Battalion Investor – user manual

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Keywords

Beslutningsspill

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Brukermanual

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Sammendrag

Dette dokumentet er brukermanualen for "Battalion Investor", et datastyrt beslutningsspill og treningsmodell. Spillet setter deg i ansvar for allokeringsavgjørelsene i Hæren, slik at du skal balansere størrelsen av krigsmateriell og personellstrukturer. Manualen beskriver først de ulike alderskategoriene for materiell og personell med tanke på deres driftsutgifter og estimerte effektivitet. Deretter blir brukergrensesnittet forklart med instruksjoner om hvordan man skal samhandle med modellen. Til slutt er det råd angående pedagogisk bruk av modellen.

"Battalion investor" er en modifisert versjon av "Bataljonsinvestor 2000", som igjen var en modifisert utgave av "Brigadeinvestor 2.0". Sammenlignet med den siste, så ble "Brigade" erstattet med "Bataljon". "Battalion investor" er oversatt til engelsk og reprogrammert slik at man ikke er avhengig av programvare for å kunne kjøre modellen.

English summary

This document is the user manual for "Battalion Investor", a computerized decision making game and exercise model. The game puts a decision maker in charge of allocation decisions in the Army in order to balance the size of the combat materiel and personnel structures. The manual first explains the various age categories of materiel and personnel in terms of their operating costs and estimated effectiveness. Thereafter the user interface is explained with instructions on how to interact with the model. Last there is advice concerning the pedagogical use of the model.

"Battalion investor" is a modified version of "Battalion investor 2000", which again was a modified version of "Brigade investor 2.0". Compared to the latter, the term "Brigade" was replaced with "Battalion". "Battalion investor" is translated to English and reprogrammed such that a licence for the software program is unnecessary for running the model.

Contents

1 Introduction

Battalion Investor[1] is a game created to study the effects of different resource utilisation strategies on the Norwegian Defence Force's composition, effect and costs. The game is suitable for studying the balance between operation and investments. The balance between the wartime organisation and the peacetime production system is also illuminated. Similarly the balance between personnel and materiel in wartime structures is apparent, as is the balance within the materiel inventory and between categories of conscripts.

Battalion Investor puts you in the chair of the Chief of the Army (CHoA). Your task is to steer the Army towards the best possible balance between the various production and force components, i.e. to accumulate the best possible Combat Score during the game's duration (typically 10-20 years). The art of balancing involves distributing resources between force production and wartime organisation, while simultaneously also balancing materiel administration and training personnel with a steady hand. As CHoA you have in reality few decision variables to play with, while your sources of information are many. All the information is reliable and free of political bias and other uncertainties. The risks with respect to factors such as resource level and force disposal are also dealt with by your principal. Nonetheless, there are many challenges.

The very first version of this model, Brigade Investor for Macintosh, was designed at the Norwegian Defence Research Establishment in 1992/93 (1). Thereafter it was updated and converted to ithink® for Windows (2) in 1996 and called "Brigade Investor 2.0" (3), and in 2000 updated to "Battalion investor 2000" (4). In this version the model has been converted and reprogrammed to AnyLogic 5.5. AnyLogic applies Java language, which makes it possible to run an applet version of the "Battalion investor" from any computer, even without an AnyLogic license. The applet version is found in the attached disk. In order to run the applet you need Java (TM) SE Runtime Environment 6. However, in order to enter the model and accessing the game's underlying structure, you need the program software for AnyLogic.

2 BATTALION INVESTOR'S STRUCTURE

2.1 Overview

The game is based on a system dynamic description of the Army. The game is quite coarse which enables it to shed light on overarching issues. The counting units for both personnel and materiel in both the peacetime and the wartime organisation are army battalion generic units.

At the start of the game the Army consists of 17 battalions. This figure reflects the Army's

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1 Battalion Investor 2000 is a modified version of Brigade Investor 2.0. Compared to the latter, the term "Brigade" has been replaced with "Battalion".

current structure with divisions and independent brigades[2]. These divisions are however in poor shape, which is apparent from a series of imbalances.

Figure 2.1 illustrates the model's overall structure and the mutual influences that exist between the model's various sectors.
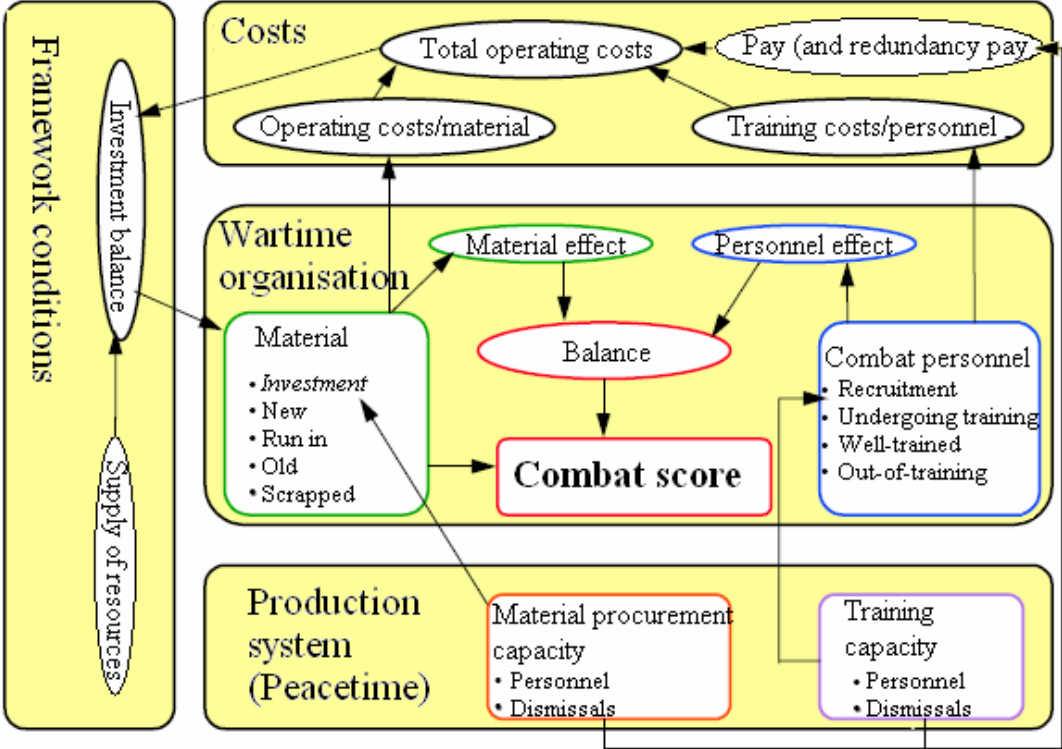
Figure 2.1: Battalion Investor's overall structure

The sectors in Figure 2.1 are described below:

The model describes the Army's combat score as a consequence of both the standard of the materiel inventory and the standard of the personnel. Materiel and personnel only achieve a combat score when viewed together given that an army without materiel is just as worthless as an army without personnel.

Both materiel and personnel must be produced. This takes place in a production system consisting of materiel administrators and training personnel.

Both the wartime structure and the peacetime production system draw on resources. The wartime structure subjects the Army to both materiel costs and personnel related training costs. The production system results in the payment of wages to materiel administrators and training personnel. Investments in materiel are made to the extent that there is money left over after the operation of the peacetime organisation and the wartime structure has been covered.

2 Each battalion therefore is of a size and structure that can be compared to a battalion battle group.

Physical aging processes and political framework conditions, which CHoA has little direct control over, are steered by the model. Five factors are nonetheless under the player's direct control. The player can *recruit* and *remove* combat personnel, *scrap* old materiel and *give production personnel their notice* (materiel administrators and training personnel). The player can thus only influence the investments by ensuring that the structure is slimmed down on the combat and/or production side.

From a costs perspective, the operating organisation is divided into three: there are ongoing materiel operating costs, costs primarily associated with combat personnel (training costs), and pay costs associated with the production system. Materiel operation and training costs are affected by the size and age composition of the wartime organisation.

In the model the wartime organisation's costs can only be affected by managing the age distribution of the materiel and personnel. The production system's costs can only be affected by steering dismissals.

