THE NAVAL CADETS' EVALUATION MODEL: A FRAMEWORK FOR EVALUATION OF THE COACHING SYSTEM

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ABSTRACT

In order to realize Superior Human Resources, X Naval Academy builds an education system that is oriented to the Tri Archetype of Armed Force Education, namely through Teaching, Training and Nurturing Methods that cannot be separated from one another. There are still problems in its implementation, it is necessary to carry out an evaluation for the development of the AAL Cadet Development system with a Dynamic Systems Approach and Game Theory to compare with the International Naval Academy in this case NDA and USNA. The simulation data uses data from the last 5 years, namely the period 2017 to 2022. The results of the study are that there are 2 key variables that have a significant effect in the Cadet Development System, namely Additional Night Activities and Additional Protocol Activities, then simulated Optimistic Scenarios, Moderate Scenarios and Pessimistic Scenarios. The most Optimal Scenario results are the Optimistic Scenario which can increase the Graduate Quality Value from 0.25 "Sufficient" to 0.63 "Good", the Teaching Quality Value from 0.32 "Sufficient" to 0.71 "Good", the Training Quality Value from 0.2 "Less" to 0.52 "Good" and the Nurturing Quality Value of 0.17 "Less" becomes 0.47 "Sufficient", then the results of the Scenario are analyzed with the Game Theory Two Persons Zero Sum Game approach by comparing with the situation in NDA and USNA, the results of the analysis produce Policy suggestions namely X Naval Academy regulates the time to face Junior Cadets to Senior Cadets in Daily Activity and regulates Technical Facing as has been applied in NDA and USNA to To avoid missing nightly rest and deviations from undirected and measurable coaching, X Naval Academy screens and advises leaders on priority scales in support of unscheduled protocol activities involving cadets. This has been implemented in NDA and USNA.

Keywords: *Cadets, Game Theory, Naval Academy, NDA, System dynamics, USNA.*

1. INTRODUCTION

The development of the world of education is increasing from time to time. It is characterized by many findings and innovations in the field of science and technology. This condition requires education practitioners to increase their contribution in an effort to produce quality resources and be able to compete, namely humans who have faith and devotion to God and mastery of science and technology in the future. However, to develop the quality of human resources, there are challenges and problems of the nation that must be faced, namely: the need to improve quality and added value, changes in the structure of society, increasingly fierce global competition, and the influence and dominance of developed countries in mastering science and technology. To realize Superior Human Resources, X Naval Academy builds an Education system that is oriented to the Tri

Archetype of Armed Force Education, namely through Teaching, Training and Nurturing Methods that cannot be separated from one another. In every educational implementation, various efforts and methods are carried out in order to achieve the educational goals that have been set. In addition to teaching and training activities, guidance and nurturing activities are also carried out so that the results achieved can be obtained optimally. This guidance and nurturing is a unity that cannot be separated from an educational process, which is interrelated and supports each other.

The results of the author's observations and experiences in the field obtained preliminary data on several problems of cadets, including too many protocol activities that can take up time to study and practice cadets and have an impact on the Learning Process in the Classroom There are still cadets who lack focus in receiving lessons in class due to fatigue factors, so that cadets cannot receive the knowledge

provided optimally. In addition, cadets are still found who carry out personal activities until late at night which results in lack of rest time and independent study of cadets at night. This is an indicator of reduced cadet discipline in carrying out the Daily Activity. In this study, the author intends to model the X Naval Academy Cadet Development with a Dynamic system approach, namely identifying what variables affect the X Naval Academy Cadet Education system. Then in the next stage using Game Theory in describing the interaction between the Naval Academy Cadet Education system implemented in several Asian countries, in this case namely X Naval Academy, NDA and USNA. In the Game Theory simulated in this study, the three countries or players are assumed to have carried out policies or strategies in this game. so that the quality of X Naval Academy cadets is maintained and so that education is more international standard in accordance with the assignment of cadets in the future and can adjust the development of existing defense equipment technology so that superior human resources can be realized.

2. LITERATURE REVIEW

2.1 Nurturing Theory.

The care of X Naval Academy cadets uses the Among Foster Method, namely Silih Asah, Silih Asih and Silih Asuh. According to H. R. Hidayat Suryalaga Silih asah means educating each other, expanding each other's horizons and inner birth experiences, penance has the meaning of loving each other by giving sincere affection, penance has the meaning of guiding, nurturing, fostering, guarding, directing carefully so that inner birth is safe (Rahmah, 2020). This method of among foster care is framed in the relationship between senior and junior cadets applied in the life of the Mixed Battalion.

2.2 System Theory.

System theory is a system term encompassing systems of machines, organisms, psychology and different social systems with individual actions and parts. A system is a set of elements and relations separated by the boundaries of its environment that are always more complex than the system itself. (Hall, A. D., & Fagen, 1968).

2.3 Dynamic System.

System dynamics attempts to study a part of the whole system, but this does not mean ignoring the system with the environment. In the language of dynamical systems, variables that do not have a significant effect on the system of observations will become limitations in the analysis of dynamical systems, making the system of observations a closed system. In analyzing a system that has a feedback relationship, partial analysis cannot be done. Weaknesses in conducting partial analysis make dynamic systems superior in conducting system analysis that has feedback *loops* or causal *loops*. In conducting dynamic system analysis, stages are needed to be able to produce a good model of the observation system. (Sterman, 2000)

In feedback relationships there are two types of relationships, positive feedback and negative feedback (Caropeboka, 2017). explains that the determination of the types of positive and negative feedback must first be determined which is the cause and which is the effect. Furthermore, it is known the type of effect caused by the cause, which is unidirectional (positive) or opposite direction (negative). A positive result is if one component causes an increase in another component, while a negative if one component causes a reduction in another component. Then assemble the causal relationship into a closed system of loops. To determine whether the *loops* are positive or negative, it must be seen whether the entire interaction produces a reinforcement or counter-balancing process. *Positive loops* are characterized by the existence of processes that are growing, while negative means the opposite, namely the process of decreasing or balancing.

