The Dynamics of Trust and Organizational Performance

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Trust represents a fundamental aspect in human communication and cooperation. For example, trust leads to higher cooperation in social dilemmas (Parks, Henager, & Samahorn, 1996), and a lack of trust may result in individuals withholding information from each other (Mellinger, 1956). Furthermore, several studies have investigated the role of trust in group and organizational performances and generally found that trust is linked to higher cooperation and better performance (Dirks, 1999; McAllister, 1995; Jones & George, 1998). In this paper, we investigate the antecedents and consequences of trust among employees in a dynamic systems model.

While several studies have investigated specific outcomes and antecedents of trust in organizations, a broader model that integrates several aspects of trust in organizations is still lacking in the literature. Our objective is to contribute to filling this gap and model trust as an endogenous element of an organizational structure. We aim to investigate the dynamics of trust and the conditions in which trust might thrive or deteriorate. For this, we model an organization that produces a certain good or service. Our model includes the dynamics around competiveness, productivity, demand, a hiring and firing process, and the seniority of employees.

Model Overview

The method employed in this project was System Dynamics, and the model was developed using the ISEE systems STELLA software[1]. The model boundaries were set to include three components of a company structure and culture: The production of goods or services, the employees, and the level of trust, as displayed in Figure 1.

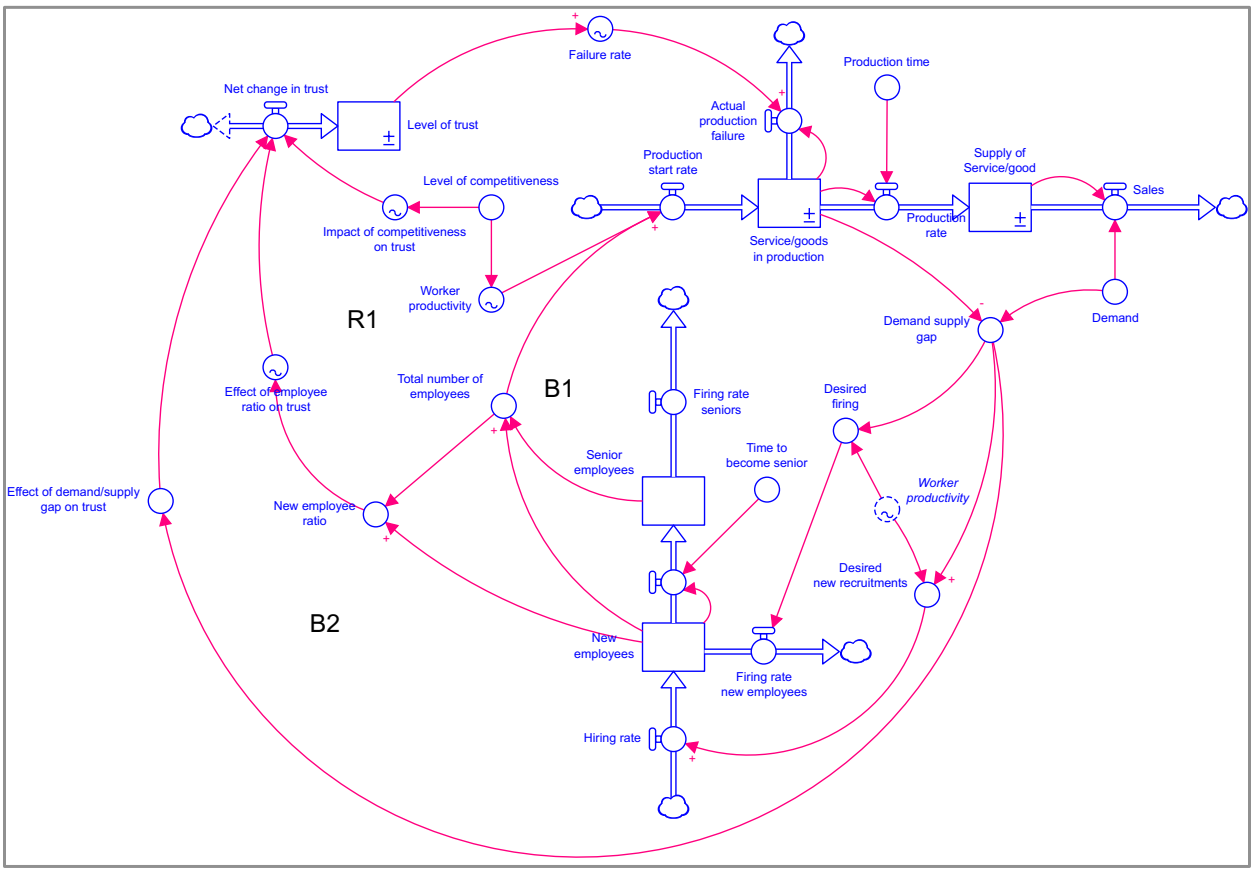

Figure 1: Model structure containing three main components: The supply chain of goods/services, the employees, and the level of trust.

[1]For more information, see: https://www.iseesystems.com

In the model, goods or services produced by the company are either in production, or available to be sold at the market, as represented by the stocks 'Service/goods in production' and 'Supply of Service/good'. Sales are equal to demand, as long as there is sufficient supply. Employees at the company can be either 'new employees' or 'senior employees'. Trust is represented by a stock that can be built up or eroded over time, which in turn affects company performance through the variable 'failure rate'.

Key Assumptions

The central assumption of our model is that trust influences production failure through the amount of information sharing – trust increases information sharing, which results in lower production failure due to miscommunication. We define production failure in a broad sense, referring to events such as the company failing to innovate as desired, or failing to solve problems that arise in the production process. If trust is at minimum, production failure is assumed to be at 10%. If the level of trust is at the threshold five or higher, production failure is assumed to be at 0%. In between, the relation between trust and production failure is a negative linear function.

