Structural Model of Smart Integration of Green Open Space and Slaughterhouses

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ABSTRACT
The value of Green Open Space is often overlooked or underestimated by policymakers, leaders and developers including animal slaughterhouse industry developers. One of the biggest environmental concerns associated with slaughterhouses is wastewater, water contamination, and air pollution. Therefore, integration is needed between the construction of slaughterhouses and the provision of green open space. The study's objective was to come up with a structural model for the smart integration of green open space and slaughterhouses. The analysis of Interpretative Structural Modeling and Principal Component Analysis (PCA) methodologies were employed in this work (ISM). The PCA approach was used to identify the significant elements and sub-factors in the knowledge of Information Technology Governance of Green Open Spaces Integration and Slaughterhouses. Interview was conducted with three knowledgeable specialists in the fields of IT Governance, Green Open Spaces, and Slaughterhouses were conducted to gather data. The best data appropriateness acquired from these experts is then considered, and ISM is used to process it. The following are the findings of the analysis: (a) the key goal is pollution absorption by Green Open Spaces; (b) the program's key needs are Information and Communication Technology; Infrastructure-internet-Human Resources; (c) the program's key constraints are funding and control; (d) the government is the key institution; and (e) the program's key action plan is to use digital technology.

Keywords: *Green-Open-Spaces, Slaughterhouse, PC, ISM.*

1. INTRODUCTION

Green Open Space (GOS) is frequently disregarded or undervalued by politicians, leaders, and developers, particularly those in the animal slaughtering sector. Wastewater, water contamination, and air pollution are some of the most serious environmental hazards related with slaughterhouses. Therefore, integration is needed between the construction of slaughterhouses and the provision of GOS. Coordination factors between government agencies and developers including developers of Slaughterhouses and also concepts offered by developers only affect formal housing [1].

Spatial politics of the spatial layout of the slaughterhouse located on the outskirts of the city [2]. The state outlines the techniques, scientific and communal ideas, and the notion of cleanliness and sanitation is consolidated in slaughtering facilities by applying urban layout and GOS. Therefore, the author wants to contribute to the paradigm change, namely formulating the structural model of Smart Integration of GOS and Slaughterhouse as the basis of state policy. The study's goal was to develop a structural model for smart GOS and slaughterhouse integration. The structural model concept will more clearly describe the key components of integration between GOS and Slaughterhouse as public facilities that could be one of the sources of air pollution. The analyses of Interpretative Structural Modeling and Principal Component Analysis (PCA) methodologies were employed in this work (ISM). PCA approach to uncover the essential elements and sub-factors in GOS Integration and Slaughterhouses awareness Information Technology Governance. Awareness of Government in IT Governance is essential and necessary [3].

2. METHOD

Literature and talks with CIT, OGS, and Slaughterhouses experts led to the development of a structural model for smart integration of GOS and slaughterhouses. The Model of Smart Integration of GOS and Slaughterhouses employs two separate techniques: PCA and ISM. In a study titled Identifying Industry 4.0 IoT enablers by integrated PCA-ISM-DEMATEL method, PCA and ISM analysis were also used [4].

2.1. Principal Component Analysis (PCA)

For multivariate data analysis, the PCA method is the cornerstone. The PCA examines a table of data that contains observations that are explained by numerous dependent variables that are related. The objective is to extract information from a data collection and express it as a new set of orthogonal variables known as the main components.

2.2. Interpretive Structural Modeling (ISM)

ISM (Interactive Structural Modelling) is a collaborative technique that organizes a collection of directly or indirectly related elements into a comprehensive model. It aims to identify the relationship between the elements, which describes the problem. ISM can be referred to from several works [5], [6], [7], [8].

Here are the basic steps for developing the ISM model: (1) variable identification; (2) build a matrix of structural self-interaction (SSIM); (3) obtain the initial affordability matrix from the SSIM; (4) examine transitivity and establish a final affordability matrix; (5) partition the affordability matrix to a different level; and (6) develop the ISM model.