2.4 Dynamic System Validation.

Validating the model is a key consideration in evaluating whether the model created is representative of the real situation. Model validation and testing can be done by testing the structure and behavior of the model (Schreckengost, 1985). Model behavior testing or replication is performed to find out whether the model is already behaving the same as real or representative conditions. This test can be done by comparing simulation data with actual data using a model (Barlas, 1996).

2.5 Game Theory.

Game theory is a mathematical theory that addresses the general features of competitive situations such as these formally and abstractly, this theory mainly emphasizes the decision-making process on opposite parties A form of competition between two parties or two groups facing each other and using aturns known to both parties facing each other. A decision must be made to obtain optimal results. A decision is taken to maximize its minimum winnings or profits or minimize its maximum losses or losses. Decision making is the most important thing in game theory which is a quantitative analysis method of operations research *(Operation Research).* So game theory itself is a field of supporting science in determining marketing strategies, which is widely used in marketing

competition conditions. This technique is a form of competition between two parties or two groups that face each other and use rules known to both parties (Hiller &; Lieberman, 2014).

3.   MATERIAL AND METHODS

The approach method used in research is a quantitative approach. The quantitative approach is applied in this study through the results of questionnaires which are then formulated mathematically the relationship between variables according to the specification structure in the Dynamic Systems method. Through Dynamic System modeling, it can be known that *stock and*

flows affect the formulation of scenarios and *Game Theory* methods are used to determine strategies and policies from the scenarios obtained.

Researchers collect research data sources primary from X Navy Headquarters and X Naval Academy and secondary data sources from from literature, articles, journals and sites on the internet related to the research conducted

4   RESULT AND DISCUSSION

4.1   Causal Loop Diagram

The causal loop model is made to show the variables described in the model, in this case it has been compiled based on the initial variables that have been identified
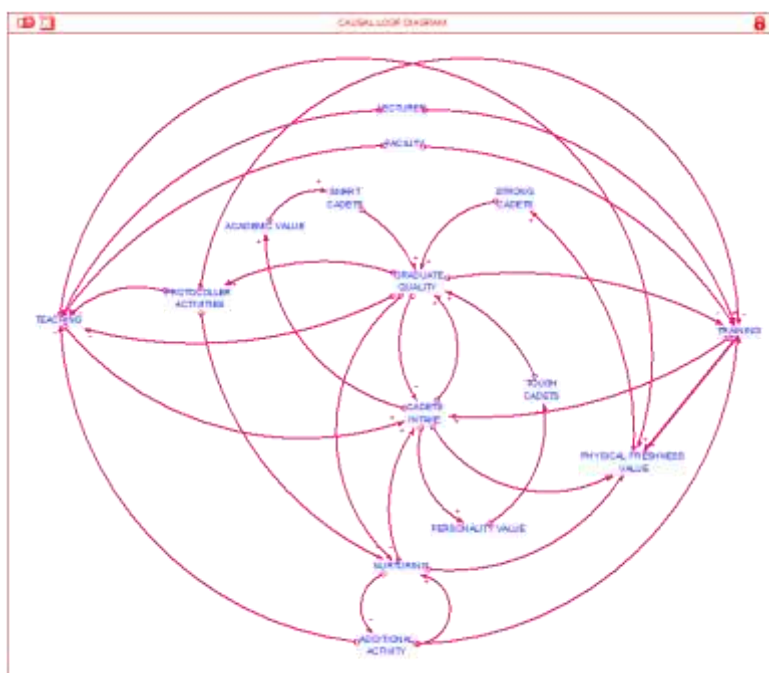
Figures 1 Causal Loop Diagrams

Figure 2 is a structuralization of models and systems that occur in the X Naval Academy Cadet Training system. The structuralization is modeled in the form of *causal loop diagrams (CLDs)* or causal diagrams of all variables that affect the X Naval Academy Cadet Training system. From the conceptualization of the *causal loop diagram* model above, it can be seen that the X Naval Academy Cadet Development system is influenced by the development of system dynamics from 4 (four) variables, namely the variables of Teaching, Training, Nurturing and Quality of Graduates. The variables that affect the three variables are defined according to the identification of variables that have been done before.

4.2   Variable Identification

The initial step in conceptualizing X Naval Academy Cadets Development is identifying the variables that influence X Naval Academy Cadets Development. The purpose of identifying this variable is to deepen knowledge of the object under study. The variables identified are variables related to the level of implementation of the education system and interact with X Naval Academy Cadets Development. Based on the X Naval Academy Cadets Education Implementation Program and the identification of all influential variables, the Cadets Development variables can be categorized as including 3 (three) sub-models namely: Teaching, Training and Nurturing.
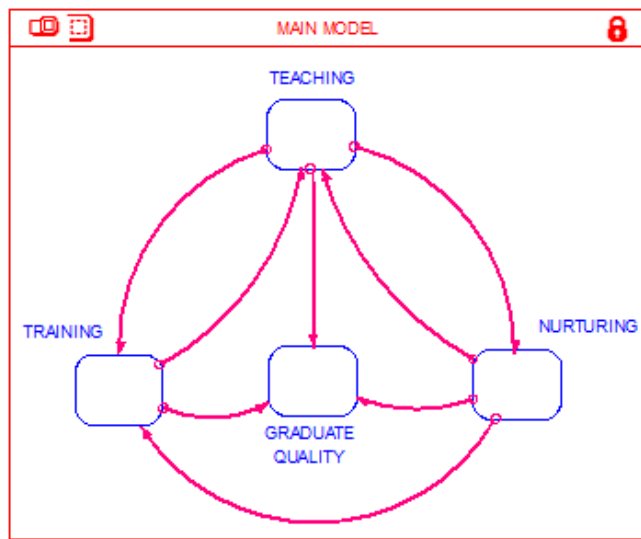
Figure 2. Main Model

