

Macro Ergonomics Approach Towards Haddon Matrix in Traffic Accident Prevention

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Abstract - In traffic accidents there are factors that affect, to identify the factors that affect traffic accident can be used Haddon matrix, whereby the factor is divided into three phases: the time before the accident, when the accident occurred and after the occurrence of an accident. Haddon matrix as well as a tool that combines the three views and the environment into a combination of prevention. With macro-ergonomics approach an accident scene can not be regarded as a "single chain of events" or a stand-alone single event, but a series of events that encourage an accident occurs. This research aims to identify the factors that cause traffic accidents that occurred on the highway and analyze the relationship between these factors, as well as to formulate the concept of prevention of traffic accidents on the highway.

Keyword - Road Traffic Accident, Haddon Matrix, Macroergonomics.

I. INTRODUCTION

Traffic accidents are the events that occurred on the road whether intentional or not and involve vehicles with other road users, who generally cause human casualties (Enggarsasi & Sa'diyah, 2017). In an accident there are factors that cause accidents. According to (Azizirrahman, et al., 2015) factors that cause traffic accidents on the road can be derived from the driver factor that is not focused when driving a vehicle, and can also come from factors such as lack of road markers or road signs are sufficient to make the drivers to be less vigilant. Besides the two factors above, the high number of accidents caused by road users who are not careful in traffic (Nastiti, 2017). In the macro ergonomics, there are three factors that must be considered in evaluating an organization or system of human factor, The organization and the environment (Realyvásquez A, et al., 2018),

With macro ergonomics of a scene of the accident can not be seen as a "single chain of events" or a stand-alone single event, but a series of events that encourage an accident occurs. Furthermore, occurrence of accidents are

often also seen as a factor "Human Error" or pure human error. While in the macro ergonomics, human error must be explained in the context of human and environmental factors surrounding the organization or system (Robertson, et al., 2015),

With macro-ergonomics approach is expected to efforts in prevention terfacing traffic accidents on the highway can be formulated in the form of a more comprehensive policy. But so far have not found a study evaluating the causes of accidents and prevention of macro ergonomics approach.

Identifying factors that cause traffic accidents that occurred on the highway. Analyze the relationship between factors that influence the occurrence of traffic accidents on the highway plainly. Formulate the concept of traffic accident prevention approaches macro ergonomics and modified matrix haddon,

II. METHOD

In this study is to review previous research to develop methods Haddon matrix on the prevention of traffic accidents.

III. DISCUSSION

Researchers examined several journals to see the extent of the development of the concept of macro ergonomics and Haddon matrix, this is done to possibilities in integration method to provide the prevention of traffic accidents that occur

A. *Macroergonomics*

Ergonomics is the macro perspective, the methodology and the sub-discipline of ergonomics or human factors are supported by empirical science. Based on research in sociotechnics system becomes the basis for the development of modern laboratory and field investigation of the system elements sociotechnic (Hendrick and Kleiner, 2002). Sociotechnics element is due to the contribution of macro ergonomics and manufacturing system to be taken as the basis for the analysis and design or redesign of the various elements of the system. Like, job description, technology and environment interact with the human factor. It had been the goal of macro ergonomics to analyze and design elements of the system to detect potential factors of health, safety, and employee performance (Realyvasquez et al, 2018).

B. *Difference of Micro Ergonomics and Macro Ergonomics*

Ergonomics is divided into two micro and macro ergonomics. at the beginning of the development of the science of ergonomics is focused on designing a working system in which more emphasis on the ability of human beings with all the work that must be completed. But over time people began to recognize the presence of macro ergonomics. The following is a comparison between micro ergonomics and macro ergonomics.

Micro Ergonomics has characteristics as measuring tool, generally physical size such as length, style, lumen, decibels and time, Expertise application: Anatomy, Physiology, Psychology, Perceptual, Industrial Engineering. While the macro ergonomics measurement tool: Generally organizations such as the number of people, span of control, and moral attitudes, skills application: Organizational behavior, organizational psychology (Pulat, 1991 in Widodo et al (2006). According to Karsh et al (2014) in Murphy et al (2015), ergonomics macro is a systems sosiotechnic

approach and ergonomics associated with a climate of safety from the top to the bottom is applied to the various levels of interaction.

C. *Methods in Macroergonomics*

Macroergonomics has several methods that can be used in resolving some of the problems in a working system, technology, safety and measuring the capability of an organization.