The output of ISM methods are into four categories: (1) autonomous, (2) dependent, (3) linkage and (4) independent. Autonomous categories: these sub-elements have weak driving power and weak dependence. Dependent categories: the sub-elements in this category have weak driving power but strong dependence. Linkage categories: the sub-elements in this category have strong driving power as well as strong dependence. Independent categories: the sub-elements in this category have strong driving power and weakdependence.

3. RESULT AND DISCUSSION

The result of identification and inventory in the field, there are fifty-five components of GOS Smart Integration and Slaughterhouse, which are processed using PCA. In this study, data was collected from IT Experts, OGS, and Slaughterhouse from private, government sector and academics through online surveys. Of the 245 questionnaires distributed through online surveys, 200 questionnaires were returned and as required [9], [4]. In the case of PCA, a sample size of 200 is deemed sufficient to account for fifty-five variables. Then, using SPSS, reliability tests are run to analyze the mistakes and consistency of the full data set. The bivariate correlation test and the reliability test are used to validate the indicators. PCA analysis is also employed in IT-related investigations [11], [12], [13].

Based on the correlation test findings, it appears that the correlation between each indicator and the total score of the variable is significant in value, implying that the indicator is valid and the Reliability Test process can proceed.

Therefore, fifty-five factors are accounted for into five main components. The five factors are named as the needs of the program, the main obstacles, the objectives of the program, the activities needed, and the agencies involved.

3.1. Presenting the Results

The Cronbach Alpa Coefficient is used to illustrate reliability testing, with the goal of calculating empirical data from the first and second trials [14]. Reliability Test of five Dimensions (Needs of Program, Major Constraints, Objectives of the Program, Activities Needed, and Agencies Involved) the average Cronbach's Alpha value or Alpha Reliability coefficient for each dimension is 89.24 percent or 0.8924 (>0.7). The next step is to use exploratory factor analysis to assess all five dimensions in the field by looking at their correlation values. The kaiser-meyer-olkin (KMO) value is used to determine the appropriateness of sample. The resulting 5-dimensional range is (0.885-0.942) based on KMO values, allowing for easy factor extraction.

Furthermore, the five factors (program needs, main constraints, program objectives, required activities, and agencies involved) that have been tested with PCA are continued to be processed with ISM to obtain structural models. The steps for the development of ISM model for Structural Model of Smart Integration of GOS and Slaughterhouses are:

3.1.1. Identification of Element and Sub-Element.

The dimensions, elements, and sub elements for the implementation of the Smart Integration of GOS and Slaughterhouse have been identified through literature reviews and discussions with experts. These are: program needs, major constraints, program objectives, activity needs, institutions involved (Table 1).

Table 1. Dimensions, elements and sub-elements of the PCA's smart integration of GOS and slaughterhouse implementation.

Dimension	Components	Id Components	Sub-Components
Needs of program	ICT infrastructure	IL01	physical infrastructure
		IL02	Technological Infrastructure
		IL03	data infrastructure
		IL04	**network infrastructure**
	Resources	RL01	**human resources**
		RL02	IT resources
		RL03	data resources
		RL04	**information & Communication technology resources**
		RL05	social resources
		RL06	knowledge resources
		RL07	Natural resources and the environment
major constraints	internal challenges	CL01	Funding
		CL02	demand and Expectation
		CL04	Transformation
		CL05	digital developer
		CL08	privacy security
		CL10	smart characters
	external challenges	CL03	Collaboration
		CL06	Controlling
		CL07	Empowerment
		CL09	crisis management
Objectives of the program	general goals	GL01	economic growth
		GL05	social culture value
		GL06	**pollutants of Slaughterhouse activities will be absorbed by Green Open Spaces**
	specific goals	GL02	Satisfaction
		GL03	digital services
		GL04	Users of Slaughterhouse Services business Transaction
Activities needed	strategy in technologies	SL01	**utilizing digital Technology**
		SL04	market competition
		SL08	Animal Slaughterhouse Service Manager Experience
		SL09	Entertainment
		SL10	innovation creativity
	strategy in humans	SL02	human empowerment
		SL03	Engagement Stakeholders
		SL05	policy regulation
		SL06	Integration Coordination
		SL07	collaboration co- Creation
Activities needed	obligatory Applications	AL01	ICT based apps