We further assume that there are several factors influencing trust. First, competitiveness decreases trust linearly. Second, overproduction reduces trust. In the model, if production exceeds the demand by two units (which corresponds to 20% in the base-case scenario), trust starts to erode. Third, the ratio of senior employees relative to new employees influences trust and the relation is a positive linear function. This is based on the assumption that trust is built up gradually over time as employees work together. New employees move to senior status on average after five time periods (i.e., in the current configuration of the model this is equal to five months).

Apart from the negative influence of competitiveness on trust, we assume that competitiveness has a positive impact on productivity. If competitiveness is at a minimum, each employee produces one unit per month. If competitiveness is at maximum, each employee produces two units per month. In between, the relation between competitiveness and productivity is a positive linear function. However, as overproduction undermines trust, the positive impact of competitiveness on productivity can also have an indirect negative impact in some instances.

Key Feedbacks

In the model, there are three main feedback loops, as presented in the Causal Loop Diagram (CLD)[2] in Figure 2.

B1: The balancing feedback loop B1 represents the process of adjusting capacity in terms of employees to the desired production capacity. The more employees, the higher the production and the lower the demand/supply gap. The lower the demand/supply gap the lower the hiring rate.

B2: The balancing feedback loop B2 shows the dynamics around the level of trust and company performance. The link between the demand/supply gap and the level of trust is dashed, indicating that this relationship goes in two directions. As long as the company performs above a certain level, there is a positive impact on trust from performance. If, however, a situation occurs where the company has access capacity and oversupplies, the relationship is negative.

R1: The reinforcing feedback loop R1 shows the effect of hiring new employees on the level of trust. When new employees are hired, the level of trust decreases. The lower level of trust may then result in higher production failure, which in turn might lead to undersupply, which then again leads to the hiring of new employees. Yet, this effect is relatively small, in comparison to other dynamics surrounding the hiring and production processes.

[2]In Casual Loop Diagrams, arrows represent causal relationships between independent and dependent variables. Causalities can move either in the same direction, represented by a (+) sign, or in opposing direction, as represented by a (-) sign. This implies that, if variable Y and X are connected by an arrow with a (+) sign, then an increase in variable Y will lead to an increase in variable X. If variable Y decreases, X will also decrease. If, on the other hand, Y is connected to X by an arrow with a (-) sign, an increase in Y will lead to a decrease in X.