The measurement of the effect is combat materiel, adjusted for a surplus or deficit of combat personnel. This is called the combat score. The effectiveness of the combat materiel and personnel depends on their age composition. The production system does not directly contribute to the combat score, but does so indirectly through the system being necessary for procuring materiel and personnel.

The model is system dynamic. In such models one primarily differentiates between rate variables (such as recruitment, dismissals, procurements, etc) and condition variables (such as new materiel, old materiel, personnel, etc). The rate variables in figures 2.2 to 2.5 are depicted as "cranes", while the condition variables are depicted as "boxes". Black rate variables indicate that the player can manage these with decisions; the "clouds" define the model's limits and indicate that one is not concerned with where the flow comes from or is going to, respectively.

Even though the model may seem complex, the representation is extremely simplified. The only type of personnel is "battalion personnel", the only differentiation takes place along the aging axis and the entire Army is forced into this simplified battalion concept, including divisions that in the current structure operate outside the battalion formation. The model can therefore not describe the relationship between performance and costs across the age categorisations. It therefore does not differentiate between small arms and main battle tanks. Nor does it differentiate between a mobilising corporal in the infantry and an artillery colonel. As far as the production system and wartime organisation are concerned these are not affected by economies of scale, even if these often exist in reality. In addition some of the model's parameters have been fixed on the basis of pedagogic considerations rather than to be as realistic as possible.

2.2   Framework conditions

This part of Battalion Investor describes factors that lie outside the Army's control such as the

total supply of resources and the price of materiel. The average price of a battalion has been set at €4,000 million in year 0, but the price increases by an annual percentage rate (investment cost escalator factor – ICE) in order to take account of technological developments. The annual supply of resources has been set at €8,000 million and is intended to cover both operations and investments. Both the percentage wise change in the supply of resources and annual investment cost escalator are scenario parameters (see figure 3.5), i.e. they can be determined before the game starts. At the start the ICE factor is set at 3%, which means that the average price for a battalion after 20 years is more than €7,000 million. It is basically assumed that there will be no change in the annual supply of resources, such that this is €8,000 million every year during the entire period.

2.3   Wartime organisation

2.3.1   General

The wartime organisation consists of materiel and personnel that "flow" through their respective aging chains. Each of the three categories of materiel (new, run in and old materiel) has a given materiel effect and cost. Each category of personnel (undergoing training, well-trained and out-of-training) has a given performance and cost. The performance of the Army (combat score) reflects the effect weighted sum of materiel, adjusted for any deficit or surplus of registered personnel.

2.3.2   Combat personnel

All of the combat related personnel in the Army, officers and men, including combat related logistics personnel and other support apparatus, are included in this category[3]. Combat personnel are measured in number of battalions (battalion battle groups) which each consists of approx. 2,000 people. Within each age category there are great similarities with respect to operating costs and output. Thus it is assumed that personnel undergoing training have high operating costs, among other things because the men serve 365 days of the year. Later on personnel train for 20 days every fourth year and every eighth year when they become so old that they have a lower priority, which means that the operating costs for a battalion decrease. The out-of-training personnel are not very attractive, including for reasons other than the fact that they only train every eighth year. Age in itself plays its part in ensuring that the personnel become unsuitable for many duties. In addition the promotion process means that, at least during a period with falling forces, one ends up with a very top-heavy organisation, which in other words is poorly qualified for work at a lower level.

There are three categories in the flow of combat personnel: undergoing training, well trained and out-of-training. The number of years (on average) in the three categories are 2, 10 and 10 years respectively, which is described by the fact that *FinishEdu, DegradWellTrained* and

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3 Training and administrative personnel employed in the Army are however entered under the production system category.

DepOutOfTrain are fixed at 1/2, 1/10 and 1/10 of the stock of personnel. There is also departure during training and from well-trained personnel, as show in figure 2.2.
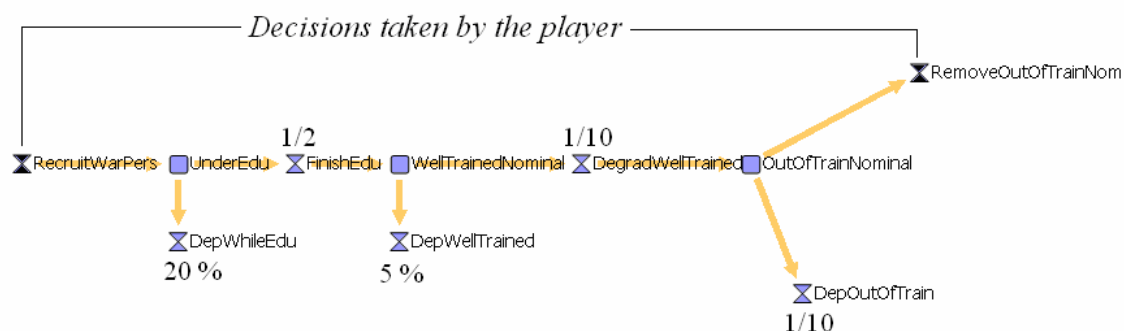
Figure 2.2: The flow of combat personnel

The player determines recruitment, but must accordingly have sufficient training personnel in order to do this. The player can also "remove" out-of-training personnel, which reflects the fact that the oldest personnel are taken off the registers.

2.3.3   Combat personnel effectiveness

The three categories of combat personnel have various levels of effectiveness. While each battalion with well-trained personnel has an effect equal to one battalion, every battalion with personnel undergoing training and out-of-training personnel only have an effect equal to 0.6 and 0.4 of a battalion respectively.

2.3.4   Combat materiel

The distribution of materiel into three age categories: new, run in and old materiel is shown in figure 2.3. All the materiel should be understood as battalion materiel and the unit of measure is the number of battalions. At the start the cost of a new battalion is set at €4,000 million, and using this method of calculation there are around 17 battalions in Battalion Investor today (of varying quality). Within each age category there are great similarities when it comes to the materiel's operating costs, output and personnel requirements.

New materiel is assumed to have relatively high operating costs; it has to be run in. The combat score is also low during this period because the personnel must be trained on the new equipment. Furthermore the personnel requirements are also high at first because logistics and operational personnel spend much of their time learning to use the new equipment.

The designation given for the next 20 years is run in materiel. During this period the materiel is characterised by low costs, high output and low personnel requirements.

However, after a while the materiel becomes less attractive. This is partly due to the fact that maintenance becomes more extensive, partly that it loses much of its effectiveness versus a

constantly (assumed) more advanced enemy. In addition the aging means that operational reliability is reduced, which in turn affects both costs and output in a negative direction.

The number of years (on average) in the three categories is 2, 20 and 30 years respectively, such that the rates for run in, ageing and old materiel wear and tear are 1/2, 1/20 and 1/30 respectively. If the materiel is not scrapped, it disappears as a result of age (*OldMatWeart*) and from damage and the wear and tear of run in materiel. Materiel that is worn out or scrapped disappears without disposal costs. The investments (*Invested_Number*) in figure 2.3 below are steered by the financial resources that remain after the operating costs are covered. However, materiel administrators are also a limiting factor. Without sufficient capacity the money quite simply cannot be spent, and will no longer be at the disposal of the Army.
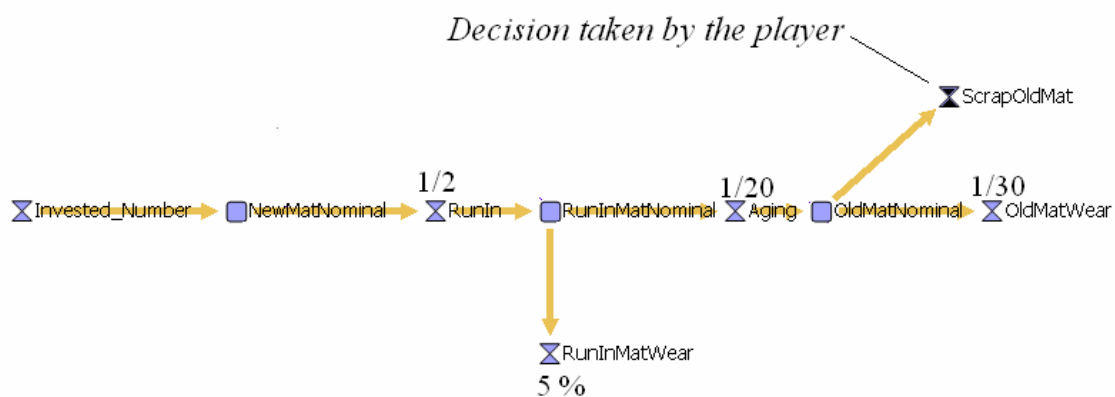
Figure 2.3: The flow of combat materiel

2.3.5   Materiel effect

The three categories of materiel have different levels of effectiveness: while a battalion of run in materiel really counts as 1, a battalion of new materiel counts as 0.5 and old materiel as only 0.15.