The main Model System in Figure 3 is the modeling of the X Naval Academy Teaching, Training and Nurture Cadet system that affects the Quality of X Naval Academy Graduates. At this point it is explained that there are sub-models on each variable that affect each other. Within each model, there are many variables that can affect other variables either inside the model or outside the model. The submodel relationship variables are illustrated by the red lines in Figure 3

4.3 Stock and Flow Diagram

In this section, research discussion is carried out by displaying and translating *the Causal Loops* model into a *Stock and Flow diagram* model and continued with model verification and validation. After verification and validation, the next step is to create a dynamic model simulation to measure the Quality of X Naval Academy Graduates and look for variables that have the most significant impact.In assessing the Quality of Graduates, X Naval Academy consists of 3 variables, namely teaching, training and nurturing. *Stock and flow* diagram of X Naval Academy Graduate Quality illustrated in Figure 4 In the implementation of the Teaching, Training and Nurturing submodel is made by compiling *stock and flow* diagrams based on *causal loops* that have been compiled. Grades, weights and relationships between variables are prepared based on the average report of teaching results for the last 5 (five) years and assisted by *deep interviews* and *brainstorming* with *experts* and questionnaires on X Naval Academy cadets. The depiction can be seen in Figure 5, Figure 6 and Figure 7.
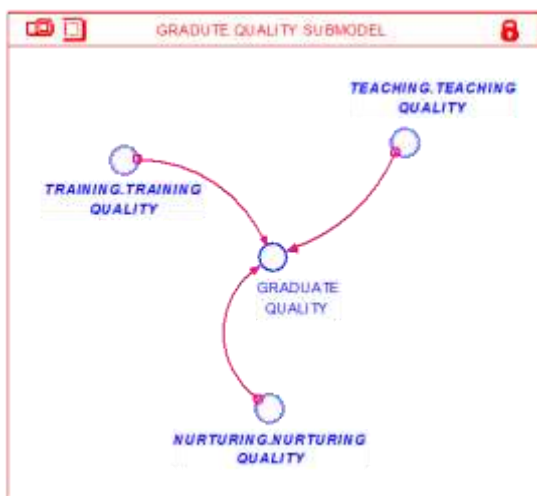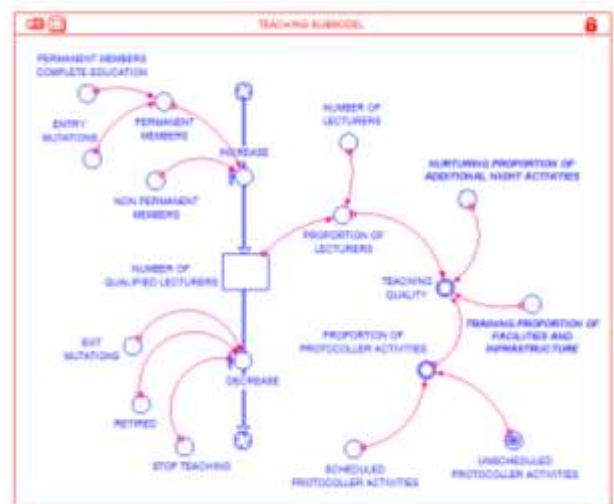

Figure 3. Graduate Quality Submodel

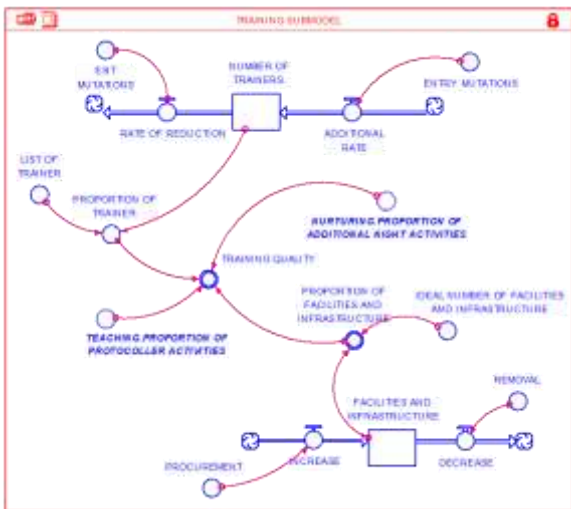

Figure 4. Training Submodel
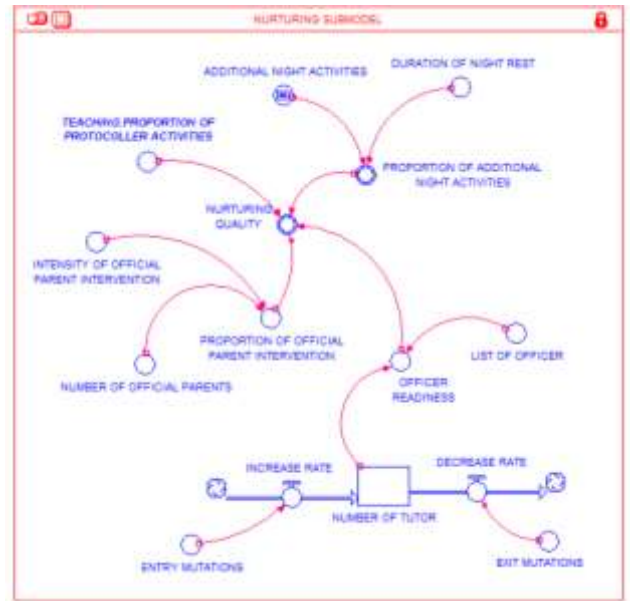
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Figure 5. Training Submodel

Figure 6. Nurturing Submodel

4.4   Verification and Validation Model

Model verification and validation aims to find out whether the model can run or there are errors, as well as to compare the structure of the model and its behavior with the structure and behavior of the system in its actual state, so that in this case, it can be known that the model is able to represent the real system.