D. *Macroergonomics Analysis and Design (MEAD)*

MEAD is one method that existed at Macroergonomic to analyze and analyzed the working system (Purnomo et al, 2017). MEAD methods are useful because they integrate existing methods with a variety of disciplines to provide a comprehensive evaluation system. Using Macroergonomic approach allows the flexibility of using classical methods such as laboratory experiments, field studies, field experiments, questionnaires and survey organizations, the survey interviews, and focus groups (Hendrick and Kleiner, 2002).

E. *Macroergonomics Structure Analysis (MAS)*

Macroergonomic Analysis of Structure (MAS) developed by Hendrick to evaluate a structure of a working system compatibility manipulate sociotechnics characteristics. From these characteristics Macroergonomic Analysis of Structure include aspects of technology, people and environment of a company. Macroergonomic Analysis of Structure is designed to integrate the new system with existing systems. This model increases the complexity of the optimal organization (Realyvásquez et al, 2018).

F. *Macroergonomics Compability Index (MCI)*

Macroergonomics Compability Index is a methodology that combines macro-ergonomic employee perceptions of which have been applied in the company and working system that supports the appropriate interaction of personnel subsystems and subsystem technologies, including its relationship with the characteristics of the external environment (Realyvásquez et al, 2018). Macroergonomics Compability Index is obtained by assessing the extent to which the macro ergonomics ergonomics implemented in five macro factors, namely: Person, Organization, Technology and tools, tasks, and Environment and related elements. The person may be employees who perform various tasks (Holden et al, 2013).

G. Macroergonomics Organization Questionnaire and Survey (MOQS)

Macroergonomics Organization Questionnaire and Survey is a method to collect information about various aspects of a working system such as: tasks, organizational conditions, environmental issues, tools, technology, and the characteristics of each individual (Hoonakker & Carayon, 2004). Macroergonomics Organization Questionnaire and Survey can be a tool in every stage of diagnosis as well as a benchmark of an industry or organization (Khandan et al, 2018).

H. Development of Haddon Matrix using Macroergonomics Approach

Haddon matrix is a matrix that is used to look at the factors that cause a traffic accident divided into the time before the accident, when the accident occurred and the aftermath of a traffic accident. Haddon matrix as well as a tool that combines the three views and the environment into a combination of prevention (Christoffel, 2006), Haddon Matrix also serves as a useful coordination tool for stakeholders in response to the scenario in the future (Anparasan, and Lejeune, 2017), Haddon Matrix was developed by William Haddon in 1972, this matrix look at the factors associated with the host, agent, Environment. Where humans as hosts, vehicles as agent, and the physical environment and the social environment. These factors are very important to be considered in the prevention in road accidents (Li & Baker, 2012).

Based on the methods contained in macroergonomics found that the method in accordance with Haddon matrix. The results of this research development can be seen in Figure 1.

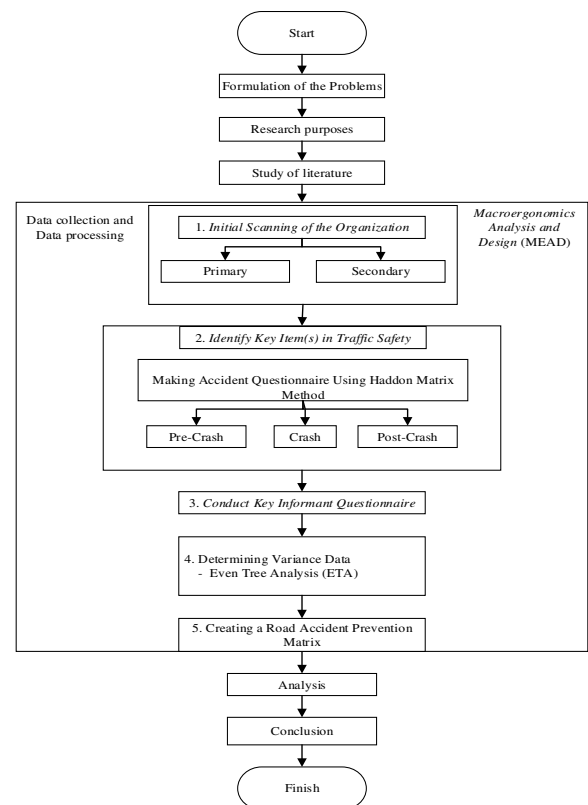


Figure 1. Framework Methodology

IV. CONCLUSION

Based on the results framework Haddon developing a matrix to prevent traffic accidents through macroergonomics approach. In this research will get a policy that will be beneficial to motorists and other road users.

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