Interpretative Structural Modeling (ISM) can provide excellent conditions for diversity and very complex different viewpoints [15], [16]. System elements and sub-elements are presented in a graphical picture of each relationship and its hierarchy level, enables the identification of the relationship between concept and determinant structures in such complex issues. The ism processing stage, starting with compiling:

3.1.2. Matrix of Structural Self-Interaction (Ssim), with Four Notations Used:

(i) V-smart i affects smart j; (ii) A-smart j affects smart i; (iii) X-smart i and j influence each other; and (iv) O-smart i and j are not related to each other.

3.1.3. Reachability and Final Reachability Matrix from the SSIM

The initial reachability matrix, or binary matrix, is constructed from the SSIM matrix by substituting V, A, X, and O with 0 and 1 according to the following rules: I If the (i,j) entry in SSIM is V, the I j) entry in the reachability matrix becomes 1 and the (j, I entry becomes 0; (ii) If the (i,j) entry in SSIM is A, the I j) entry in the reachability matrix becomes 0 and the (j, I entry becomes 1; (iii) If the (i,j) entry in SSIM is X*3.1.3.1. Developing ISM Model.*

The ISM model illustrates that pollutants of slaughterhouse activities will be absorbed by G OS (E6) has the highest driving power (Figure 1).

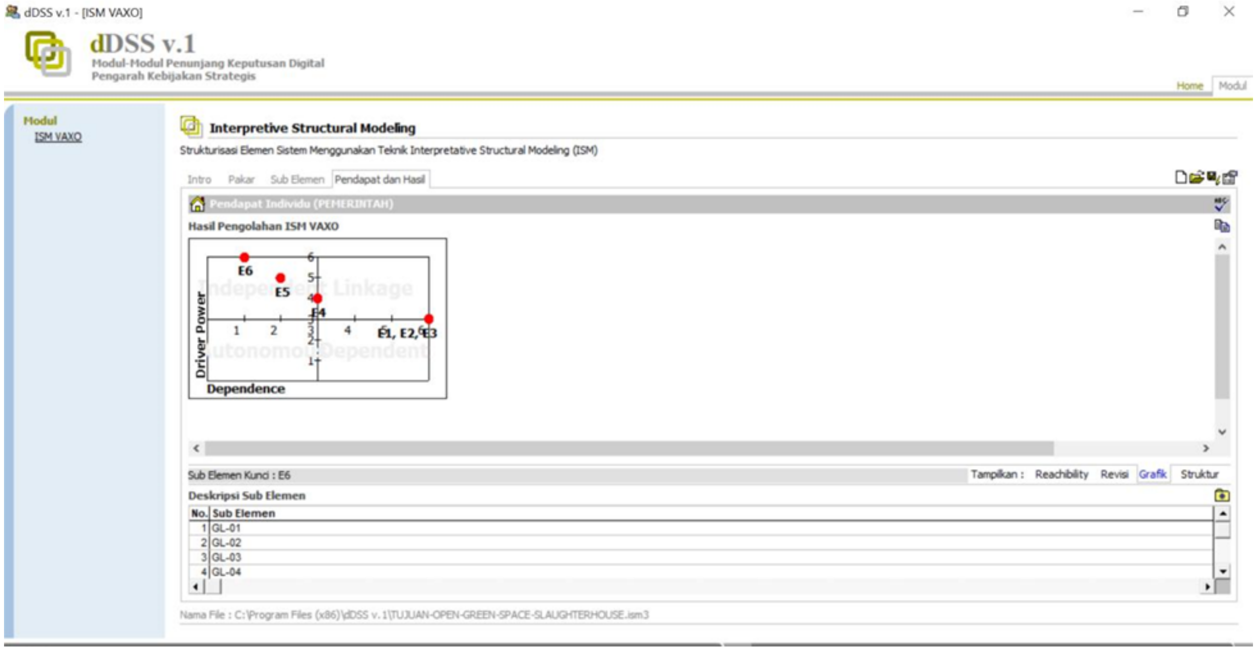

Figure 1 The relationship of Driver-Power and Dependence to the objectives elements