2.3.6   The need for combat personnel

The different categories of materiel have different needs when it comes to the number of personnel needed to utilise them properly. Each battalion with new, run in and old materiel needs 1.2, 1 and 1 personnel battalion(s) respectively. The total need for combat personnel is thus steered by the composition of the materiel.

2.3.7   Combat score

To a large degree it is the effect of the materiel that determines the combat score. The value is adjusted however in such a manner that if there is deficit of personnel the combat score is over proportionally downgraded. Surplus personnel on the other hand provides an over proportional addition to the combat score. The value is expressed as the number of effective army battalion generic units.

2.4   Production system

The production system's only function in the game is to enable the procurement of personnel and materiel. It is the productivity of this system that determines the relationship between the production personnel and capacity. The production system defined in this way accounts for around 25% of the Army's annual costs. The production system changes very slowly, but can be "stimulated" by the provision of financial incentives. The model assumes that personnel want to leave if they are offered adequate redundancy pay. The magnitude of this remuneration however increases with the percentage of the employees one wants to dismiss.

2.4.1   Materiel administration personnel

These personnel primarily take care of the ordering and reception of new materiel. To the extent that there are not enough materiel procurement personnel to utilise all the available investment resources (i.e. *MatAdmBalance* < 1), the model will hire new employees. The model will only hire 25% of the gap between the need for and stock of materiel administrators every year. 1% of the materiel administrator personnel disappear due to natural departure. The player can also choose to dismiss personnel.
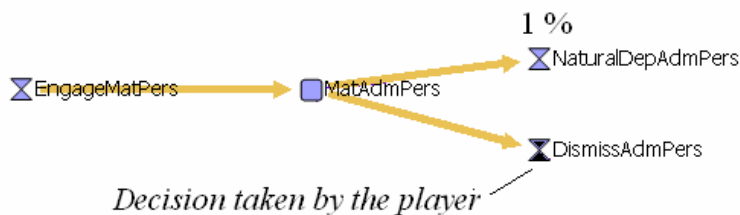
Figure 2.4: Administration personnel

2.4.2   Training personnel

Training personnel primarily take care of recruitment and training. To the extent that the quantity of combat personnel (the decision *RekruitWarPers*) requires more training capacity than that which is available (i.e. *EduBalance* < 1), the model will also here hire new employees. The model will only hire 25% of the gap between the need for and stock of materiel training every year. 1% of the training personnel also disappear due to natural departure.
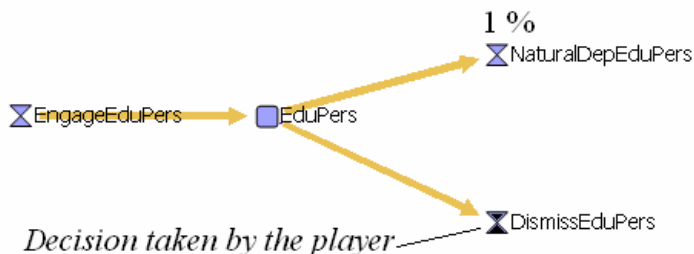
Figure 2.5: Training personnel

2.5 Costs

2.5.1 Operating costs

2.5.1.1 Materiel

The three categories: new, run in and old materiel, are each assigned their normal operating costs[4]. The three types of battalion cost €100, 80 and 50 million per year respectively to keep in operation. The high level of costs in the first few years is due to running in. The high level of costs in the last few years on the other hand is due to a lot of maintenance.

2.5.1.2 Training costs for combat personnel

The three categories of personnel: undergoing training, well-trained and out-of-training, are each assigned their normal training costs[5]. The three statuses of personnel cost €600, 50 and 40 million per year respectively to train. The high level of costs in the first few years is due to all the costs associated with training, the first two years are regarded as training costs. After this well-trained personnel are trained every fourth year and out-of-training every eighth year.

2.5.1.3 Pay and redundancy pay

In order to get materiel administrators and training personnel to leave, the personnel who leave receive €600,000 as a one-time payment. The cost of phasing out a battalion (2,000 men) of materiel administration personnel and training personnel is thus €1,200 million. This rule applies if less than 6% of the labour force is dismissed. However, the one-time payment increases along with the share of the labour force that is dismissed, such that if 20% redundancy is demanded it costs €1.2 million to get people to leave.

2.5.1.4 Total operating costs

The total operating costs are the sum of materiel operation, training costs, pay and redundancy pay. Should these together exceed the total resource limits for investment and operations, one will still be able to pay these, but there will be no resources left for investments.

2.5.2 Investments

The proportion of the total resources not spent on operating costs can be spent on investments. The prerequisite is that there is sufficient materiel administrator capacity. The only way to increase investments is therefore to release operating resources and have sufficient materiel administrator capacity. The quantity of materiel (measured in the number of battalions) also depends on the individual price of the materiel, which in turn depends on the investment cost escalator.

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[4] Training costs are exclusively regarded as personnel related. During training materiel is regarded as "training aids".

[5] The lion's share of personnel costs however are due to the peacetime organisation and are consequently posted under Materiel Administration and Training Personnel respectively.

3   THE GAME

3.1   User interface

The game takes place on a screen as shown in figure 3.1. At the top of the screen there is information about the magnitudes that are of value to the player. Figure 3.1 also shows the figures that describe the situation at the start of the game.
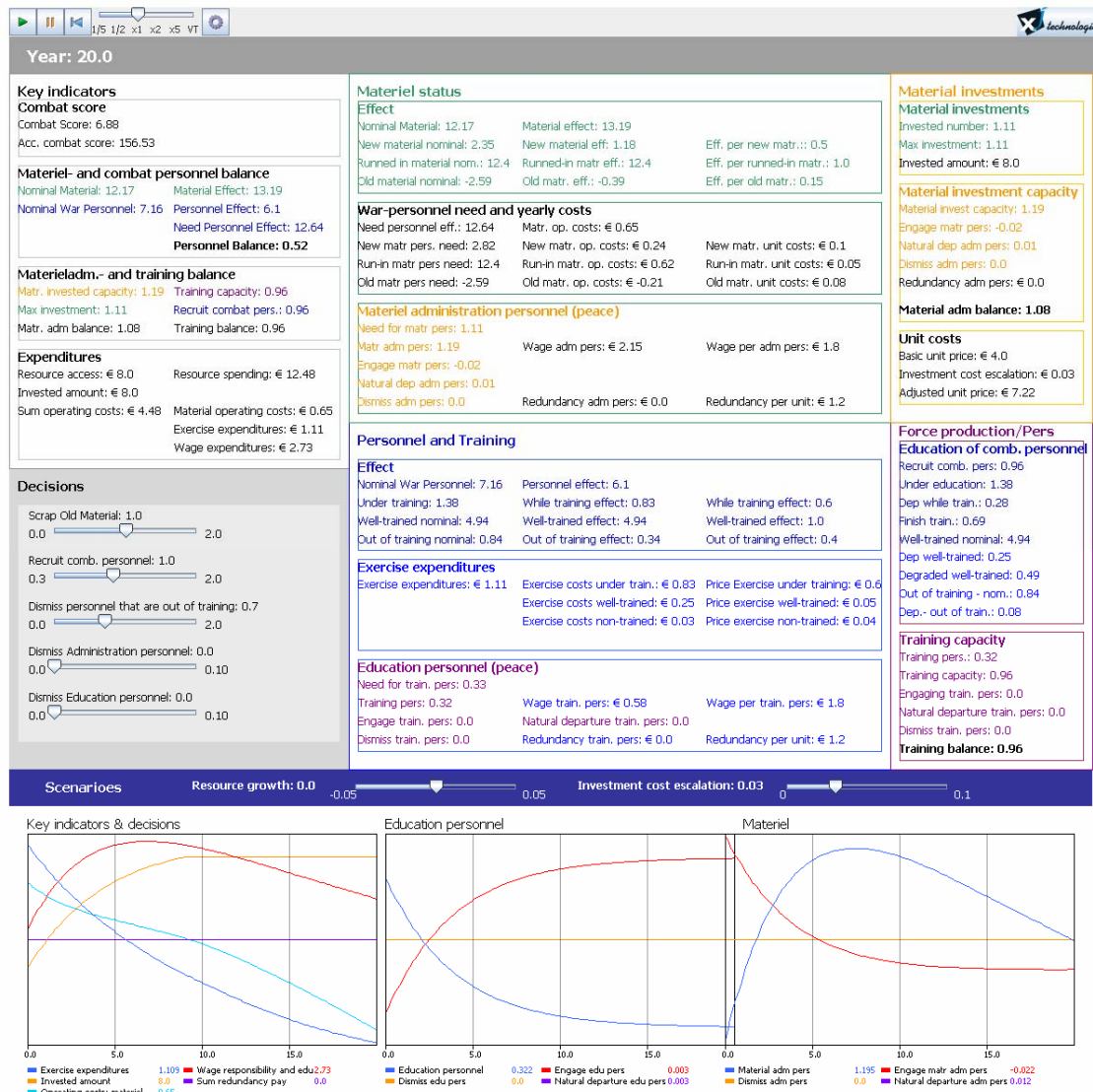
Figure 3.1: Game screen: materiel is marked in green, personnel in blue, resource spending and balances in black, force production in purple and materiel administration in yellow.