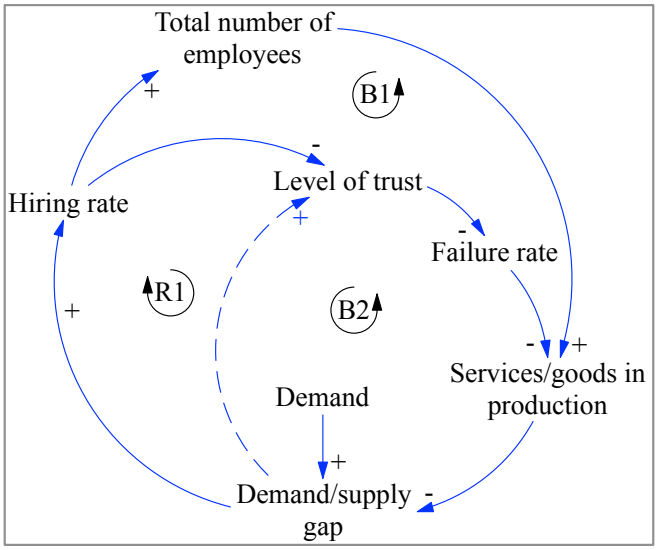

Figure 2: Key feedback loops.

Simulation Results and Analysis

This section presents simulated results under different conditions. Company performance is represented by the variable 'demand/supply gap'. The higher the demand, the bigger the gap, assuming everything else being equal. The higher the supply, the lower the gap.

The Base-Run Scenario

The base-run presents an equilibrium state, where supply meets demand, and where company capacity in terms of the number of employees does not need to be adjusted (see Figures 3-5). The level of trust is increasing steadily, and does not fall below a level where it would negatively affect company performance (thus the 'failure rate' is equal to zero).

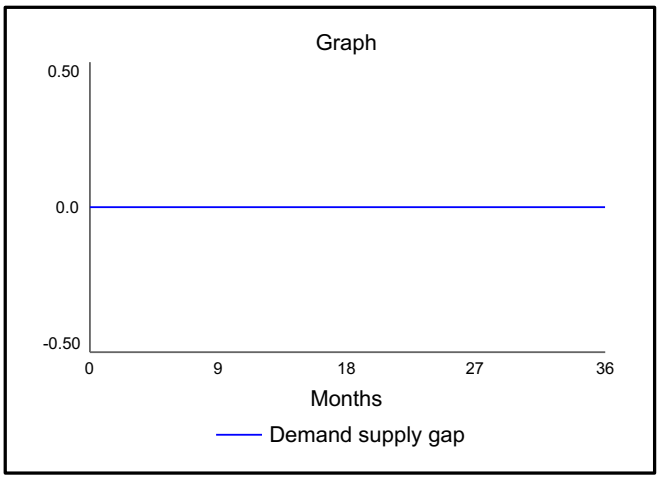

Figure 3: Demand/supply gap.

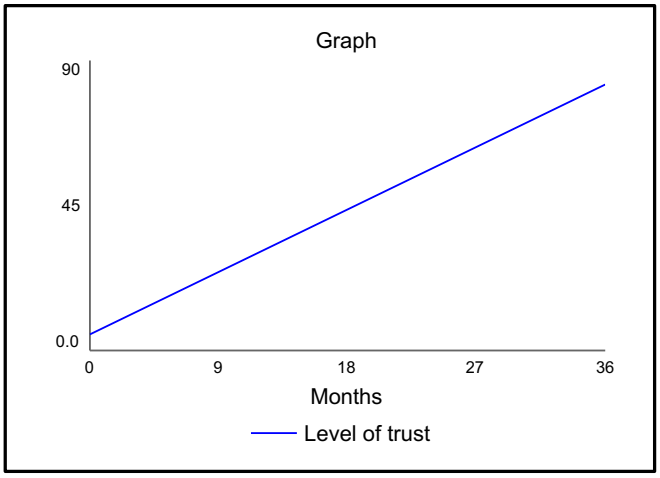

Figure 4: Level of trust.