Figure 7. Verification Test

4.5   Structure Validation Test

The X Naval Academy Cadet Development system model is made with the formulation and units have been accepted by the evaluator, so the model is qualitatively valid.

4.6   Model Parameter Test

Model *Parameter Test Model parameter testing is* carried out by looking at two interrelated variables so that it will analyze the relationship between the two variables. The relationship formed must be comparable between actual logic and simulation results. A good simulation result will show the same pattern as the actual logic. The purpose of this test is to validate the status of the relationship between two variables. In this study, the variables that have been tested are variables that have a negative and positive relationship in causal loops
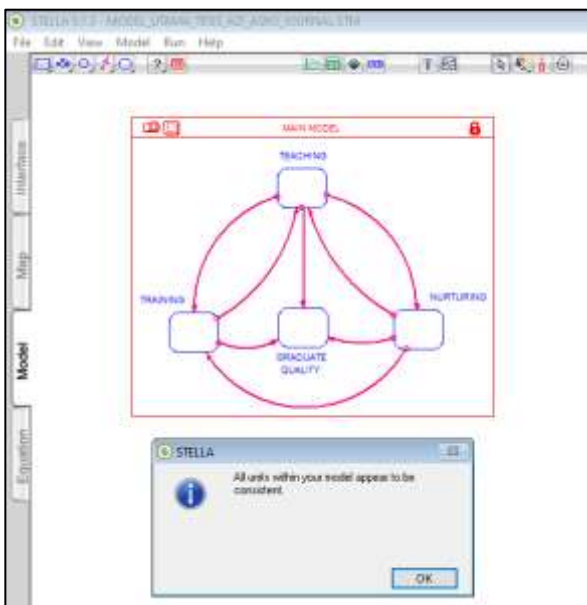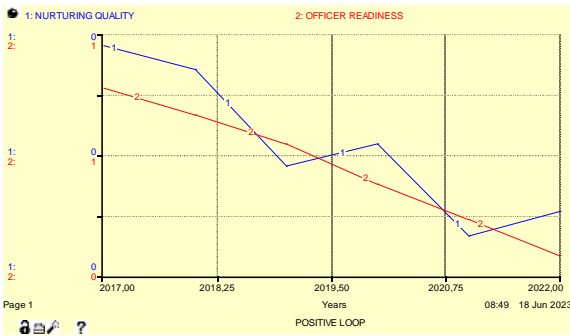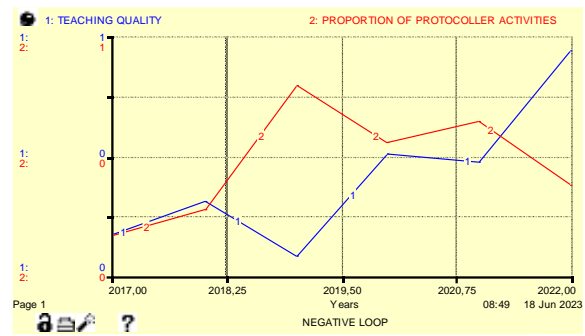
Figure 8. Positive Loop

Figure 9. Negative Loop

4.7 Behavior Model Test

To validate the behavioral model, actual data from several previous years are used. In the Validation of the Nurturing submodel in the Sub-Variable of Cadet Night Activities outside Daily Activity, a comparison was made between actual data and simulations of the average duration of cadet independent night activities outside Daily Activity. The validation test on the Nurturing submodel was carried out a comparison between actual and simulated data from the average duration of night activities outside Daily Activity. The actual data is obtained from the results of the questionnaire to X Naval Academy Alumni from 2018 to 2022. The following will display some tables of simulation model behavior validation results.

Table 1. Calculation of Cadet Night Activities Errors outside daily activity1

No	Additional Average Night Activity Duration			
	Year	Simulation	Actual	*Error*
1	2018	2	2	0
2	2019	2	2	0
3	2020	3	2	0,5
4	2021	2	2	0
5	2022	3	2	0
	Average			**0,08**

In the Nurturing submodel validation test on the sub-variable Cadet night activities outside Daily Activity, in Table 3 above can be seen that the resulting error data is still below the allowable variance tolerance value E < 0.1. Validation results with an E value of 0.08, it can be concluded that the

behavioral test on the data of cadet night activities outside Daily Activity is valid.

Furthermore, a validation test was carried out on the Teaching submodel with the Sub-variable Number of Gadik. Actual Data is obtained based on a recap of the Number of outriggers carried out by the X Naval Academy Educator Department. Comparison of simulation and actual data For the period of time used starting from the past 5 (five) years, namely from 2017 to 2022 which can be seen in table 4 below:

Table 2. Calculation of outrigger number errors2

No	Number of Lecturers			
	Year	Simulation	Actual	*Error*
1	2018	144	153	0,06
2	2019	155	152	0,20
3	2020	150	149	0,01
4	2021	151	154	0,02
5	2022	145	151	0,04
	Average			**0,06**

In the Teaching submodel validation test on the Number of Educators sub-variable, in Table 4. 15 above can be seen the error data produced is still below the allowable variance tolerance value E < 0.1. Validation results with an E value of 0.06, it can be concluded that the behavioral test on the data of cadet night activities outside Daily Activity is valid.

