

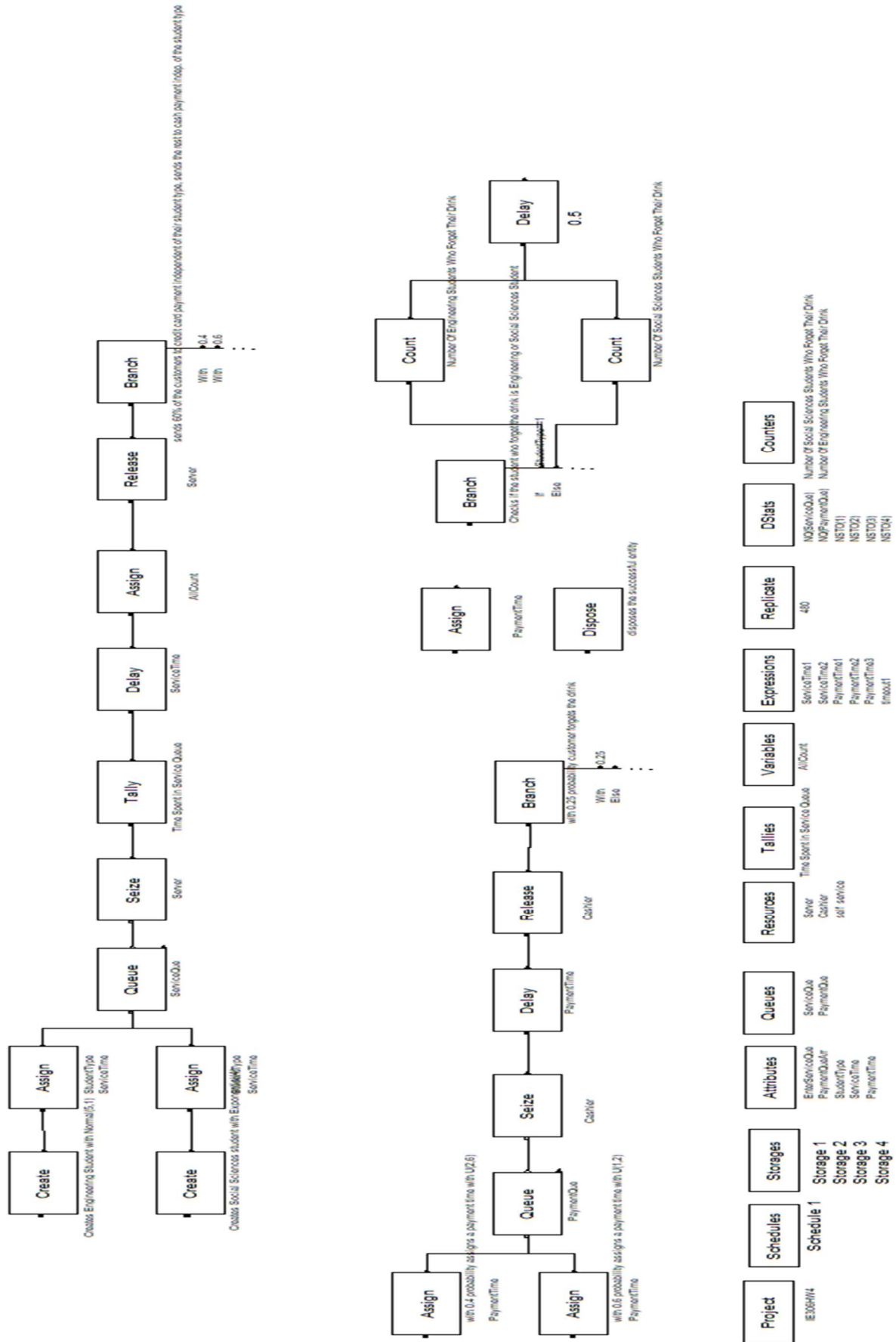
## **IE306 HOMEWORK 4**



**19.12.2022**

Ömercan Mısırlıoğlu

# MODEL BLOCK DIAGRAM



# MODEL LISTING

```

0$          CREATE,          1:NORM(5,1):NEXT(11$);          Creates
Engineering Student with Normal(5,1)

11$          ASSIGN:          StudentType=1:
                                ServiceTime=ED(StudentType);          Assigns the
student type with respected service and payment times.
service      QUEUE,          ServiceQueue:MARK(EnterServiceQueue);
1$           SEIZE,          1,Other:
                                Server,1:NEXT(10$);

10$          TALLY:          Time Spent in Service Queue,INTERVAL(EnterServiceQueue),1;
2$           DELAY:          ServiceTime,StudentType,Other:NEXT(3$);

3$           ASSIGN:          AllCount=AllCount+1;
resume       RELEASE:          Server,1;
12$          BRANCH,          1:
                                With,0.4,cashPayment,Yes;
                                With,0.6,CreditPayment,Yes;          sends 60% of the
customers to credit card payment independent of their student type, sends the rest to cash
payment indep. of the student type
cashPayment  ASSIGN:          PaymentTime=4;          with 0.4
probability assigns a payment time with U(2,6)
payment      QUEUE,          PaymentQueue:MARK(PaymentQueueArr);
4$           SEIZE,          1,Other:
                                Cashier,1:NEXT(5$);

5$           DELAY:          PaymentTime,StudentType+2,Other:NEXT(6$);

6$           RELEASE:          Cashier,1;
7$           BRANCH,          1:
                                With,0.25,forget,Yes;
                                Else,dont_forget,Yes;          with 0.25
probability customer forgets the drink
forget       ASSIGN:          PaymentTime=ED(5):NEXT(forgetbranch);

forgetbranch BRANCH,          1:
                                If,StudentType==1,Engineering Student,Yes;
                                Else,Social Sciences Student,Yes;          Checks if the
student who forget the drink is Engineering or Social Sciences Student
Engineering Student COUNT:    Number Of Engineering Students Who Forget Their Drink,1; counts the
Engineering Students who forget their drinks
selfservice  DELAY:          0.5,,Other:NEXT(payment);

Social Sciences Student COUNT: Number Of Social Sciences Students Who Forget Their
Drink,1:NEXT(selfservice); counts the Social Sciences Students who forget their drinks

dont_forget  DISPOSE:          No;          disposes the
successful entity

CreditPayment ASSIGN:          PaymentTime=3:NEXT(payment);          with 0.6
probability assigns a payment time with U(1,2)

9$           CREATE,          1:EXPO(4):NEXT(8$);          Creates Social
Sciences student with Exponential(4)

8$           ASSIGN:          StudentType=2:
                                ServiceTime=ED(StudentType):NEXT(service);          Assigns the
student type with respected service and payment times.

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# EXPERIMENT LISTING

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PROJECT,      "IE306HW4", "Omercan Misirlioglu", , Yes, No, Yes, No, No, No, No, No, No, No, No, No;

ATTRIBUTES:   PaymentTime, DATATYPE (Real) :
              StudentType, DATATYPE (Real) :