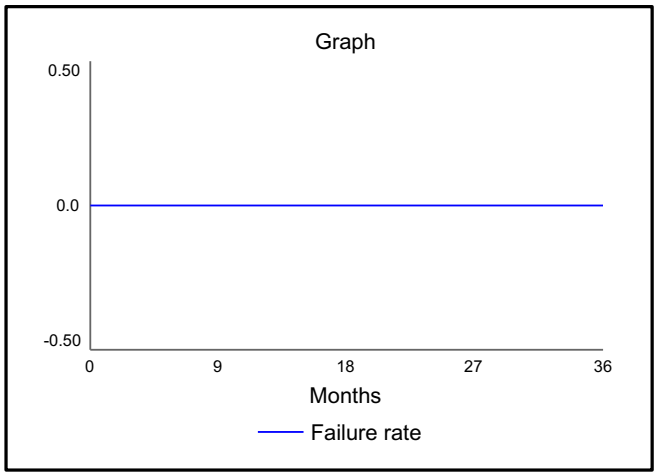

Figure 5: Production failure rate.

Scenario I: Changing Market Conditions – Increasing Demand

In scenario I, demand is suddenly increasing, causing the demand/supply gap to increase (see Figures 6-8). The company responds by building capacity through hiring new employees. However, due to the lags in the system, too many new employees are hired. Initially, this results in a negative demand/supply gap, as not all of what is produced is sold. After a period of oscillation, a new stable state is reached, where supply matches demand. In this scenario, the level of trust initially drops, due to the impact of the new employees on the company environment, but still grows over time .

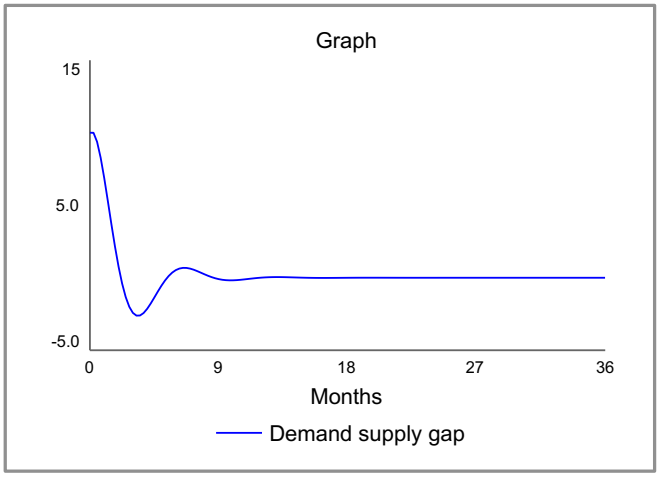

Figure 6: The development of supply relative to demand in Scenario I.

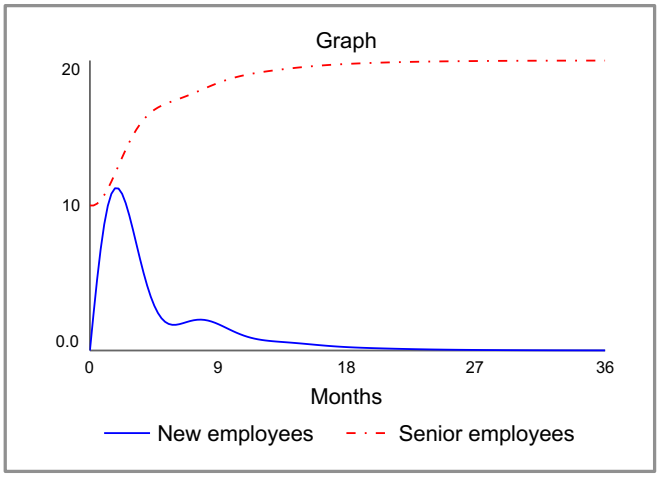

Figure 7: Dynamics of employment given increasing demand.