4.8 Simulation

Model simulations are carried out thoroughly on variables to determine their effect on the assessment of Teaching Quality, Training Quality, Nurturing Quality and Graduate Quality of X Naval Academy. The simulation was carried out for 5 years, from 2017 to 2022

Figure 10. Simulation Result

Table 3. Recap of 3 Simulation Results

Year	Graduate Quality	Teaching Quality	Training Quality	Nurturing Quality
2017	0,24	0,22	0,26	0,28
2018	0,27	0,27	0,26	0,26
2019	0,16	0,18	0,12	0,16
2020	0,28	0,35	0,22	0,18
2021	0,22	0,34	0,13	0,07
2022	0,35	0,53	0,23	0,09
AVG	**0,26**	**0,32**	**0,20**	**0,17**

(Source: Processed researcher data using stella 9.1.3 software, 2023)

4.8 Measurement of Cadet Development Index

To measure the success rate of cadets in achieving educational goals and objectives after following the educational process which includes teaching, training and nurturing. Evaluation of these three aspects, obtained through measurement and assessment of educational operational activities including teaching, training and nurturing activities (Jarlatsuh) in an integrated manner. To measure the effectiveness of the implementation and success of cadets in participating in the Jarlatsuh activities

Table 4. Graduate Quality Assessment Index4

No	Quality	*Index* Conversion
1	Excellent	0,76 – 1
2	Good	0,51 < 0,75
3	Enough	0,26 < 0,5
4	Less	0 < 0,25

Source: Results of *deep-interviews* and *brainstorming* with *experts*

4.9 Analysis and Assessment of Cadet Coaching.

The Running Model for this assessment is carried out with *Stella Software version 9.1.3* for a period of 5 years starting in 2017 to 2022. Analysis of the X Naval Academy Cadet Development model can be seen in Table 10 and 11 as follows:

Table 5. Analysis of X Naval Academy Cadet Development Model5

Year	Quality of Graduates	Teaching Quality	Training Quality	Nurturing Quality
2017	0,24	0,22	0,26	0,28
2018	0,27	0,27	0,26	0,26
2019	0,16	0,18	0,12	0,16
2020	0,28	0,35	0,22	0,18
2021	0,22	0,34	0,13	0,07
2022	0,35	0,53	0,23	0,09
AVG	**0,26**	**0,32**	**0,20**	**0,17**

Header row spanning: "X Naval Academy Cadet Development Model Analysis"

Table 6. Average Quality Rate6

No	Quality	Index	5-year grade point average
1	Quality of Graduates	Enough	0,26
2	Teaching Quality	Enough	0,32
3	Training Quality	Less	0,2
4	Nurturing Quality	Less	0,17

Based on Table 11 above, it can be seen that the average X Naval Academy Graduate Quality index for 5 Years is in the Sufficient category, and the Teaching Quality is in the Sufficient category, the Quality of Training and the Quality of Nurturing are in the Less category. From the simulation, it can be concluded that the Quality of Teaching, Quality of Training and Quality of Nurturing need to be improved. To find out which variables are the most influential, the application of alternative scenarios will be carried out on the variables that make up the X Naval Academy Cadet Coaching model.

4.10 Alternative Scenarios

By looking at the simulation results that show that there is an increase and decrease in the Quality of X Naval Academy Graduates for 5 years which are assessed from 2017 to 2022. To evaluate and improve the quality of X Naval Academy Graduates as Superior Human Resources, it is necessary to apply alternative scenarios to see the impact of the scenario on changes in the Quality value of X Naval Academy Graduates. Scenario analysis has parameters that are sensitive to changes in system behavior patterns, namely the Variable Proportion of Protocol activities and the Proportion of Cadet Night Activities. Any change in parameters, in this case if increased or decreased from the value of the base scenario parameter, if it is proven that changes in the parameter result in a noticeable and significant change in the main parameter, then these parameters will be considered as *key variables (*Sterman, 2000)*.

a. Optimistic Scenario.

The Oprimistic scenario is the best scenario that has the possibility of happening to the X Naval Academy's Cadet Training system. In the Optimistic Scenario, the value of Additional Protocol Activities was lowered to 0 and the value of Cadet Night Independent Activities outside Daily Activity was lowered to 0, resulting in an Optimistic scenario of X Naval Academy Graduate Quality rising to 0.63, Teaching Quality to 0.71, Training Quality to 0.59 and Nurturing Quality to 0.47. The Optimistic Scenario leads to an Increase in the entire value. This increase can be indicated that X Naval Academy is able to eliminate independent night activities of cadets outside Daily Activity by increasing the supervision and application of sanctions for violations of cadets according to Persustar so that cadets can take advantage of night rest time effectively and efficiently to participate in learning and training activities at X Naval Academy and avoid deviations in the coaching of Senior Cadets to Junior Cadets. In addition, X Naval Academy can also arrange in Additional Protocol activities not involving Cadets which can result in Cadets Losing Time studying, training and nurturing. The results of the Pessimistic Scenario can be seen in Table 12

Table 7. Results of Optimistic Scenarios7

Year	Graduate Quality	Teaching	Training	Nurturing

2017	0,56	0,55	0,59	0,55
2018	0,6	0,62	0,6	0,53
2019	0,61	0,66	0,6	0,52
2020	0,64	0,73	0,59	0,46
2021	0,66	0,8	0,59	0,42
2022	0,69	0,88	0,59	0,36
AVG	**0,63**	**0,71**	**0,59**	**0,47**

(Source: *Stella Software* version 9.13, data processed by Ms Excel, 2023)

