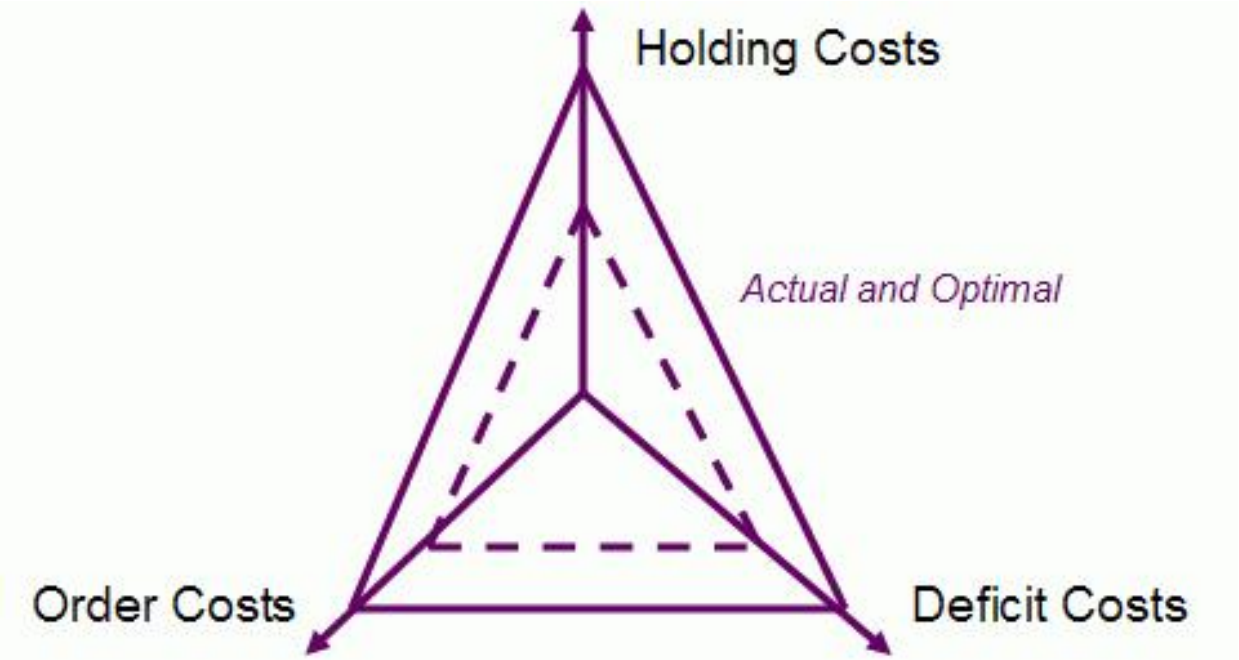

The Law of Inventory Management Works for Supply Chain Management

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The simulation experiment was organized by Genobium.com to answer the question: what would the results be if a firm would have used optimal inventory management policy with a technical solution. It is as if the firms under analysis relive the past period again. The simulation uses past demands to create new/different orders: using knowledge about previous periods it makes forecasts, calculates norms and simulates orders when the system recommends to do so and it simulates filling inventory after the set time of delivery. Real inventory dynamics summary is presented as a blue line, the simulated as a pink line.

The graphs and tables show that the level of inventory is reduced in simulation, if we check the individual dynamics for a separate position we see that the number and size of the periods when inventory remnant is close to zero are less (this leads to increase in sales), that the number of spikes is less, so the number of orders is less and the transportation costs are reduced.

Table 1

Actual and simulated results using ROInventory indicator **(with optimal policy of inventory management -58 enterprises)**