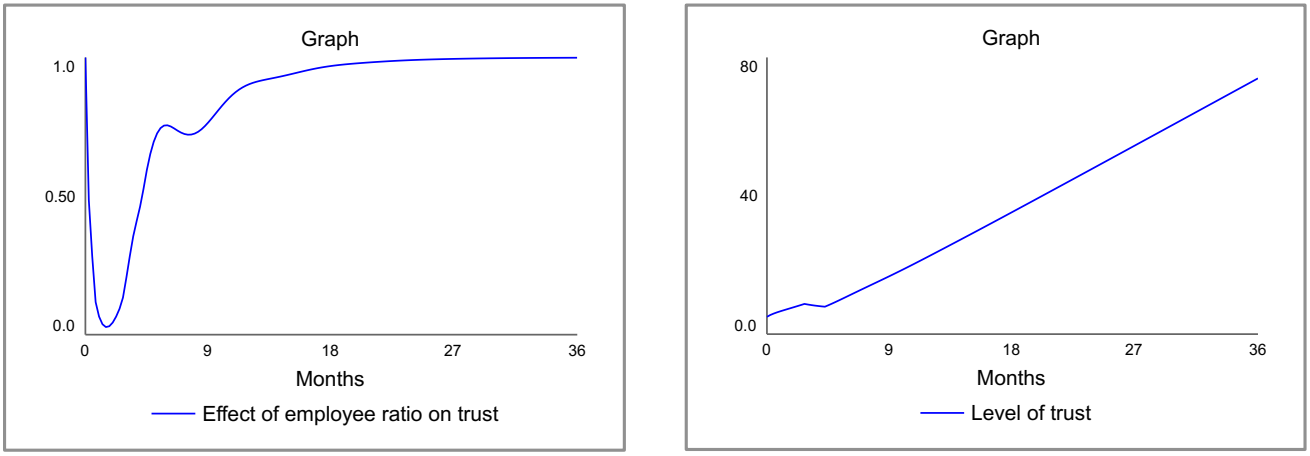

Figure 8: The impact of new employees on the overall level of trust in the organisation.

Scenario II: A Changing Company Culture

In scenario II, the company responds to the increasing demand not only by recruiting new employees, but also by implementing measures to boost productivity (see Figures 9-11). It is assumed that this is done by schemes aiming to increase competitiveness among individual employees. In response, the level of trust is directly negatively affected. In this simulation run, trust reaches a level where the production is negatively affected by a rising failure rate. Yet, over time the net effect on production is positive, due to the number employees and the overall higher level of productivity. The performance does not fall below the level in which the trust would be negatively affected, which could happen in a situation that also involves overproduction in the company (see feedback R1).

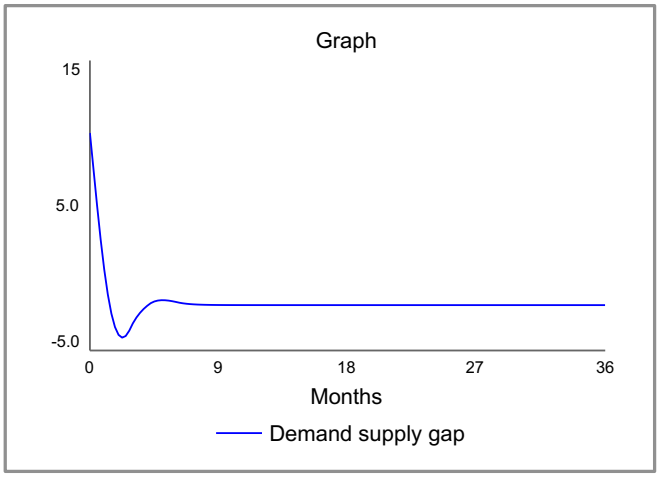

Figure 9: Demand/supply gap given multiple interventions to increase production.

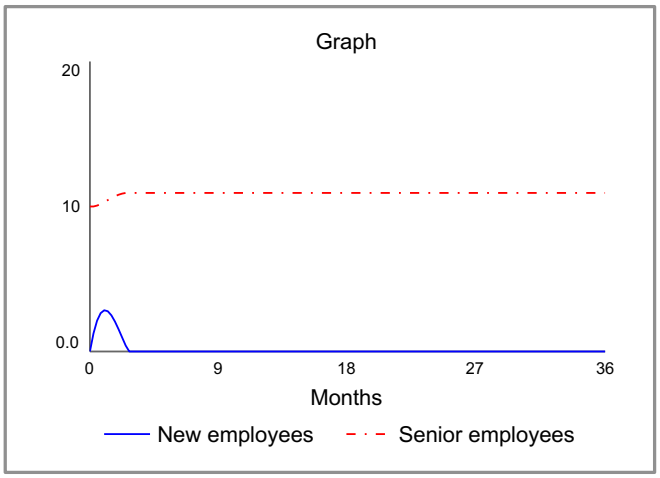

Figure 10: The system stabilising at a comparable lower level of employees due to measures to increase productivity.