From Table 12 above, it can be seen that the results of the analysis and assessment of the X Naval Academy Cadet Development model for 5 years from 2017 to 2022 with an Optimistic Scenario have improved from existing conditions. The Graduate Quality Value is 0.63. The Teaching Quality score is 0.71. The Training Quality Value is 0.59 and the Nurturing Quality Value is 0.47. Furthermore, the average Quality data on the X Naval Academy Cadet Training System from the results of data processing within 5 years can be seen in table 13 below:

Table 8. Index Conversion Optimistic Scenario Results8

No	Quality	Index	5-year grade point average
1	Graduate Quality	Good	0,63
2	Teaching Quality	Good	0,71
3	Training Quality	Good	0,59
4	Nurturing Quality	Enough	0,47

Based on 13 above, it can be seen that the Graduate Quality Index, Teaching Quality, Average Training Quality for 5 years the results of the Optimistic Scenario are "Good" and the average Nurturing Quality Index for 5 years is "Sufficient". It can be concluded that the variables of additional protocol activities and additional cadet night activities outside Daily Activity have a significant effect on the Development of X Naval Academy Cadets.

b. Moderate scenario.

Moderate Scenario is medium or medium Scenario, with the expectation of improving slightly better than actual events on the X Naval Academy Cadet Coaching System. In this Moderate Scenario, the value of Additional Protocol Activities was lowered to 0.25 and the value of Cadet Night Independent Activities outside Daily Activity was lowered to 1, resulting in the Moderate scenario, the Quality of X Naval Academy Graduates rose to 0.55, the Quality of Teaching to 0.63, the Quality of Training to 0.51 and the Quality of Nurturing to 0.40. The Moderate scenario leads to an increase in the entire value. This increase can be indicated that X Naval Academy is able to reduce independent night activities of cadets outside Daily Activity with a tolerance of 1 hour to prepare equipment for tomorrow's activities by increasing supervision and application of sanctions for cadet violations according to Persustar so that cadets can utilize night rest time effectively and efficiently to participate in learning and training activities at X Naval Academy and avoid any deviations in the coaching of Senior Cadets to Junior Cadets. In addition, X Naval Academy can also set and filter priority scales in Additional Protocol activities involving Cadets that can result in Cadets Losing time studying, training and nurturing. Furthermore, the results of the Moderate scenario can be seen in Tabel 14 Below.

Table 9. Moderate Scenario Results9

Year	Graduate Quality	Teaching	Training	Nurturing
2017	0,49	0,48	0,5	0,48
2018	0,52	0,55	0,51	0,46
2019	0,54	0,58	0,51	0,45
2020	0,56	0,66	0,51	0,39
2021	0,58	0,72	0,5	0,35
2022	0,61	0,81	0,5	0,29
AVG	**0,55**	**0,63**	**0,51**	**0,40**

(Source: *Stella Software* version 9.13, data processed by Ms Excel, 2023)

From Table 14 can be seen that the results of the analysis and assessment of the X Naval Academy Cadet Development model for 5 years from 2017 to 2022 with a Moderate Scenario have improved from existing conditions. The Graduate Quality Value is 0.55. The Teaching Quality score is 0.63. The Training Quality Value is 0.51 and the Nurturing Quality Value is 0.40. Furthermore, the average Quality data on the X Naval Academy Cadet Training System from the results of data processing of Stella Software version 9.3 within 5 years can be seen in table 4.35 below:

Table 10. Results Moderate Conversion Index Scenario10

No	Quality	Index	5-year grade point average
1	Graduate Quality	Good	0,55
2	Teaching Quality	Good	0,63
3	Training Quality	Good	0,51
4	Nurturing Quality	Enough	0,40

Based on Table 15 above, it can be seen that the Graduate Quality Index, Teaching Quality, Average Training Quality for 5 years, the results of the Moderate Scenario are "Good" and the average Nurturing Quality Index for 5 years is "Sufficient". It can be concluded that the variables of additional protocol activities and additional cadet night activities outside Daily Activity have a significant effect on the Development of X Naval Academy Cadets.

c.   Pessimistic Scenarios
The Pessimistic Scenario is the worst-case scenario that still has a tolerance limit but is not expected because it is worse than the actual events in the X Naval Academy Cadet Coaching system. In the Pessimistic scenario, the variable value of the duration of independent night activities of cadets outside Daily Activity increases to 5 and additional protocol activities increase to 0.5. Based on the Results of Pessimistic Scenario Simulation using Stella 9 software. 13 It was found that the increase in additional Protocol activities involving cadets and the increase in additional independent evening cadet activities outside Daily Activity led to a significant decrease in the quality of teaching, training, nurturing and quality of X Naval Academy graduates. Increased Additional Protocol Activities involving Cadets can reduce the time to study and train Cadets, which can result in a decrease in the quality of coaching X Naval Academy Cadets. An increase in the time of independent night activities of cadets outside Daily Activity can also result in cadets losing night rest time which has an impact on sleepy cadets in class and has the potential to increase the number of violations, especially undirected and measurable coaching from Senior Cadets to Junior Cadets which leads to violence/beatings can impact Junior Cadets illness, injury and even death. For more details on the results of the Pessimistic Scenario simulation can be seen in Table 16 below:

Table 11. Pessimistic Scenario Simulation Results11

Year	Graduate Quality	Teaching	Training	Nurturing
2017	0,19	0,2	0,16	0,21
2018	0,22	0,27	0,17	0,19
2019	0,24	0,31	0,17	0,18
2020	0,27	0,39	0,17	0,12
2021	0,29	0,45	0,16	0,08
2022	0,32	0,54	0,16	0,02
rata2	**0,26**	**0,36**	**0,17**	**0,13**