On the left-hand side of the game screen there are key figures and decision variables (figure 3.2), further down there is information about the wartime organisation's personnel (figure 3.3), the wartime organisation's materiel status and investments (figure 3.4) and the scenario parameters (figure 3.5). One moves around the screen by clicking on the game's outer border. All the variables in the model are described in detail in Appendix A.

Key indicators

Combat score
Combat Score: 6.88
Acc. combat score: 156.53

Materiel- and combat personnel balance
Nominal Material: 12.17   Material Effect: 13.19
Nominal War Personnel: 7.16   Personnel Effect: 6.1
                                                 Need Personnel Effect: 12.64
                                                 Personnel Balance: 0.52

Materieladm.- and training balance
Matr. invested capacity: 1.19   Training capacity: 0.96
Max investment: 1.11   Recruit combat pers.: 0.96
Matr. adm balance: 1.08   Training balance: 0.96

Expenditures
Resource access: € 8.0   Resource spending: € 12.48
Invested amount: € 8.0
Sum operating costs: € 4.48   Material operating costs: € 0.65
                                                 Exercise expenditures: € 1.11
                                                 Wage expenditures: € 2.73

Decisions

Scrap Old Material: 1.0
0.0 ————◯———— 2.0

Recruit comb. personnel: 1.0
0.3 ——◯———— 2.0

Dismiss personnel that are out of training: 0.7
0.0 ——◯———— 2.0

Dismiss Administration personnel: 0.0
0.0 ◯———————— 0.10

Dismiss Education personnel: 0.0
0.0 ◯———————— 0.10

Figure 3.2: The main screen: Key Figures and Decisions

Personnel and Training

Effect

Nominal War Personnel: 7.16	Personnel effect: 6.1	
Under training: 1.38	While training effect: 0.83	While training effect: 0.6
Well-trained nominal: 4.94	Well-trained effect: 4.94	Well-trained effect: 1.0
Out of training nominal: 0.84	Out of training effect: 0.34	Out of training effect: 0.4

Exercise expenditures

Exercise expenditures: € 1.11	Exercise costs under train.: € 0.83	Price Exercise under training: € 0.6
	Exercise costs well-trained: € 0.25	Price exercise well-trained: € 0.05
	Exercise costs non-trained: € 0.03	Price exercise non-trained: € 0.04

Education personnel (peace)

Need for train. pers: 0.33

Training pers: 0.32	Wage train. pers: € 0.58	Wage per train. pers: € 1.8
Engage train. pers: 0.0	Natural departure train. pers: 0.0	
Dismiss train. pers: 0.0	Redundancy train. pers: € 0.0	Redundancy per unit: € 1.2

Force production/Pers

Education of comb. personnel

Recruit comb. pers: 0.96
Under education: 1.38
Dep while train.: 0.28
Finish train.: 0.69
Well-trained nominal: 4.94
Dep well-trained: 0.25
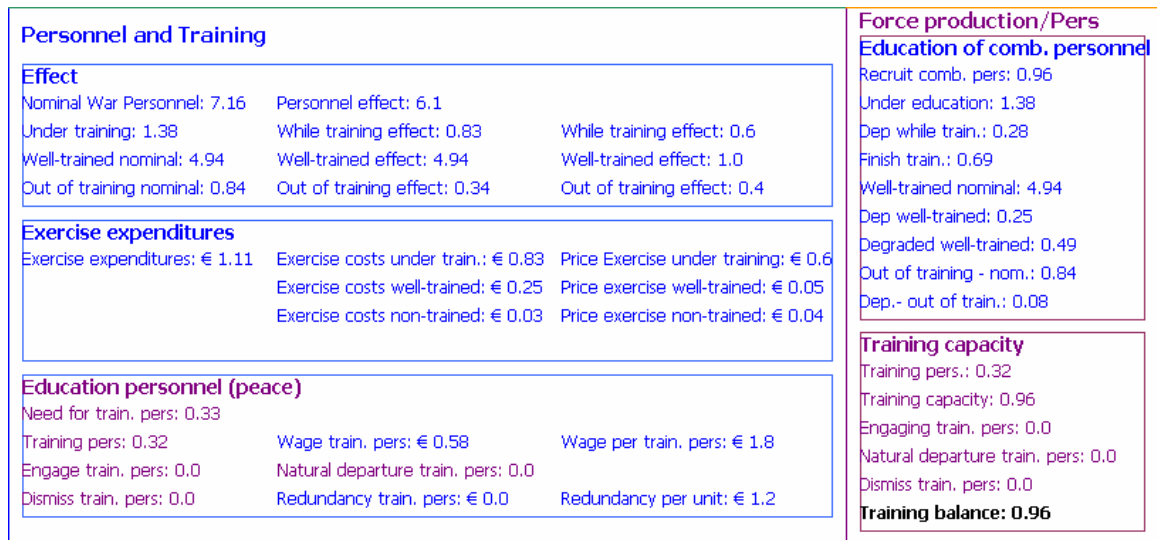Degraded well-trained: 0.49
Out of training - nom.: 0.84
Dep.- out of train.: 0.08

Training capacity

Training pers.: 0.32
Training capacity: 0.96
Engaging train. pers: 0.0
Natural departure train. pers: 0.0
Dismiss train. pers: 0.0
Training balance: 0.96

Figure 3.3: Combat personnel, training and production

Materiel status

Effect

Nominal Material: 12.17	Material effect: 13.19	
New material nominal: 2.35	New material eff: 1.18	Eff. per new matr.:: 0.5
Runned in material nom.: 12.4	Runned-in matr eff.: 12.4	Eff. per runned-in matr.: 1.0
Old material nominal: -2.59	Old matr. eff.: -0.39	Eff. per old matr.: 0.15

War-personnel need and yearly costs

Need personnel eff.: 12.64	Matr. op. costs: € 0.65	
New matr pers. need: 2.82	New matr. op. costs: € 0.24	New matr. unit costs: € 0.1
Run-in matr pers need: 12.4	Run-in matr. op. costs: € 0.62	Run-in matr. unit costs: € 0.05
Old matr pers need: -2.59	Old matr. op. costs: € -0.21	Old matr. unit costs: € 0.08

Materiel administration personnel (peace)

Need for matr pers: 1.11

Matr adm pers: 1.19	Wage adm pers: € 2.15	Wage per adm pers: € 1.8
Engage matr pers: -0.02		
Natural dep adm pers: 0.01		
Dismiss adm pers: 0.0	Redundancy adm pers: € 0.0	Redundancy per unit: € 1.2

Material investments

Material investments

Invested number: 1.11
Max investment: 1.11
Invested amount: € 8.0

Material investment capacity

Material invest capacity: 1.19
Engage matr pers: -0.02
Natural dep adm pers: 0.01
Dismiss adm pers: 0.0
Redundancy adm pers: € 0.0

