furthermore, the assessment stage is carried out where an activity or event will be assessed using a rating of 1 to 3 (low,
medium, and high) for each factor that exists. The corresponding scale value is then used as the value of the workload for the activity in question [10].

3. Methodology

3.1. Data and classification of respondents

To obtain data on the mental and physical workload of Remote Software Engineer (RSE), questionnaires were distributed to related professions. Respondents in this study are people who work as Remote Software Engineer from various professions. Respondents also have an age range, type of work, scope of company where they work, and other different factors. The following is the respondent's data along with the classification for each profession and for all respondents.

| Table 1. Classification of respondents by profession. |
|-----------------------------------------------|
| Profession of RSE | Amount | Profession of RSE | Amount |
|-------------------|--------|-------------------|--------|
| System Analyst    | 5      | Back End Engineer | 7      |
| System Engineer   | 6      | Quality Assurance Engineer | 6 |
| Mobile App Developer | 9 | UI/UX Designer | 7 |
| Front End Engineer | 9 | Development and Operations Engineer | 5 |

The mention of respondents in each profession will then be SA1, SA2, SA3, and so on for the System Analyst; SE1, SE2, SE3, and so on for System Engineers; and so forth.

3.2. Determination of mental workload level

In the process of assessing the mental workload of Remote Software Engineer on the SWAT method, respondents were asked to choose the level of mental workload felt in each element. The level consists of level 1 (low), 2 (medium), and 3 (high).

| Table 2. Determination of mental workload level. |
|-----------------------------------------------|
| Respondent | Time Load | Mental Effort Load | Psychological Stress Load | Respondent | Time Load | Mental Effort Load | Psychological Stress Load |
|-----------|-----------|--------------------|---------------------------|-----------|-----------|--------------------|---------------------------|
| SA1       | 2         | 1                  | 3                         | FE8       | 3         | 3                  | 2                         |
| SA2       | 3         | 3                  | 3                         | FE9       | 1         | 1                  | 2                         |
| SA3       | 3         | 2                  | 3                         | BE1       | 2         | 3                  | 3                         |
| SA4       | 2         | 2                  | 2                         | BE2       | 1         | 1                  | 2                         |
| SA5       | 1         | 2                  | 2                         | BE3       | 3         | 2                  | 3                         |
| SE1       | 1         | 2                  | 2                         | BE4       | 3         | 3                  | 3                         |
| SE2       | 3         | 3                  | 3                         | BE5       | 2         | 2                  | 2                         |
| SE3       | 3         | 2                  | 3                         | BE6       | 1         | 2                  | 3                         |
| SE4       | 3         | 3                  | 3                         | BE7       | 2         | 2                  | 2                         |
| SE5       | 2         | 2                  | 2                         | QA1       | 2         | 3                  | 1                         |
| SE6       | 3         | 1                  | 3                         | QA2       | 2         | 3                  | 1                         |
| MA1       | 3         | 3                  | 3                         | QA3       | 2         | 2                  | 3                         |
| MA2       | 3         | 3                  | 2                         | QA4       | 3         | 3                  | 3                         |
| MA3       | 3         | 3                  | 2                         | QA5       | 1         | 1                  | 2                         |
| MA4       | 1         | 3                  | 3                         | QA6       | 1         | 1                  | 2                         |
| MA5       | 3         | 1                  | 3                         | UI1       | 3         | 2                  | 1                         |
| MA6       | 1         | 3                  | 1                         | UI2       | 2         | 2                  | 1                         |
| MA7       | 2         | 2                  | 1                         | UI3       | 3         | 3                  | 2                         |
| MA8       | 3         | 2                  | 3                         | UI4       | 2         | 1                  | 1                         |
Respondent | Time Load | Mental Effort Load | Psychological Stress Load | Respondent | Time Load | Mental Effort Load | Psychological Stress Load
--- | --- | --- | --- | --- | --- | --- | ---
MA9 | 1 | 2 | 1 | UI5 | 3 | 2 | 3
FE1 | 2 | 3 | 3 | UI6 | 2 | 2 | 2
FE2 | 1 | 2 | 3 | UI7 | 1 | 2 | 1
FE3 | 3 | 3 | 3 | DO1 | 2 | 2 | 2
FE4 | 2 | 1 | 3 | DO2 | 2 | 1 | 3
FE5 | 3 | 1 | 3 | DO3 | 3 | 3 | 2
FE6 | 1 | 2 | 3 | DO4 | 1 | 1 | 2
FE7 | 1 | 2 | 1 | DO5 | 1 | 2 | 1