Description:

E1 : economic growth

E2: Satisfaction

E3: Digital services

E4: Users of Slaughterhouse Services business transaction

E5: social culture value

E6: pollutants of slaughterhouse activities will be absorbed by GOS

A comprehensive understanding of the pollutants emitted by slaughterhouse operations that will be absorbed by GOS is essential for policymakers and urban planners to make informed judgments. By examining the relationship between green slaughterhouse infrastructure and human health through air pollution reduction. Natural science and epidemiology (a branch of ecology) take quite diverse approaches to the problem of green infrastructure and human health. The paths connecting health benefits and pollution reduction by urban vegetation are yet unknown, and the form of green infrastructure development is crucial to minimize unforeseen consequences. Green infrastructure, such as the Green Slaughterhouse, can be strategically deployed to limit pollutant exposure downstream.

However, developing unique Green Slaughterhouse Infrastructure design principles is critical to promoting and optimizing greening benefits, as is quantifying green infrastructure's environmental, socioeconomic, and health benefits. Greening cities to reduce pollution effects is becoming more popular, but scientific proof and rules are needed to back it up. Although there is limited empirical evidence tying these benefits to air pollution reduction by urban vegetation, significant efforts are needed to define the underlying policies, design, and engineering rules guiding its deployment, including activities on Slaughterhouse. Green infrastructure is approached from the perspectives of natural sciences and epidemiology [17].

The 20th century marked a step change in the thinking on food supply (including meat from slaughterhouses) for urban areas. The first cluster, based on the categorization, is autonomous Smart, which is greatly removed from the system. There are no autonomous Smarts in this situation. The second categorization is the dependent cluster, which shows that smart economic growth (E1), satisfaction (E2), and digital services (E3) have driving power of 3 and dependability of 6. One of the real steps of recording the butcher's activities while at Slaughterhouse is digital services (E3). Photographs were taken using a digital camera to chronicle the state of the infrastructure and the operations of the butchers in Slaughterhouse [18].

The final group is linking, and any impact on these Smart will almost certainly have an impact on other Smart. There is no connectivity cluster in this situation. The fourth classification are independent cluster which consists of Smart pollutants of slaughterhouse activities will be absorbed by GOS (E6), social culture value (E5) and Smart Users of Slaughterhouse Services business transaction (F4). Pollutants of slaughterhouse activities will be absorbed by GOS has a driving power of 6 and dependence of 1, besides social culture value has a driving power of 5 and dependence of 2. Users of Slaughterhouse Services business transaction has a driving power of 4 and dependence of 3 (Figure 1).

3.1.3.2. Developing ISM Model

The ISM model is built using the final reachability matrix and the Smart hierarchical level, respectively.The ISM model illustrates that network infrastucture (E4), human resources (E5), information communication technology (E8) have a driving power of 11 and dependence of 3 (as the key program needs elements) (Figure 2).