From Table 16 above, it can be seen that the results of the analysis and assessment of the X Naval Academy Cadet Development model for 5 years from 2017 to 2022 with the Pessimistic Scenario have decreased from existing conditions. The Graduate Quality Value is 0.26. The Teaching Quality score is 0.37. The Training Quality Value is 0.17 and the Nurturing Quality Value is 0.13. Furthermore, the average Quality data on the X Naval Academy Cadet Training System from the results of data processing within 5 years can be seen in table 17 below:

Table 12. Results after implementation of Pessimistic Scenario12

No	Quality	Index	5-year grade point average
1	Quality of Graduates	Enough	0,26
2	Teaching Quality	Enough	0,36
3	Training Quality	Less	0,17
4	Nurturing Quality	Less	0,13

Based on Table 17 above, it can be seen that the average Graduate Quality Index and Teaching Quality for 5 years, the results of the Pessimistic Scenario are "Sufficient" and the Training Quality Index of the average Nurturing Quality for 5 years is "Less". It can be concluded that the variables of additional protocol activities and additional cadet night activities outside Daily Activity have a significant effect on the Development of X Naval Academy Cadets.

4.11 Game Theory

a. *Payoff* Matrix Analysis X Naval Academy and NDA, X Naval Academy and USNA
Strategy is prepared as follows:
1) Strategy 1: X Naval Academy Does not arrange time to face Junior Cadets to Senior Cadets

2) Strategy 2: X Naval Academy arranges the time to face Junior Cadets to Senior Cadets.
then determine the *value of the Game*. then can be arranged the Basic *Pay-off* Matrix according to Table 18 follows:

Table 13. 13Pay-off Matrix X Naval Academy and NDA

Strategy		NDA		Maximin
		B1	B2	
X Naval	A1	2	4	2
Academy	A2	3	3	3
Minimax		3	4	

In Table 18 it can be explained that the Game Theory applied is Game 2 Player number 0 (2 *person, zero sum game*) Player A is X Naval Academy and Player B is NDA. This game uses a pure strategy, namely Completion is done using the concept of Maksimin for line players, namely X Naval Academy and Minimax for column players, namely NDA. In this strategy, players use one single strategy to get optimal results, namely the same *saddle point*. For X Naval Academy as a line player, it will determine the Maksimin value by choosing the maximum value from the minimum line value. The minimum value of row 1 is 2 and the minimum value of row 2 is 3, then 3 is the maximum value of the minimum value of rows or maxims marked in yellow in Table 18

For Column players, NDA determines the minimum value, which is to choose the largest value of each column then choose the smallest value from the largest value of the column, the maximum value of column 1 is 3, the maximum value of column 2 is 4, then 3 is the minimum value of the maximum value of the column or Minimax marked in yellow in Table 18. So it can be concluded that the Line Player, namely X Naval Academy, and the Column player, namely NDA, already have the same Strategy choice, namely Strategy 2 with a value of 3 which is the Optimal value.

The pattern of coaching in NDA when facing for the coaching of Senior Cadets to Junior Cadets is carried out at noon Apple. And form punishment or action from small mistakes with physical actions *Push ups* and *Sit Ups* no beating. supervision is carried out by caretaker officers and Command Cadets, this can be applied at X Naval Academy so that the pattern of coaching Senior Cadets to Junior Cadets can be monitored and measured. The

implementation of Strategy 2 can minimize the night activities of cadets that can interfere with night rest and prevent deviant coaching to junior cadets that can be detrimental. The implementation of this strategy is with the supervision of caregivers and guard command cadets with the application of strict sanctions in accordance with special regulations for cadets if there are cadets who violate

Table 14. Pay-off Matrix X Naval Academy and USNA14

Strategy		USNA		Maximin
		C1	C2	
X Naval	A1	3	5	3
Academy	A2	4	4	4
Minimax		4	5	

Table 19 explained that themLine Players are X Naval Academy and Column Players are USNA. This game uses a pure strategy, namely Completion is done using the concept of Maksimin for line players, namely X Naval Academy and Minimax for column players, namely USNA. In this strategy, players use one single strategy to get optimal results, namely the same *saddle point*. For X Naval Academy as a line player, it will determine the Maksimin value by choosing the maximum value from the minimum line value. The minimum value of row 1 is 2 and the minimum value of row 2 is 4, then 4 is the maximum value of the minimum value of rows or maxims marked in yellow in Table 19. For Column players, USNA determines the minimum value, namely choosing the largest value of each column then choosing the smallest value from the largest value of the column, the maximum value of column 1 is 4, the maximum value of column 2 is 5, then 3 is the minimum value of the maximum value of the column or Minimax marked in yellow in Table 19. So it can be concluded that the Line Player, namely X Naval Academy, and the Column player, namely USNA, already have the same Strategy choice, namely Strategy 2 with a value of 4 which is the Optimal value. Max Value = Minimax Value which is the Saddle Point or optimal point on both Players. The chosen strategy is Strategy 2, namely X Naval Academy manages the time to face Junior Cadets to Senior Cadets, the strategy has been implemented by USNA.

a. *Pay-off* Matrix Analysis for Scenario 2 X Naval Academy and NDA, X Naval Academy and USNA The strategy is structured as follows:
1) Strategy 1: X Naval Academy accepts and supports all unscheduled protocol activities and involves cadets in such activities.