Material adm balance: 1.08

Unit costs

Basic unit price: € 4.0
Investment cost escalation: € 0.03
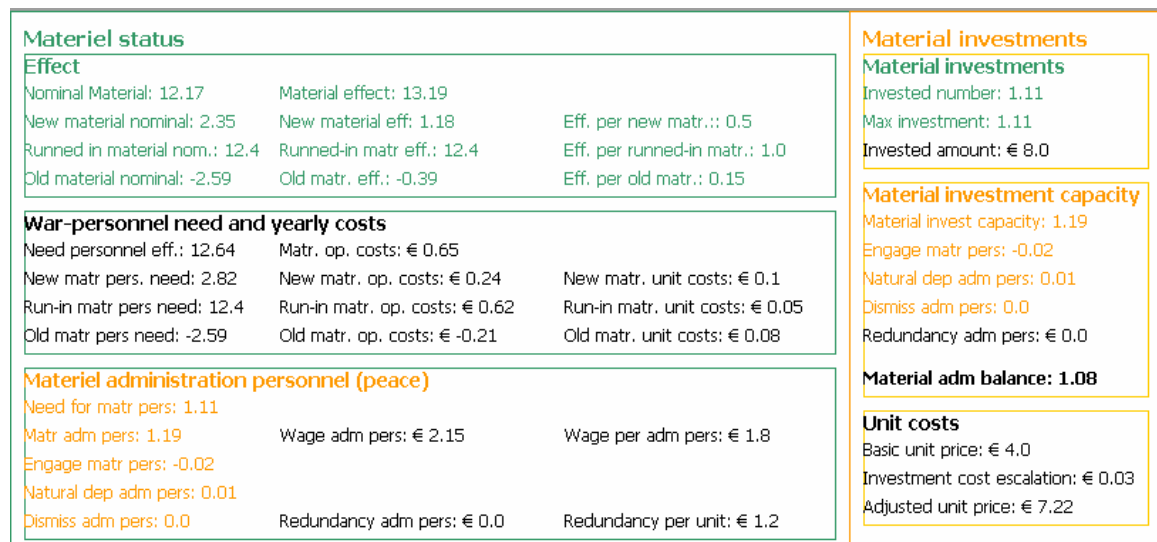Adjusted unit price: € 7.22

Figure 3.4: Materiel status and investments

Figure 3.5: Scenario parameters

3.2 Starting a game

When one opens the game, one enters the screen shown in figure 3.2, "*Key indicators and decisions*".

The decision variables are found on the left-hand side. The desired values are set by using the "potentiometer" such that the desired decisions are achieved.

The player is assigned the role of CHoA and manages with the help of decisions that apply for each year for a period of five years. A number of decisions, e.g. hiring new employees, are made by the "model". The player can phase out materiel, recruit and "remove" combat personnel, as well as dismiss those who in peacetime administer materiel and those who train recruits.

At the top of the screen (e.g. see figure 3.1) there is a small "cassette player" (figure 3.6) in which the model starts running by clicking the "play" button. Once the decisions have been effectuated a new round of decisions can be initiated. You initiate the model by clicking on the "backward" button. You can pause the model by clicking on the "pause" button, and speed up or slow the model down by using the slider at the right-hand side.

Figure 3.6: "Cassette player" that initiates a decision sequence

3.3   Additional information

During the game one can read reports, i.e. the figures that are presented in figure 3.2 to figure 3.4. You can also study graphs that show trends over time. At the bottom of the screen there are three graphs labelled "Key Indicators and Decisions", "Personnel and Training" and "Materiel". For example, figure 3.7 shows the graph that is shown for "*Key indicators and decisions*" in the 20th year.
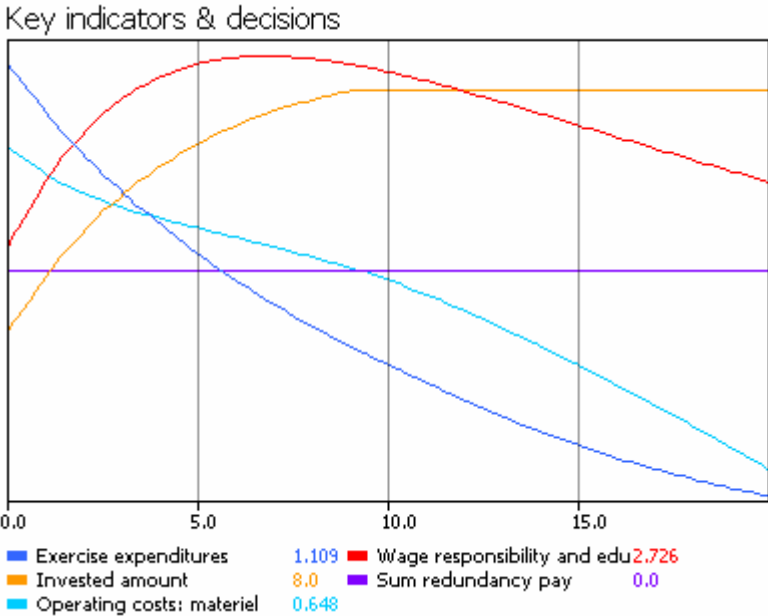
Figure 3.7: Key indicators and decisions

More graphs are available and these are shown at the bottom of the screen.

3.4   Information about the game's structure

For accessing the game's structure, you need the AnyLogic software.

The game's structural assumptions can be studied in more detail by double clicking on one of the active object classes in the project window in the program ware window. This provides you with the screen shows in figure 3.8. By clicking on "description" in the properties window one will bring up further information about a sector. In the middle of the window there is the editor window. In this case it shows the flow in "Combat Materiel", also shown in figure 3.9.
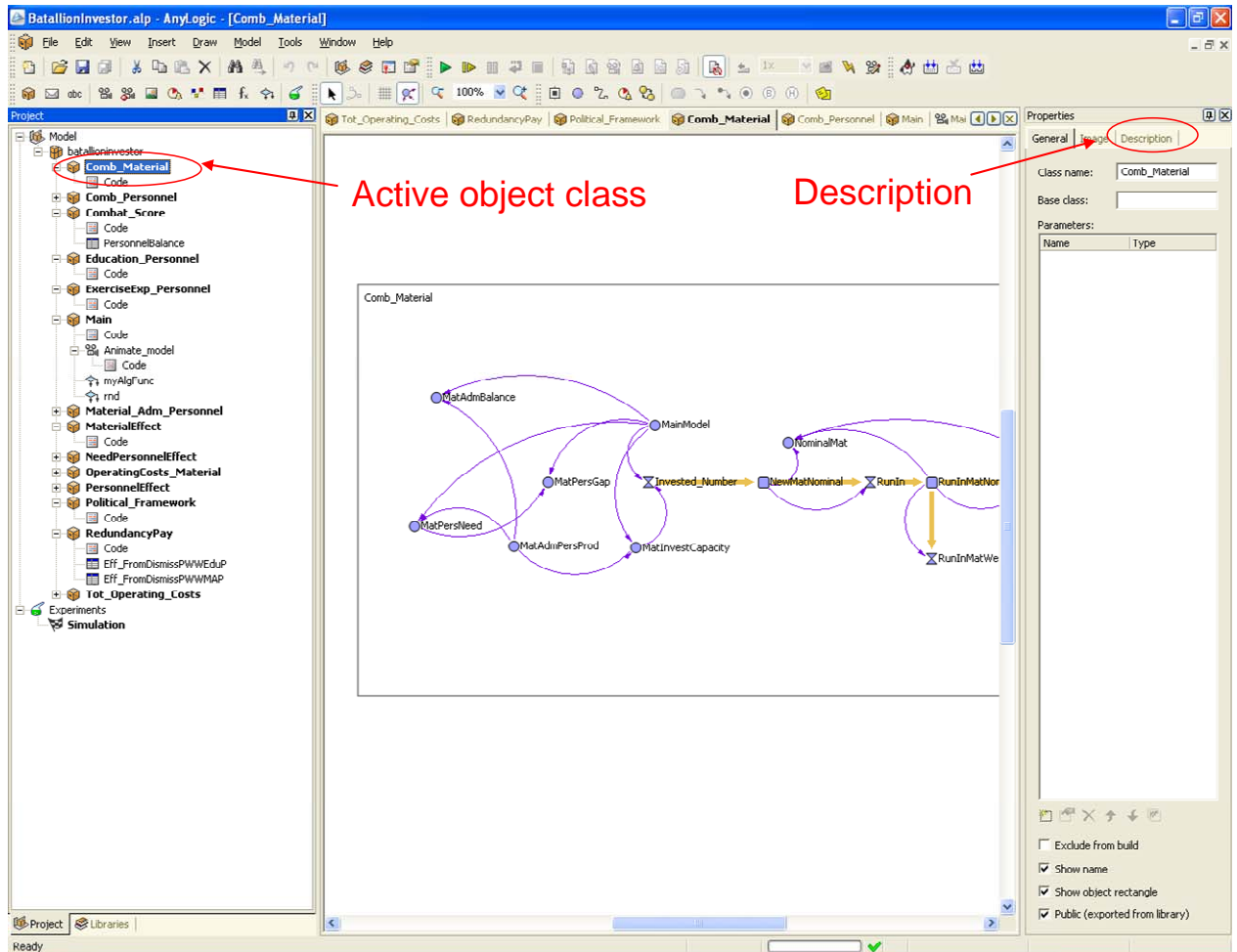
Figure 3.8: The game's structure