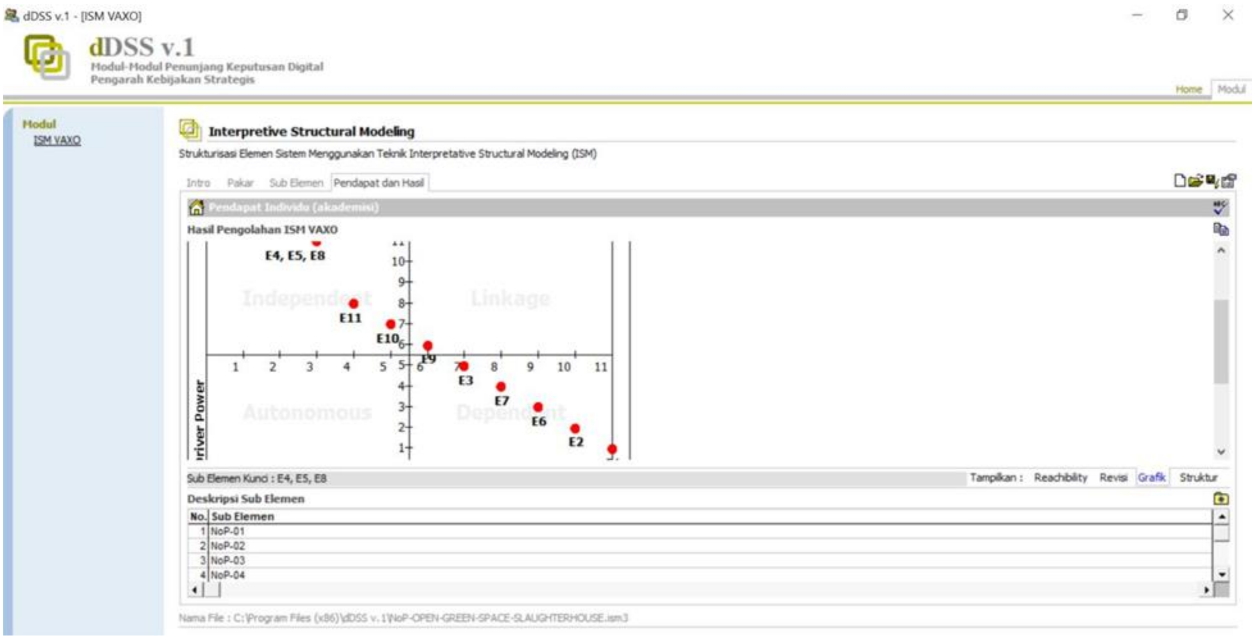

Figure 2 The relationship of Driver-Power and Dependence to the Needs elements

There are no autonomous clusters in this situation (requires elements). The dependent cluster is the second classification. Data infrastructure (E3) has a driving power of 5.50 and a dependency of 7, data resources (E7) has a driving power of 4 and a dependency of 8, information technology (E6) has a driving power of 3 and a dependency of 8, technological infrastructure (E2) has a driving power of 2 and a dependency of 10, and physical infrastructure (E1) has a driving power of 1 and a dependency of 11.

The third classification is **linkage cluster** and the given figure represents that social infrastructure (E9) has driving power of 9 and dependence of 9. The fourth classification is independent cluster which consists of network infrastucture (E4), human resources (E5), information communication technology (E8) have a driving power of 11 and dependence of 3 (key needs elements), knowledge resources (E10) has driving power of 7 and dependence of 5, and natural resources and environment (E11) has driving power of 8 and dependence of 4 (Figure 2).

Some key aspects of human resource development require network infrastructure and information communication technology. Hygiene policies and the necessity of providing safe food in urbanized areas, causing the rural agricultural sector to experience progressive distancing (between cities and their food). The government deserves to support

Farmers/Ranchers/Fish Growers to cede land to pastures rich in vegetation and wildflowers, plant more trees, restore habitat for endangered species, restore soil fertility and attract wildlife back. The government will ensure the wider landscape is changed to connect habitats to larger corridors for wildlife [19]. One step to realize food availability (meat from Slaughterhouse) and humans is smart integration of GOS with Slaughterhouse

3.1.3.3. Developing ISM Model.

The final reachability matrix and the hierarchical level depicted are used to build the ISM model. According to the ISM model, funding (E1) and controlling (E6) have a driving power of 10 and a reliance of 2 (as the principal constraint element) (Figure 3).