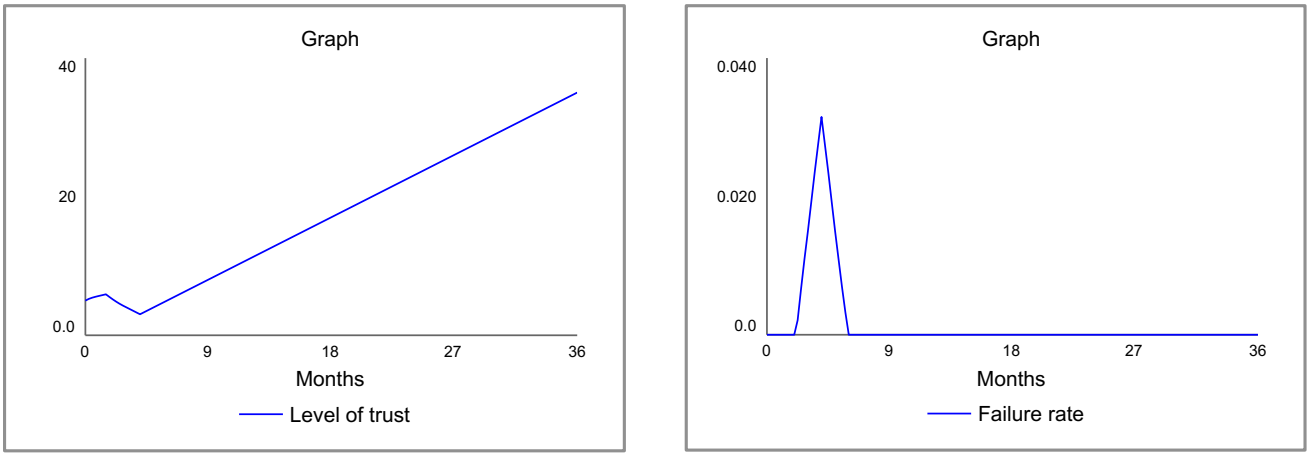

Figure 11: A relatively low level of trust causing production failure.

Conclusions and Future Work

While our model provides interesting insights in its current forms, there are several adjustments that might be made to the model. First, production failure does currently not have any other impacts than reducing the overall productivity. It might, however, be more realistic to let production failure lower the amount of trust. This would create a positive feedback loop between trust and production failure, which could cause up- or downward spirals of organizational performance. Second, demand is currently fixed to a specific value for

each model run. Modeling demand endogenously would add additional dynamics to the model. Moreover, companies respond in different ways to changing market conditions, which the model could be modified to represent. Third, competiveness is currently modeled exogenously. There are, however, factors in our model that might influence the level of competitiveness. For example, firing employees might change the company environment and create higher levels of competitiveness. Furthermore, it might be more realistic that firing also causes lower level of trust.

Our model and extensions of it might be useful in assisting interventions aimed at increasing company performance and to better understand how trust evolves. Because of the broadness of our model, negative side effects can be discovered that might not become apparent by focusing only on specific links. For example, the implication of our model that the hiring of new employees might result in lower trust, which might indirectly result in yet more hiring of new employees does not become apparent when one only acknowledges the direct effects of hiring new employees. Furthermore, specific aspects of a given organization can easily be added to our model. Because of this, our model may serve as a basis for discussion and a support tool in company planning. In general, there are several theories about how trust evolves in an organizational setting. It would be useful to incorporate those in the model, to develop a general framework which could then be adjusted to a specific company or organization.

References

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Mellinger, G. D. (1956). Interpersonal trust as a factor in communication. *Journal of Abnormal and Social Psychology*, *52*, 304–309.

Parks, D., Henager, R. F., & Samahorn, S. D. (1996). Trust and reactions to messages of intent in social dilemmas. *Journal of Conflict Resolution*, *40*, 134–151.