Actual ROInventory, % (1)	*Simulated, % (2)*	*Months in evaluation (3)*	*As in 1*	*As in 2*	*As in 3*
Pharmaceuticals					
48,34	69,27	3	346,99	571,47	12
26,05	36,10	9	91,62	186,50	4
64,33	90,84	2	78,15	263,27	6
160,61	336,31	5	14,48	22,0	1
301,33	430,47	6			
Auto spare parts					
211,70	243,81	2	1327,35	2956,72	48
132,43	184,84	4	370,03	572,97	14
2112,95	2418,88	36			
Алкоголь					
42,60	162,34	2	10,10	21,25	1
Haberdashery					
49,25	79,62	6	129,01	198,66	1
464,06	858,13	36			
Construction materials					
57,75	83,89	6	140,41	640,44	6
152,11	259,75	6	28,07	53,99	1
78,81	303,61	3,5	129,78	177,42	2,5
20,38	48,87	2	47,69	130,23	7
Machine tools					
93,23	125,94	9	36,45	40,56	2,75
54,08	72,20	4,5			
Products					
23,08	31,54	5	207,86	407,22	9,75
105,40	290,38	6	320,45	413,03	4,7
91,48	263,38	3	217,89	374,56	5

Perfume					
96,46	160,88	3,6	30,19	75,71	2
9,03	22,68	3			
Furniture					
108,74	158,63	3			
Stationery					
471,50	826,74	12	321,17	1000,59	10
Computer spare parts					
40,21	74,35	12			
Raw materials, industry					
267,21	647,79	12	322,13	497,31	12
Cloths					
199,18	332,48	12			
Books					
80,77	124,60	7			
Industrial commodities					
59,03	115,18	6	8,93	20,27	1
29,14	31,85	3	162,14	246,61	12
249,16	346,03	26	8,96	178,14	2
Shoes					
553,59	735,46	3			
Other					
639,65	694,34	24	329,24	378,11	2
614,35	724,03	6	453,00	742,74	24

The results of survey - average return on inventory levels and its variation (actual and optimal) and significance level are organized in table 2 (all the data are adjusted to annual).

Table 2

Figures of statistical importance of the survey

Figures	Simulation*	Actual
Mean	378,95	642,43
Dispersion	195171,10	331631,50
MSE	441,78	575,87
Variation coefficient	1,17	0,90
Hypothesis testing, z	-2,76	
Importance Z=0,005	>0,99	

* Return on Inventory = (Margin Sold – Order Costs) / Ave. Inventory

The data obtained shows that average ROInventory level using SIMPLE-system model is 1,7 higher than actual, that existed at the firms. We should also point out that our indicator ***"logistical" return on inventory capital*** is more stable according to variation coefficient. In addition, the statistical procedure of hypothesis testing shows that we need to deny "null" hypothesis about closeness of 2 rows (simulated and actual) with the importance level Alpha more then 99 percents. Hence we may conclude that optimal (simulated) results with using technical solution are surely better, integral results is higher.

Therefore, the tactical and operative model considered should be used in planning and projecting logistics systems using the criteria of ***maximum "logistical" return on capital in material flows***. We can also see that all elements of this indicator (order costs, average inventory, margin sold), and also traditional indicators (sales volume, service level, turnover coefficient) all tend to improve (see the results of simulation for 58 enterprises in the Appendix).

Correlation coefficient = 91%, it means tough, almost functional correlation of positive and negative deviations from corresponding means so all factors are accounted in the model that supports the statement that optimization model corresponds to conditions of firms and it uses the most important factors and relations.

In other words, we have significant and definite improvement for the integral figure just because we use inner law of inventory formation. We have shown the usage of optimization and simulation models of a system that maximizes the ***"logistical" return on inventory***. As a result we supported the hypothesis about existing law of inventory formation that reduce stochastic elements. Also having this ***"logistics return in inventory capital"*** evaluation we might to conclude that the model of trade firm used is sustainable. Models and methods of the technical solution are optimal and applicable.

The indicator "logistical" return on capital in material flow may be recommended to evaluate the state of supply chain systems and also as the integral value of inventory management system to be taken both at strategical stage (when choosing conditions and parameters of its functioning) and at tactical stage for limiting inventory and at the stage of operative inventory control.

Because the result of experiment is positive then scientific task of finding the "ideal" logistics system for a separate storage may be considered as completely solved. Further significant improvements according to simulation are impossible.

Solving more complex logistics could be possible with the principles of simulation experiments in addition to analytical models of inventory optimization that gives the opportunity to test different factors in combinations, also true for conditions and operative policy procedures, also true for multi-stage logistics systems. It seems this is part of the methology of finding its "place", the identity of logistics chains, with certainty of its configuration using the ***"economically effective material flow" concept***.

Appendix

Simulated results on graphs (actual and simulated dynamics of inventory).