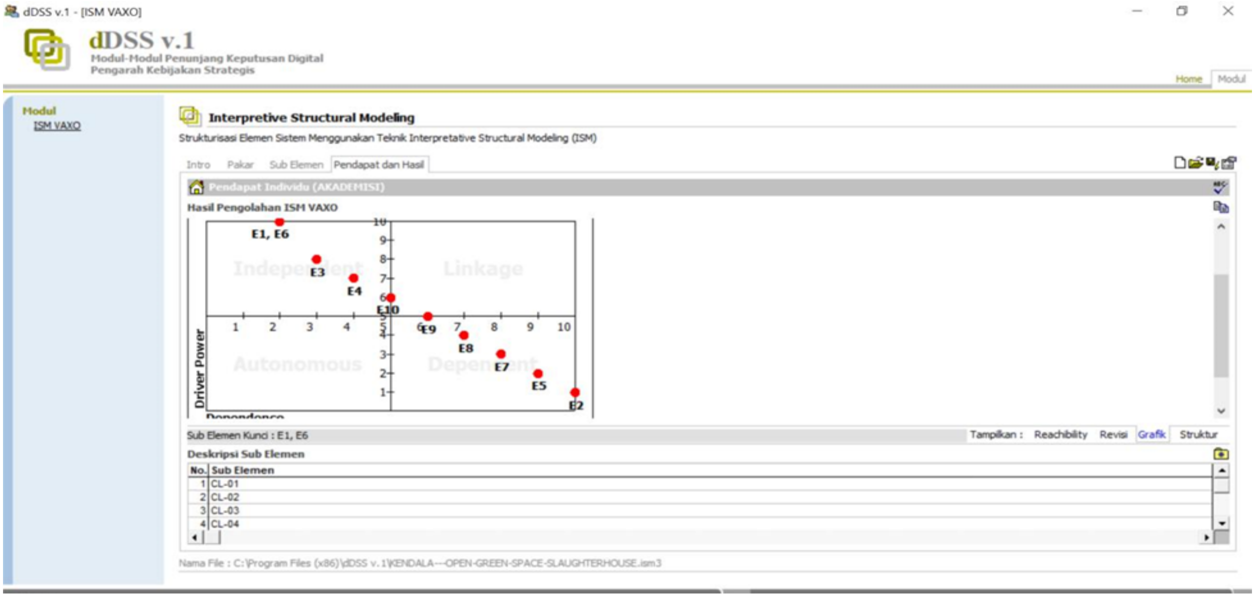

Figure 3 The relationship of Driver-Power and Dependence to the Major Constraint elements

There are no autonomous clusters in this situation (requires elements). The dependent cluster is the second classification. The given graph depicts slaughterhouse crisis management (E9) having a driving power of 5 and a dependence of 6, privacy security (E8) having a driving power of 4 and a dependence of 7, empowerment (E7) having a driving power of 3 and a dependence of 8, digital developer (E5) having a driving power of 2 and a dependence of 9, and demand and expectation (E2) having a driving power of 1 and a dependence of 10.

The third classification is linkage cluster and the given figure represents there are no linkage cluster. The fourth classification is independent cluster which consists of funding (E1), and controlling (E6) have a driving power of 10 and dependence of 2 (as the key major constraint), transformation (E4) has driving power of 7 and dependence of 4, smart characteristic (E10) has a driving power of 6 and dependence of 5, and collaboration (E3) has driving power of 8 and dependence of 3. (Figure 3).

3.1.3.4. Developing ISM Model

The final reachability matrix and the hierarchical level depicted are used to build the ISM model. Using digital technology (E1) has a driving power of 17 and a dependency of 1 (as the key activity aspects) according to the ISM model (Figure 4).

There is no autonomous cluster in this set of requirements. The dependent cluster is the second type of classification. The given graph shows that social media (E16) has a driving power of 8 and a dependence of 10, entertainment apps (E17) has a driving power of 7 and a dependence of 11, recommendation apps (E15) has a driving power of 6 and a dependence of 12, information apps (E13) has a driving power of 5 and a dependence of 13, ICT based apps (E11) has a driving power of 4 and a dependence of 14, and entertainment (E9) has a driving power.