Appendix A. Model Equations

{The model has 28 (28) variables (array expansion in parens).
In 1 Modules with 0 Sectors.
Stocks: 5 (5) Flows: 9 (9) Converters: 14 (14)
Constants: 5 (5) Equations: 18 (18) Graphicals: 4 (4)}

Demand = 10
Demand_supply_gap = Demand-'Service/goods_in_production'
Desired_firing = IF(Demand_supply_gap)<0 THEN(-Demand_supply_gap/Worker_productivity) ELSE(0)
Desired_new_recruitments = Demand_supply_gap/Worker_productivity
'Effect_of_demand/supply_gap_on_trust' = IF(Demand_supply_gap)>(-2) THEN(1) ELSE(-1)
Effect_of_employee_ratio_on_trust = GRAPH(New_employee_ratio)
(0.000, 1.000), (0.100, 0.737), (0.200, 0.486), (0.300, 0.337), (0.400, 0.120), (0.500, 0.006), (0.600, -0.154), (0.700, -0.337), (0.800, -0.543), (0.900, -0.749), (1.000, -1.000)
Failure_rate = GRAPH(Level_of_trust)
(0.000, 0.1), (0.500, 0.09143), (1.000, 0.08229), (1.500, 0.06571), (2.000, 0.05257), (2.500, 0.04), (3.000, 0.032), (3.500, 0.024), (4.000, 0.01543), (4.500, 0.00743), (5.000, 0)
Impact_of_competitiveness_on_trust = GRAPH(Level_of_competitiveness)
(0.000, 0.154), (0.500, 0.131), (1.000, 0.120), (1.500, 0.074), (2.000, 0.040), (2.500, 0.029), (3.000, -0.063), (3.500, -0.257), (4.000, -0.497), (4.500, -0.749), (5.000, -1.000)
Level_of_competitiveness = 0
Level_of_trust(t) = Level_of_trust(t - dt) + (Net_change_in_trust) * dt
INIT Level_of_trust = 5
INFLOWS:
Net_change_in_trust = "Effect_of_demand/supply_gap_on_trust"+Effect_of_employee_ratio_on_trust+Impact_of_competit
New_employee_ratio = New_employees/Total_number_of_employees
New_employees(t) = New_employees(t - dt) + (Hiring_rate - Firing_rate_new_employees - "") * dt
INIT New_employees = 0
INFLOWS:
Hiring_rate = Desired_new_recruitments
OUTFLOWS:
Firing_rate_new_employees = Desired_firing
"" = New_employees/Time_to_become_senior
Production_time = 1
Senior_employees(t) = Senior_employees(t - dt) + ("" - Firing_rate_seniors) * dt
INIT Senior_employees = 10
INFLOWS:
"" = New_employees/Time_to_become_senior
OUTFLOWS:
Firing_rate_seniors = 0
"Service/goods_in_production"(t) = "Service/goods_in_production"(t - dt) + (Production_start_rate - Production_rate - Actual_production_failure) * dt
INIT "Service/goods_in_production" = 10
INFLOWS:
Production_start_rate = Worker_productivity*Total_number_of_employees
OUTFLOWS:
Production_rate = "Service/goods_in_production"/Production_time
Actual_production_failure = Failure_rate*"Service/goods_in_production"
"Supply_of_Service/good"(t) = "Supply_of_Service/good"(t - dt) + (Production_rate - Sales) * dt
INIT "Supply_of_Service/good" = 10
INFLOWS:
Production_rate = "Service/goods_in_production"/Production_time
OUTFLOWS:
Sales = IF(Demand<"Supply_of_Service/good")THEN(Demand) ELSE("Supply_of_Service/good")
Time_to_become_senior = 5
Total_number_of_employees = New_employees+Senior_employees
Worker_productivity = GRAPH(Level_of_competitiveness)
(0.000, 1.000), (0.500, 1.062), (1.000, 1.154), (1.500, 1.211), (2.000, 1.280), (2.500, 1.394), (3.000, 1.543), (3.500, 1.657), (4.000, 1.726), (4.500, 1.817), (5.000, 2.000)