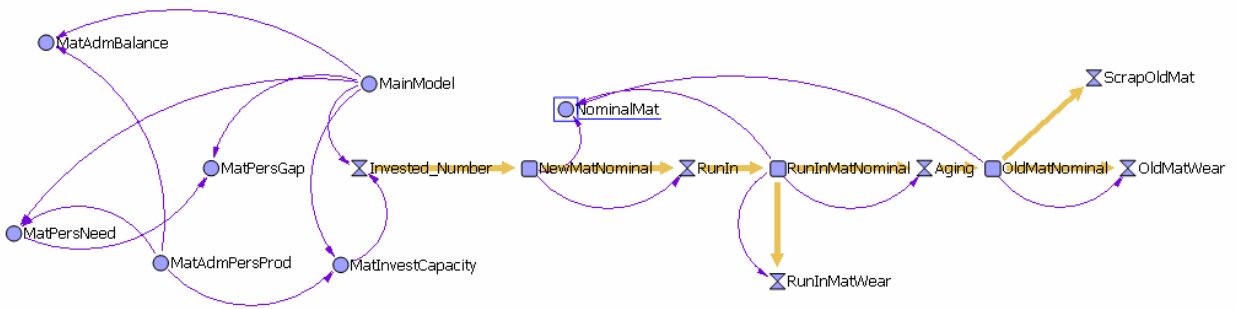*Figure 3.9: The flow of combat materiel*

Clicking on description for a variable brings up further information about this, as shown in figure 3.10.
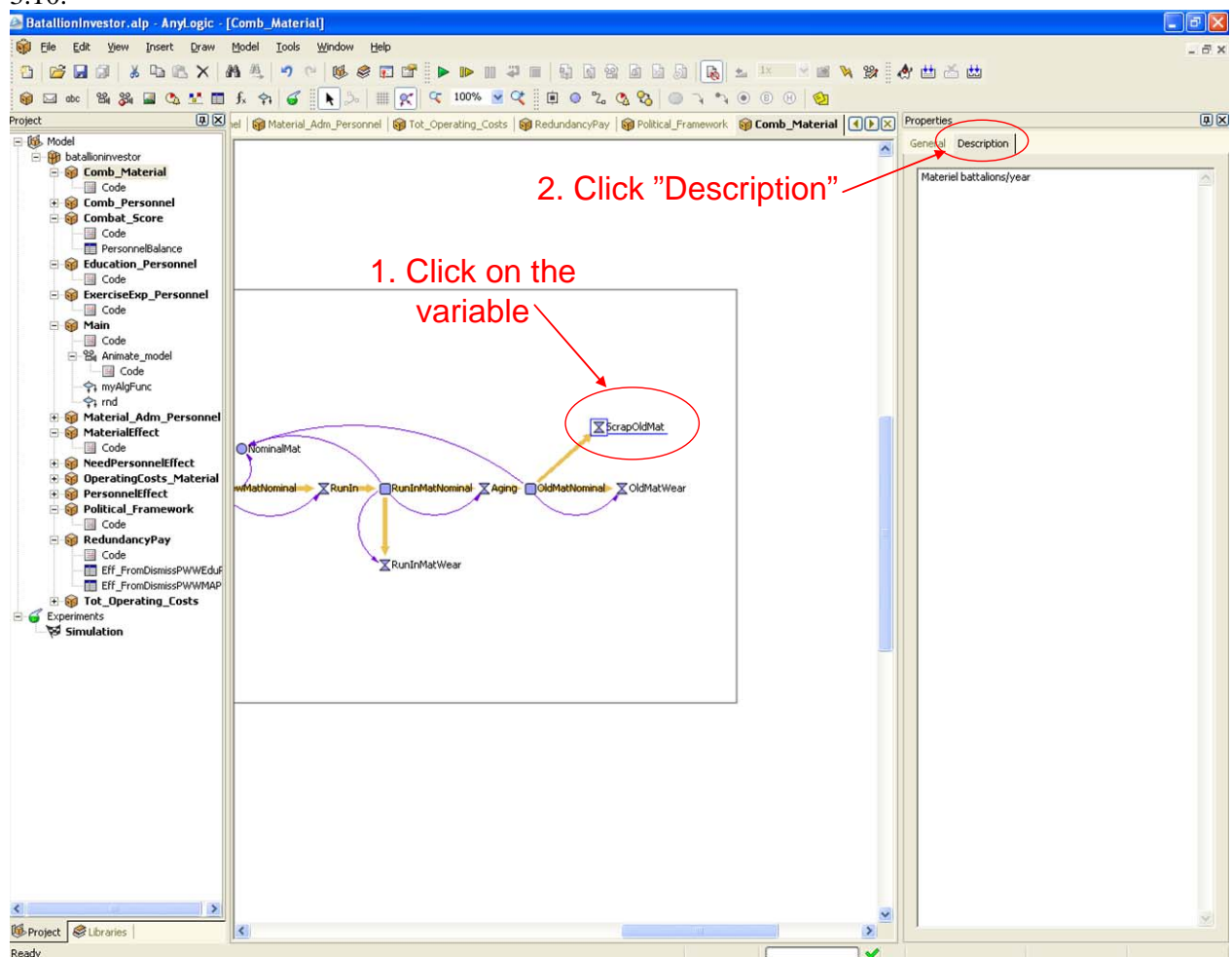

Figure 3.10: More information about ScrapOldMat

4   PEDAGOGIC TIPS

The game is characterised by time delays, i.e. this means that today's decisions influence costs and output factors tomorrow (and the day after tomorrow). While entertainment games are

characterised by the fact that cause and effect are direct and unproblematic, Battalion Investor is characterised by long-term effects. A player without a long-term strategy will thus not be in a position to interpret and utilise the information well. Through long-term plans the player is forced to think through links within and between materiel and personnel, and how these affect the relationship between output and costs.

Learning is attained by comparing the expectations one has with respect to relationships and the results that are achieved. In Battalion Investor this means that one learns best by carrying out at least two subsequent run-throughs of each long-term plan. The goals, expectations and decisions for each run-through should be made explicit by noting them on a piece of paper. Afterwards the paper should be brought out again and compared with what has been achieved (on the screen). Appendix B contains a form that can be used for this. New hypotheses concerning causative relationships can then be formed, new goals defined or redefined, and new decision making partners chosen. If one has time, then this learning process ought to continue until one is satisfied with one's own understanding.

Literature

(1)   Bakken B E (1993): Brigadeinvestor – brukerveiledning.

(2)   High Performance Systems, Inc (1994): ithink® Version 3.06 for Windows ™.

(3)   Bakken B E, Nesset A (1996): Brigadeinvestor 2.0 – Brukerveiledning, FFI/RAPPORT-96/00794.

(4)   Bakken B E, Nesset A, Bakken B T (2000): Bataljonsinvestor 2000 – Brukerveiledning, FFI/Rapport-2000/04417.