The third classification is linkage cluster and the given figure represents that navigation apps (E14) has driving power of 9 and dependence of 9. The fourth classification is independent cluster which consists of utilizing digital technology (E1) has driving power of 17 and dependence of 1 (as the key activities needed), market competition (E4) has a driving power of 16 and dependence of 2, policy regulation (E5) has driving power of 15 and dependence of 3, collaboration co-operation (E6) has a driving power of 14 and dependence of 4. The engagement of stakeholders (E3); and animal slaughterhouse service manager experience (E8) have driving power of 13 and dependence of 6, innovation creativity (E10) has a driving power of 11 and dependence of 7. The last needed application model

(E12) has a driving power of 10 and dependence of 8. (Figure 4).

3.1.3.5. Developing ISM Model

The final reachability matrix and the hierarchical level depicted are used to build the ISM model. According to the ISM model, government awareness in IT governance (E4) has the highest driving power of 11 and the lowest dependence of 1 (as important institutional factors) (Figure 5).

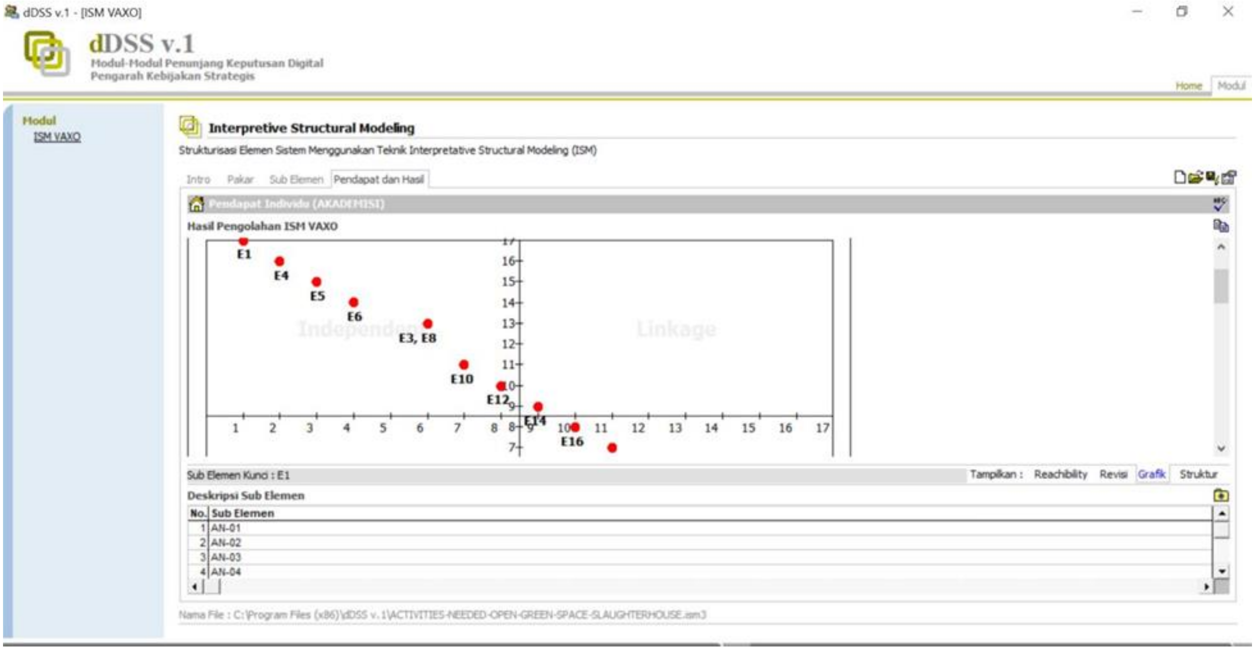

Figure 4 The relationship of Driver-Power and Dependence to the Activities Needed elements