3.3. Sorting 27 SWAT cards

In completing questionnaires and sorting out SWAT cards, guidance is carried out by the researcher so that there is no misunderstanding in determining the value of the workload. The following is an explanation of the stages of dividing 27 SWAT cards consisting of variations in levels between Time Load, Mental Effort Load, and Psychological Stress Load.

N (T1 E1 S1) | C (T1 E2 S3) | G (T2 E1 S2) | K (T2 E3 S1) | P (T3 E1 S2) | O (T3 E2 S3)
B (T1 E1 S2) | X (T1 E3 S1) | Z (T2 E1 S3) | E (T2 E3 S2) | D (T3 E1 S3) | L (T3 E3 S1)
W (T1 E1 S3) | S (T1 E3 S2) | V (T2 E2 S1) | R (T2 E3 S3) | Y (T3 E2 S1) | T (T3 E3 S2)
F (T1 E2 S1) | M (T1 E3 S3) | Q (T2 E2 S2) | H (T3 E1 S1) | A (T3 E2 S2) | I (T3 E3 S3)
J (T1 E2 S2) | U (T2 E1 S1) | ZZ (T2 E2 S3) |

The following are the results of the card sequence for each Remote Software Engineer profession.

Table 3. The result of sorting 27 swat cards.

| Cards | MA1 | MA2 | MA3 | MA4 | MA5 | MA6 | MA7 | MA8 | MA9 |
|---|---|---|---|---|---|---|---|---|---|
| N | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| B | 2 | 2 | 2 | 4 | 4 | 2 | 2 | 2 | 2 |
| W | 9 | 3 | 10 | 5 | 8 | 11 | 3 | 3 | 3 |
| F | 3 | 5 | 3 | 7 | 3 | 4 | 5 | 4 | 6 |
| J | 6 | 9 | 7 | 12 | 6 | 8 | 9 | 7 | 7 |
| C | 10 | 12 | 11 | 11 | 9 | 12 | 13 | 9 | 12 |
| X | 4 | 13 | 4 | 13 | 7 | 5 | 12 | 5 | 15 |
| S | 7 | 15 | 8 | 18 | 10 | 22 | 15 | 13 | 16 |
| M | 11 | 20 | 12 | 21 | 11 | 25 | 21 | 17 | 25 |
| U | 5 | 4 | 5 | 2 | 2 | 6 | 4 | 6 | 4 |
| G | 8 | 6 | 9 | 6 | 13 | 9 | 6 | 8 | 8 |
| Z | 12 | 7 | 17 | 10 | 17 | 13 | 7 | 10 | 10 |
| V | 13 | 14 | 6 | 9 | 12 | 7 | 8 | 12 | 13 |
| Q | 19 | 21 | 13 | 17 | 16 | 18 | 20 | 15 | 19 |
| ZZ | 24 | 22 | 21 | 22 | 23 | 20 | 22 | 16 | 20 |
| K | 14 | 19 | 14 | 16 | 18 | 14 | 19 | 19 | 17 |
| E | 21 | 23 | 22 | 24 | 22 | 23 | 24 | 22 | 21 |
| R | 25 | 25 | 25 | 26 | 26 | 26 | 25 | 24 | 26 |
| H | 15 | 8 | 15 | 3 | 5 | 3 | 14 | 11 | 5 |
| P | 16 | 10 | 18 | 8 | 14 | 10 | 10 | 14 | 9 |
| D | 20 | 11 | 20 | 15 | 20 | 15 | 11 | 18 | 11 |
| Y | 17 | 16 | 16 | 14 | 15 | 16 | 16 | 20 | 14 |
The order of cards chosen by the respondent is then processed in the SWAT software. Processing is done in each profession. This is due to the limitations of SWAT software where only 30 people can be processed while there are 54 respondents in this study.