Appendix A   Explanation of variable names

A.1   Decisions

ScrapOldMat	Number of battalions of old materiel that are going to be scrapped per year.
RekruitWarPers	Recruitment of combat personnel measured in number of battalions per year. NB! Can be overridden by the model if there is insufficient training capacity.
RemoveOutOfTrain	Removed out-of-training personnel (measured in number of battalions) from wartime structure.
DismissAdmPersonnel	The number of battalions of materiel administration personnel that are going to be dismissed per year. NB! Can be overridden by the model if the number exceeds the stock.
DismissEduPersonnel	The number of battalions of training personnel that are going to be dismissed per year. NB! Remember that the number of training personnel is different to training capacity. Can be overridden by the model if the number exceeds the stock.

A.2   Key figures

Combat score	
Combat_Score	Combat score – the value of the available materiel and personnel. Calculated as a product of *MateriellEffekt* and *PersonellBalanse*.
Acc_Combat_Score	Accumulated combat score since year 0 up to and including today.
Materiel and combat personnel balance	
NominalMat	The quantity of materiel (not weighted for differing effectiveness) measured in number of battalions. The sum of *NewMatNominal*, *RunInMatNominal* and *OldMatNominal*.
NominalWarPers	The quantity of combat personnel (not weighted for differing effectiveness) measured in number of battalions (1 battalion = 2,000 people).
MaterialEffect	The volume of effective materiel measured in number of battalions. The effect of a battalion of new, run in and old materiel is 0.5, 1 and 0.15 battalion(s) respectively
PersonnelEffect	The volume of effective combat personnel measured in number of battalions. The effect of a battalion of combat personnel who are undergoing training, well-trained, out-of training is 0.6, 1 and 0.4 battalion(s) respectively.
NeedPersEffect	The effective combat personnel needed to utilise existing materiel (measured in number of effective battalions).
Personnel_Balance	Indicator of the relationship between the need for and the stock of effective combat personnel. Values > 1 means that you have more than you need. Values < 1 mean that you need more than you have, i.e. you should recruit combat personnel.
Materiel administration and training balance	

MatInvestCapacity	The materiel investment capacity per year measured in number of battalions. The capacity equals the number of *MatAdmPers*.
MaxInvest	Number of battalions there are enough investment resources to procure.
MatAdmBalance	Indicator of the relationship between *MatInvestCapacity* and *MaxInvest*. Values > 1 mean that you have more investment capacity than you have investment resources, while values < 1 means that investment capacity is too little to utilise all of the investment resources.
EduCapacity	Training capacity per year measured in number of battalions. The capacity depends on the number of battalions of *EduPers*, who can each recruit 2 battalions of combat personnel.
RecruitWarPers	The number of battalions of combat personnel recruited. NB! May deviate from that which is decided (*RekruitWarPersonnel*).
EduBalance	Indicator of the relationship between *EduCapacity* and *RekruitWarPers*. Values > 1 mean that training capacity is greater than that which is needed to carry out the desired recruitment, while values < 1 means that training capacity determines the recruitment.
Costs	
ResourceAccess	The total supply of resources in thousand M€ Shall cover both operating costs and investments.
InvestEuro	Thousand M€spent on investments. The cost of a battalion of new materiel at the start is €4,000 million.
SumOpCosts	The total operating costs, i.e. the sum of pay costs, training costs and materiel operating costs.
MatOpCost	Operating costs for the materiel. Each battalion of new, run in and old materiel costs €100, 50 and 80 million respectively to operate every year.
ExerciseExp	Training costs for combat personnel. Each battalion of combat personnel who are undergoing training, well-trained and out-of-training costs €600, 50 and 40 million respectively to train every year.
WageCosts	The sum of the pay of materiel administration and training personnel and redundancy pay of dismissed materiel administration and training personnel.
ResourceSpend	The sum of *InvestEuro* and *SumOpCosts*. Can be lower than *ResourceAccess* if all the investment resources are not utilised.

A.3 Personnel and training

Effect	
NominalWarPers	The quantity of combat personnel (not weighted for differing effectiveness) measured in number of battalions (1 battalion = 2,000 people).
UnderEdu	Combat personnel undergoing training measured in number of battalions.
WellTrainedNominal	Well-trained combat personnel measured in number of battalions.
OutOfTrainNominal	Out-of-training combat personnel measured in number of battalions.
PersonnelEffect	The volume of effective personnel (weighted for differing effectiveness) measured in number of battalions. The sum of the personnel in *UnderEduEff*, *WellTrainedEff* and *OutOfTrainEff*.

UnderEduEff	The volume of effective personnel undergoing training (weighted for differing effectiveness) measured in number of battalions.
WellTrainedEff	The volume of effective well-trained personnel (weighted for differing effectiveness) measured in number of battalions.
OutOfTrainEff	The volume of effective out-of-training personnel (weighted for differing effectiveness) measured in number of battalions.
UnderEduUnitEff	The effect of a battalion of personnel undergoing training is 0.6 of a battalion.
WellTrainedUnitEff	The effect of a battalion of well-trained personnel is 1 battalion.
OutOfTrainEff	The effect of a battalion of out-of-training personnel is 0.4 of a battalion.
Training costs	
ExerciseExp	Training costs for combat personnel. Every battalion of combat personnel who are undergoing training, well-trained, and out-of-training costs €600, 50 and 40 million respectively to train every year.
ExCostUnderEdu	Training costs per year for combat personnel undergoing training.
ExCostWellTrained	Training costs per year for well-trained combat personnel.
ExCostOutOfTrain	Training costs per year for combat personnel who are out-of-training.
PriceExUnderEdu	Every battalion of combat personnel undergoing training costs € 600 million to train every year.
PriceExWellTrained	Every battalion of well-trained combat personnel costs €50 million to train every year.
PriceExOutOfTrain	Every battalion of out-of-training combat personnel costs €40 million to train every year.
Training personnel (peacetime)	
NeedForEduPers	The training personnel needed to recruit the necessary combat personnel.
EduPers	The stock of training personnel.
EngageEduPers	The number of training personnel (measured in battalions) who are hired per year. Steered by the model in that 1/4 of the difference between need and stock is hired every year.
DismissEduPers	The number of training personnel (measured in battalions) who are dismissed per year. Can deviate from what one wants to dismiss (*DismissEduPersonnell*) because it is impossible to dismiss more than the stock.
WageEduPers	Thousand M€ paid out in wages to training personnel per year.
NaturalDepEduPers	Natural departure of training personnel per year.
RedundancyEduPers	Thousand M€ paid out to dismissed training personnel per year (starts at €1,200 million per dismissed battalion, but depends on the number dismissed).
WagePerEduPers	Every battalion of training personnel costs €1,800 million in pay every year.
RedundancyPerUnit	Every battalion of dismissed training personnel basically costs € 1,200 million, but this depends on the number dismissed.

A.4 Force production/personnel

Training of combat personnel	
RecruitWarPers	The number of battalions of combat personnel recruited. NB! Can deviate from what is decided (*RecruitWarPersonnel*).
UnderEdu	Combat personnel undergoing training measured in number of battalions.
DepWhileEdu	Combat personnel undergoing training (measured in battalions) who drop out per year.
FinishEdu	Combat personnel (measured in battalions) who go from undergoing training to being well-trained.
WellTrainedNominal	Well-trained combat personnel (measured in battalions).
DepWellTrained	Well-trained combat personnel (measured in battalions) who drop out per year.
DegradWellTrained	Combat personnel (measured in battalions) who go from well-trained to being out-of-training per year.
OutOfTrainNominal	Out-of-training combat personnel (measured in battalions).
DepOutOfTrain	Out-of-training combat personnel (measured in battalions) who leave the registers per year.
Training capacity	
EduPers	The stock of training personnel.
EduCapacity	The training capacity of training personnel measured in number of battalions per year. The capacity depends on the number of "battalions" of *EduPers*, which can each recruit 3 battalions of combat personnel per year.
EngageEduPers	The number of training personnel (measured in battalions) who are hired per year. Steered by the model in that 1/4 of the difference between need and stock is hired every year.
NaturalDepEduPers	Natural departure of training personnel (measured in battalions) per year.
DismissEduPers	The number of training personnel (measured in battalions) who are dismissed per year. Can deviate from what one wants to dismiss (*DismissEduPersonnel*) because it is impossible to dismiss more than the stock.
EduBalance	Indicator of the relationship between *EduCapacity* and *RecruitWarPers*. Values > 1 mean that training capacity is greater than that which is needed to carry out the desired recruitment, while values < 1 means that training capacity determines the recruitment.