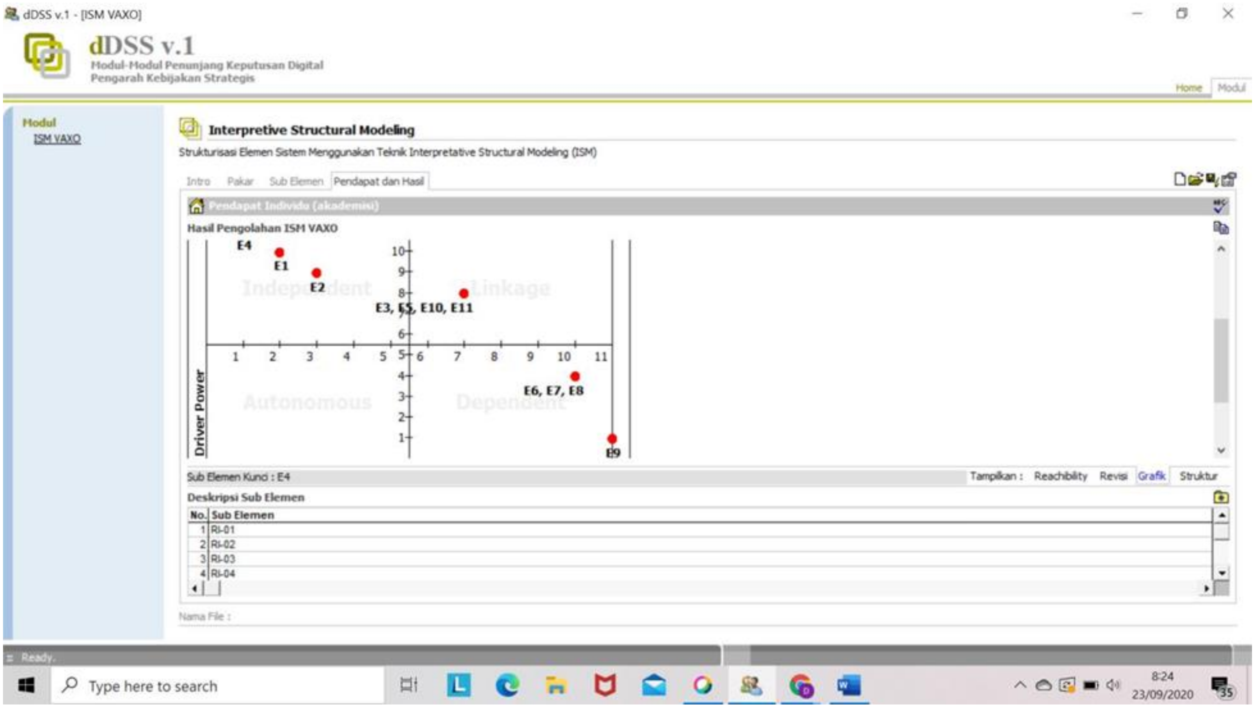

Figure 5 The relationship of Driver-Power and Dependence to the related Institutional

There are no autonomous clusters in this requirements element. The dependent cluster is the second classification. Users of slaughterhouse services (E6), citizens or the general public (E7), and netizens (E8) have driving power of 4 and dependencies of 10, respectively, whilst volunteers (E9) have driving power of 1 and dependencies of 11.

The third classification is linkage cluster and the given figure represents that community (E3), academic (E5), volunteers (E10) dan media (E11) have driving power of 8 and dependence of 7.

The fourth classification is independent cluster which consists of awareness of government in IT governance (E4) has a driving power of 11 and dependence of 1 (as the key institutional), slaughterhouse industry (E1) has a driving power of 10 and dependence of 2, and SME (E2) has driving power of 9 and dependence of 3 (Figure 5).

4. CONCLUSION

Formulating of Structural Model of Smart Integration of GOS and Slaughterhouses are: (a) as the key goal is all of sources pollutants from Slaughterhouse's activities will success absorbed by GOS; (b) there are the three key needs of the program are Information and Communication Technology (ICT); Infrastructure-internet; and Human Resources; (c) there are two the key constraint are funding, and controlling; (d) as the key institutional is awareness of Government in IT Governance; and (e) as the key action plan is utilizing digital technology.

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