3.4. Processing data using SWAT software

Later, after processing by SWAT software, the Kendall coefficient value will be seen whether it is less than 0.75 or more than equal to 0.75. This will affect the type of scaling to be selected.

| Cards | MA1 | MA2 | MA3 | MA4 | MA5 | MA6 | MA7 | MA8 | MA9 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| A     | 22  | 17  | 23  | 19  | 19  | 19  | 17  | 23  | 22  |
| O     | 26  | 18  | 26  | 23  | 25  | 21  | 18  | 25  | 24  |
| L     | 18  | 24  | 19  | 20  | 21  | 17  | 23  | 21  | 18  |
| T     | 23  | 26  | 24  | 25  | 24  | 24  | 26  | 26  | 23  |
| I     | 27  | 27  | 27  | 27  | 27  | 27  | 27  | 27  | 27  |

The Kendall coefficient value will be seen whether it is less than 0.75 or more than equal to 0.75. This will affect the type of scaling to be selected.

**Figure 1.** Kendall coefficient and suggested prototype determination.

**Figure 2.** Determination of Kendall coefficient throughout the profession.
From the processing image in the SWAT software above, it can be seen that the Kendall coefficient value is 0.8786 which is greater than 0.75. This indicates that scaling processing will be done with Group Scaling Solution (GSS) where the workload value obtained will be averaged so that it can be a value of group workload. The results of processing data using SWAT software are all the Kendall coefficient values for each profession are greater than 0.75 so the scaling specified is GSS. It can be seen that the value of the MA9 workload individually is 26.3 but if averaged it becomes a Mobile App Developer workload of 67.61. After being re-confirmed to the respondent, the results of scaling the Group Scaling Solution do not reflect the actual workload conditions, so Individual Scaling Solution will still be used.

In the following tables can be seen the results of the conversion of the SWAT scale into the workload value for each profession.

### Table 4. SWAT software scaling results.

| T  | E  | S  | Standard | Scaling | T  | E  | S  | Standard | Scaling |
|----|----|----|----------|---------|----|----|----|----------|---------|
| 1  | 1  | 1  | -1.334   | 0       | 2  | 2  | 3  | 0.549    | 78.7    |
| 1  | 1  | 2  | -0.965   | 15.4    | 2  | 3  | 1  | 0.171    | 62.9    |
| 1  | 1  | 3  | -0.693   | 26.8    | 2  | 3  | 2  | 0.539    | 78.3    |
| 1  | 2  | 1  | -0.704   | 26.3    | 2  | 3  | 3  | 0.811    | 89.7    |
| 1  | 2  | 2  | -0.335   | 41.8    | 3  | 1  | 1  | -0.476   | 35.9    |
| 1  | 2  | 3  | -0.064   | 53.1    | 3  | 1  | 2  | -0.107   | 51.3    |
| 1  | 3  | 1  | -0.441   | 37.3    | 3  | 1  | 3  | 0.165    | 62.7    |
| 1  | 3  | 2  | -0.073   | 52.7    | 3  | 2  | 1  | 0.154    | 62.2    |
| 1  | 3  | 3  | 0.199    | 64.1    | 3  | 2  | 2  | 0.523    | 77.6    |
| 2  | 1  | 1  | -0.722   | 25.6    | 3  | 2  | 3  | 0.794    | 89      |
| 2  | 1  | 2  | -0.353   | 41      | 3  | 3  | 1  | 0.417    | 73.2    |
| 2  | 1  | 3  | -0.081   | 52.4    | 3  | 3  | 2  | 0.785    | 88.6    |
| 2  | 2  | 1  | -0.092   | 51.9    | 3  | 3  | 3  | 1.057    | 100     |
| 2  | 2  | 2  | 0.277    | 67.4    |

3.5. SWAT scale conversion into RSE mental workload

Determination of the range of categories in SWAT is in accordance with the literature made by the SWAT method which is a low category for the workload value of 0-40, medium for the value of workload 41-60, and high for the value of workload above 60.