A.5 Materiel status

Effect	
NominalMat	The quantity of materiel (not weighted for differing effectiveness) measured in number of battalions. The sum of *NewMatNominal*, *RunInMatNominal* and *OldMatNominal*.
NewMatNominal	The quantity of new materiel (not weighted for differing effectiveness) measured in number of battalions.
RunInMatNominal	The quantity of run in materiel (not weighted for differing effectiveness) measured in number of battalions.
OldMatNominal	The quantity of old materiel (not weighted for differing effectiveness) measured in number of battalions.
MaterialEffect	The volume of effective materiel (weighted for differing

	effectiveness) measured in number of battalions. The sum of *EffektivtNyttMatr*, *EffektivtInnkjMatr* and *EffektivtGmltMatr*.
NewMatEffect	The volume of effective new materiel (weighted for effectiveness) measured in number of battalions.
RunInMatEffect	The volume of effective run in materiel (weighted for effectiveness) measured in number of battalions.
OldMatEffect	The volume of effective old materiel (weighted for effectiveness) measured in number of battalions.
EffectPerNewMat	The effect of a nominal battalion new materiel is 0.5 of an effective battalion.
EffectPerRunInMat	The effect of a nominal battalion run in materiel is 1 effective battalion.
EffectPerOldMat	The effect of a nominal battalion old materiel is 0.15 of an effective battalion.
Combat personnel need and annual costs	
NeedPersEffect	The effective combat personnel (measured in number of battalions of effective personnel) needed to utilise existing materiel.
NewMatPersNeed	The effective combat personnel (measured in number of battalions of effective personnel) needed to utilise existing new materiel.
RunInMatPersNeed	The effective combat personnel (measured in number of battalions of effective personnel) needed to utilise existing run in materiel.
OldMatPersNeed	The effective combat personnel (measured in number of battalions of effective personnel) needed to utilise existing old materiel.
MatOpCost	Operating costs for the materiel. Each battalion of new, run in and old materiel costs €100, 50 and 80 million respectively to operate every year.
NewMatOpCost	Operating costs for new materiel.
RunInMatOpCost	Operating costs for run in materiel.
OldMatOpCost	Operating costs for old materiel.
NewMatUnitCost	Every battalion of new materiel costs €100 million to operate every year.
RunInMatUnitCost	Every battalion of run in materiel costs €50 million to operate every year.
OldMatUnitCost	Every battalion of old materiel costs €80 million to operate every year.
Materiel administration personnel (peacetime)	
MatPersNeed	The materiel administration personnel (measured in battalions) needed to utilise the available investment resources.
MatAdmPers	The stock of materiel administration personnel measured in battalions.
EngageMatPers	The number of materiel administration personnel (measured in "battalions") who are hired. Steered by the model in that 1/4 of the difference between need and stock is hired every year.
NaturalDepAdmPers	Natural departure of materiel administration personnel per year.
DismissAdmPers	The number of administration personnel (measured in "battalions") who are dismissed per year. Can deviate from what one wants to dismiss (*SiOppForvPersonell*) because it is impossible to dismiss more than the stock.
WageAdmPers	Thousand M€ paid out in wages to administration personnel.
RedundancyAdmPers	Thousand M€ paid out in redundancy pay to dismissed materiel

	administration personnel (starts at €1,200 million per dismissed "battalion", but depends on the number dismissed).
WagePerAdmPers	Every "battalion" of administration personnel costs €1,800 million in pay every year.
RedundancyPerUnit	Every "battalion" of dismissed administration personnel basically costs €1,200 million, but this depends on the number dismissed.

A.6   Materiel investments

Materiel investments	
Invested_Number	Number of battalions of new materiel invested in.
MaxInvest	Number of battalions there are enough investment resources to procure.
InvestEuro	Thousand M€ spent on investment. A battalion of new materiel costs €4,000 million at the start.
Materiel investment capacity	
EngageMatPers	The number of materiel administration personnel (measured in battalions) who are hired. Steered by the model in that 1/4 of the difference between need and stock is hired every year.
NaturalDepAdmPers	Natural departure of materiel administration personnel per year measured in battalions.
DismissAdmPers	The number of administration personnel (measured in "battalions") who are dismissed per year. Can deviate from what one wants to dismiss (*DismissAdmPersonnel*) because it is impossible to dismiss more than the stock.
RedundancyAdmPers	Thousand M€ paid out in redundancy pay to dismissed materiel administration personnel (starts at €1,200 million per dismissed "battalion", but depends on the number dismissed).
MatAdmBalance	Indicator of the relationship between *MatInvestCapacity* and *MaxInvest*. Values > 1 mean that you have more investment capacity than you have investment resources, while values < 1 means that investment capacity is too little to utilise all of the investment resources.
Unit costs	
BasicUnitPrice	The unit price for 1 battalion of new materiel is €4,000 in year 0.
InvestCostEscalator	The factor that ensures that materiel becomes more expensive per unit due to technological developments
AdjustedUnitPrice	Unit price including investment cost escalator.

Appendix B   Planning form

Part training 1

Goal	Year 0 Status	Year 5 Plan	Year 5 Realised	Year 10 Plan	Year 10 Realised	Year 15 Plan	Year 15 Realised	Year 20 Plan	Year 20 Realised
NewMatNominal									
RunInMatNominal									
OldMatNominal									

	Year 0 Status	Year 5 Plan	Year 5 Realised	Year 10 Plan	Year 10 Realised	Year 15 Plan	Year 15 Realised	Year 20 Plan	Year 20 Realised
MaterialEffect									

Decisions

ScrapOldMat (per year)				

Part training 2

Goal	Year 0 Status	Year 5 Plan	Year 5 Realised	Year 10 Plan	Year 10 Realised	Year 15 Plan	Year 15 Realised	Year 20 Plan	Year 20 Realised
UnderEdu									
WellTrainedNominal									
OutOfTrainNominal									

	Year 0 Status	Year 5 Plan	Year 5 Realised	Year 10 Plan	Year 10 Realised	Year 15 Plan	Year 15 Realised	Year 20 Plan	Year 20 Realised
PersonnelEffect									

Decisions

RecruitWarPersonnel (per year)				
RemoveOutOfTrain (per year)				

Part training 3	Year 0	Year 5		Year 10		Year 15		Year 20	
Goal	Status	Plan	Realised	Plan	Realised	Plan	Realised	Plan	Realised
NewMatNominal									
RunInMatNominal									
OldMatNominal									
MaterialEffect									
UnderEdu									
WellTrainedNominal									
OutOfTrainNominal									
PersonnelEffect									
NeedPersEffect									
PersonnelBalance									

Decisions

ScrapOldMat (per year)				
RecruitWarPersonnel (per year)				
RemoveOutOfTrain (per year)				

Part training 4	Year 0	Year 5		Year 10		Year 15		Year 20	
Goal	**Status**	**Plan**	**Realised**	**Plan**	**Realised**	**Plan**	**Realised**	**Plan**	**Realised**
ResourceAccess									
SumOpCosts									
InvestEuro									
MatAdmPers									
MatInvestCapacity									
MaxInvest									
MatAdmBalance									
EduPers									
EduCapacity									
RecruitWarPers									
EduBalance									

Decisions

DismissAdmPersonnel (per year)				
DismissEduPersonnel (per year)				

Part training 5	Year 0	Year 5		Year 10		Year 15		Year 20	
Goal	Status	Plan	Realised	Plan	Realised	Plan	Realised	Plan	Realised
NewMatNominal									
RunInMatNominal									
OldMatNominal									
MaterialEffect									
UnderEdu									
WellTrainedNominal									
OutOfTrainNominal									
PersonnelEffect									
NeedPersEffect									
PersonnelBalance									
MatAdmPers									
MatInvestCapacity									
MaxInvest									
MatAdmBalance									
EduPers									
EduCapacity									
RecruitWarPers									
EduBalance									

Decisions

ScrapOldMat (per year)				
RecruitWarPersonnel (per year)				
DismissAdmPersonnel (per year)				
DismissEduPersonnel (per year)				