2) Strategy 2: X Naval Academy screens and advises leaders on priority scales to support unscheduled protocol activities involving cadets. then determine the *value of the Game*. then can be arranged the Basic Pay-off Matrix according to Table 20 follows:

Table 15. Pay-off Matrix X Naval Academy and NDA15

Strategy		NDA		Maximin
		B1	B2	
X Naval Academy	A1	1	4	1
	A2	2	2	2
Minimax		2	4	

Table 20 explained This game uses a pure strategy, namely Completion is done using the concept of Maksimin for line players, namely X Naval Academy and Minimax for column players, namely NDA. In this strategy, players use one single strategy to get optimal results, namely the same saddle point. For X Naval Academy as a line player, it will determine the Maksimin value by choosing the maximum value from the minimum line value. The minimum value of row 1 is 1 and the minimum value of row 2 is 2, then 2 is the maximum value of the minimum value of rows or maxims marked in yellow in Table 20. For Column players, NDA determines the minimum value, which is to choose the largest value of each column then choose the smallest value from the largest value of the column, the maximum value of column 1 is 2, the maximum value of column 2 is 4, then 2 is the minimum value of the maximum value of the column or Minimax marked in yellow in Table 20. So, it can be concluded that the Line Player, namely X Naval Academy, and the Column player, namely NDA, already have the same Strategy choice, namely Strategy 2 with a value of 2 which is the Optimal value.

Max Value = Minimax Value which is the Saddle Point or optimal point on both Players. The chosen strategy is Strategy 2, where X Naval Academy screens and advises leaders on a priority scale to support unscheduled protocol activities involving cadets. The strategy has been implemented by the NDA. NDA does not involve cadets with sudden unscheduled Additional Protocol activities, because they may interfere with cadets' learning activities. NDA cadets are only involved in scheduled protocol activities included in the Academic calendar.

Table 16. Pay-off Matrix X Naval Academy and USNA16

Strategy		USNA		Maximin
		C1	C2	
X Naval Academy	A1	2	3	2
	A2	4	4	4
Minimax		4	4	

Table 21 the Line Players is X Naval Academy and the Column Players are USNA. This game uses a pure strategy, namely Completion is done using the concept of Maksimin for line players, namely X Naval Academy and Minimax for column players, namely USNA. In this strategy, players use one single strategy to get optimal results, namely the same *saddle point*. For X Naval Academy as a line player, it will determine the Maksimin value by choosing the maximum value from the minimum line value. The minimum value of row 1 is 2 and the minimum value of row 2 is 4, then 4 is the maximum value of the minimum value of rows or maxims marked in yellow in Table 21. For column players, USNA determines the minimum value, which is to choose the largest value of each column then choose the smallest value from the largest value of the column, the maximum value of column 1 is 4, the maximum value of column 2 is 4, then 4 is the minimum value of the maximum value of the column or Minimax marked in yellow in Table 21. So it can be concluded that the Line Player, namely X Naval Academy, and the Column player, namely USNA, already have the same Strategy choice, namely Strategy 2 with a value of 4 which is the Optimal value. Max Value = Minimax Value which is the *Saddle Point* or optimal point on both Players. The chosen strategy is Strategy 2, where X Naval Academy screens and advises leaders on a priority scale to support unscheduled protocol activities involving cadets. The strategy has been implemented by USNA. USNA does not involve cadets with sudden unscheduled Additional Protocol activities, because they may interfere with cadet learning activities. NDA and USNA cadets are only involved in scheduled protocol activities included in the Academic calendar.

5. CONCLUSIONS AND SUGGESTIONS

5.1 CONCLUSIONS

Based on a series of data processing, scenario preparation and analysis of research results, several conclusions can be drawn as follows:
a. Identification of Variables that influence the development of cadets X Naval Academy is the Teaching Variable formed from the Sub-variables of Proportion of Gadik, Proportion of Facilities and Infrastructure. The Training Quality variable is formed from the Sub-variables Proportion of Trainers, Proportion of Facilities and Infrastructure. The Nurturing Quality Variable is formed from the Sub variables Proportion of Caregivers, Proportion of Independent Night Activities, Proportion of Protocol Activities, Proportion of Official Parent Intervention.
b. The results of Dynamic System Modeling show that the cadet coaching model can run in accordance with the logic and behavior of the system in the field based on the variables that have been prepared and from the model obtained Optimistic, Moderate and Pesismistic scenarios with the results of optimistic and moderate scenarios better than basic conditions, and pessimistic scenarios above basic conditions. The Optimistic Scenario has an Optimal Value with Graduate Quality 0.63 "Good" index, Teaching Quality 0.71 "Good" index, Training Quality 0.59 "Good" index and Nurturing Quality 0.47 "Sufficient" index.
c. Based on the results of Game Theory Analysis the Policy Recommendations that can be taken in the context of developing the X Naval Academy Cadet Development System are as follows: X Naval Academy arranges Junior Cadets' facing time to Senior Cadets in Daily Activity and arranges Technical Facing as has been implemented in NDA and USNA to avoid loss of night's rest and Deviation from undirected and measurable Coaching and X Naval Academy screens and advises leaders on priority scales in support of unscheduled protocol activities involving cadets. This has been implemented in NDA and USNA.

5.2 SUGGESTIONS

After researchers conducted research on the X Naval Academy Cadet Development Model in order to realize this Superior Human Resources, there were several suggestions and inputs in order to improve this research:

a. The next study can explore the Nurturing Variables, especially in the Recommendation of caregiver placement, it is necessary to carry out an assessment process based on Key Performance Indicators (KPI) which explain the ideal criteria size and projected career potential of Officers.
b. The next research can explore the Analysis of Game Theory Non ZeroSum Game in the formulation of Policy Recommendations for the Development of the X Naval Academy Cadet Coaching System.
c. In order for Navy Leaders to provide opportunities for Japanese NDA and USNA Graduate Officers to become Caretakers of the X Naval Academy Cadet Regiment so that they can share their knowledge and experience to improve the quality of X Naval Academy Cadet Training in the future.

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