### Table 5. Value of RSE mental workload.

| Respondent | Value | Category | Respondent | Value | Category |
|------------|-------|----------|------------|-------|----------|
| SA1        | 60.8  | High     | FE8        | 87.8  | High     |
| SA2        | 100   | High     | FE9        | 17.4  | Low      |
| SA3        | 90.9  | High     | BE1        | 86.3  | High     |
| SA4        | 69.5  | High     | BE2        | 23.3  | Low      |
| SA5        | 39.8  | Low      | BE3        | 88.1  | High     |
| SE1        | 24.5  | Low      | BE4        | 100   | High     |
| SE2        | 100   | High     | BE5        | 60.7  | High     |
| SE3        | 77    | High     | BE6        | 47.9  | Medium   |
| SE4        | 90.7  | High     | BE7        | 60.7  | High     |
| SE5        | 55.1  | Medium   | QA1        | 57.6  | Medium   |
| SE6        | 52.9  | Medium   | QA2        | 57.6  | Medium   |
Respondent | Value | Category | Respondent | Value | Category
--- | --- | --- | --- | --- | ---
MA1 | 100 | High | QA3 | 84.3 | High
MA2 | 88.6 | High | QA4 | 100 | High
MA3 | 88.6 | High | QA5 | 25 | Low
MA4 | 64.1 | High | QA6 | 25 | Low
MA5 | 62.7 | High | UI1 | 59.2 | Medium
MA6 | 37.3 | Low | UI2 | 45.2 | Medium
MA7 | 51.9 | Medium | UI3 | 85.9 | High
MA8 | 89 | High | UI4 | 26.5 | Low
MA9 | 26.3 | Low | UI5 | 88 | High
FE1 | 93.2 | High | UI6 | 59.9 | Medium
FE2 | 54.3 | Medium | UI7 | 18.7 | Low
FE3 | 100 | High | DO1 | 55.7 | Medium
FE4 | 52.6 | Medium | DO2 | 46 | Medium
FE5 | 59.4 | Medium | DO3 | 93.7 | High
FE6 | 54.3 | Medium | DO4 | 15.8 | Low
FE7 | 24.7 | Low | DO5 | 15.9 | Low

From the results of the categorization above it was found that as many as 48% of all respondents felt a high mental workload. It can be caused by individual factors such as age, gender, work experience, etc.

4. Conclusion

It was found that 6 of 54 respondents have a maximum workload (value of 100). Development and Operations Engineer has the lowest mental workload value of 15.8. Nearly half of the RSE studied gave confirmation that the mental workload was being felt at a high level because the works needed a new framework that needed to be studied while the knowledge of the respondents was inadequate. In addition there is also limited time that requires the respondent to immediately complete the task because supervision of the tasks is carried out daily or weekly. This is considered as a part of adverse micromanagement. In future research, an analysis towards the relationship of mental workload with the individual characteristics of remote workers and the projects that are being worked on can be conducted. In addition, it can also be considered to include aspects of the physical needs of remote workers.

References
[1] Digital News Asia 2014 available at https://www.digitalnewsasia.com/tech-at-work/half-of-us-work-remotely-malaysia-above-global-average
[2] Bloom N, Liang J, Roberts J, Ying ZJ 2014 *Q.J Econ* 130 165-218.
[3] Purnawan Z, Wignjosoebroto S 2007 *Studi aplikasi ergonomi kognitif untuk beban kerja mental pilot dalam pelaksanaan prosedur pengendalian pesawat dengan metode “SWAT”* (Indonesia: Institut Teknologi Sepuluh November)
[4] Moray N 2013 *Mental workload: Its theory and measurement* (Berlin: Springer Science & Business Media)
[5] Saputra, A. D 2014 *Analisis pengaruh waktu terbang (phases of time) terhadap beban kerja mental pilot pesawat terbang dengan menggunakan metode subjective workload assessment technique (SWAT)* (Indonesia: Jember University)
[6] Grant KA 1985 *Canadian Datasystems* 17 25
[7] Gray, M., Hodson, N 1993 *Teleworking Explained* (Chichester: John Wiley & Sons)
[8] Harpaz I 2002 *Int. J. Prod. Perform. Manag.* 51 74-80.
[9] Computer Science Online 2011 available at https://www.computerscienceonline.org/software-
[10] Reid GB, Potter SS, Bressler JR 1989 *Subjective workload assessment technique (SWAT): A user’s guide* (Wright Patterson Air Force Base: Harry G. Armstrong Aerospace Medical Research Laboratory)

[11] R.A. Simanjuntak D.A. Situmorang 2010 *Journal Of Technology* 3 53-60