              EnterServiceQueue, DATATYPE (Real) :
              ServiceTime, DATATYPE (Real) :
              PaymentQueueArr, DATATYPE (Real) ;

SCHEDULES:    Schedule
1, TYPE (Capacity) , FORMAT (Duration) , FACTOR (1.0) , UNITS (Minutes) , , , DATA (2, 165) , DATA (1, 15) ;

STORAGES:     1, Storage 1:
              2, Storage 2:
              3, Storage 3:
              4, Storage 4;

VARIABLES:    AllCount, CLEAR (System) , CATEGORY ("None-None") , DATATYPE (Real) ;

QUEUES:       PaymentQueue, FirstInFirstOut, , AUTOSTATS (Yes, , ) :
              ServiceQueue, FirstInFirstOut, , AUTOSTATS (Yes, , ) ;

RESOURCES:    Server, Schedule (Schedule
1, Ignore) , , Stationary, COST (0.0, 0.0, 0.0) , , AUTOSTATS (Yes, , ) :
              Cashier, Capacity (1) , , Stationary, COST (0.0, 0.0, 0.0) , , AUTOSTATS (Yes, , ) :
              self_service, Capacity (1) , , Stationary, COST (0.0, 0.0, 0.0) , , AUTOSTATS (Yes, , ) ;

COUNTERS:     1, Number Of Engineering Students Who Forget Their Drink, , Replicate:
              2, Number Of Social Sciences Students Who Forget Their Drink, , Replicate;

TALLIES:      Time Spent in Service Queue;

DSTATS:       1, NSTO (1) , Utilization of food servers by eng. students:
              2, NSTO (2) , Utilization of food servers by Soc. Sci. Students:
              3, NSTO (3) , Utilization of cashier by eng. students:
              4, NSTO (4) , Utilization of cashier by Soc. Sci. Students:
              5, NQ (ServiceQueue) , Average Length of Food Service Queue:
              6, NQ (PaymentQueue) , Average Length of Payment to Cashier Queue;

REPLICATE,    4, 0.0, 480, Yes, Yes, 0, , , 24.0, Minutes, No, No, , DATETIME ("Dec 18, 2022 16:50:12") , No, No;

EXPRESSIONS:  1, ServiceTime1, DATATYPE (Native) , UNIFORM (2, 7) :
              2, ServiceTime2, DATATYPE (Native) , EXPONENTIAL (5) :
              3, PaymentTime1, DATATYPE (Native) , UNIFORM (1, 2) :
              4, PaymentTime2, DATATYPE (Native) , UNIFORM (2, 6) :
              5, PaymentTime3, DATATYPE (Native) , UNIFORM (1, 1) :
              6, timeout1, DATATYPE (Native) , 15;
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# OUTPUT

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ARENA Simulation Results  
IE - License: STUDENT

Summary for Replication 1 of 4

Project: IE306HW4 Run execution  
date :12/19/2022  
Analyst: Omercan Misirlioglu Model revision  
date:12/19/2022

Replication ended at time : 480.0 Minutes (Monday, December 19, 2022, 00:50:12)  
Base Time Units: Minutes

TALLY VARIABLES

Identifier	Average	Half Width	Minimum
Maximum Observations			
Time Spent in Service Queue	42.094	(Insuf)	.00000
79.491 188			

DISCRETE-CHANGE VARIABLES

Identifier	Average	Half Width	Minimum
Maximum Final Value			
Utilization of food servers by eng.student	.83634	(Insuf)	.00000
2.0000 1.0000			
Utilization of food servers by Soc.Sci.Stu	1.1042	(Insuf)	.00000
2.0000 1.0000			
Utilization of cashier by eng.students	.46585	(Insuf)	.00000
1.0000 1.0000			
Utilization of cashier by Soc.Sci.Students	.52500	(Insuf)	.00000
1.0000 .00000			
Average Length of Food Service Queue	17.835	(Corr)	.00000
33.000 26.000			
Average Length of Payment to Cashier Queue	28.848	(Corr)	.00000
72.000 71.000			

COUNTERS

Identifier	Count	Limit
Number Of Engineering Students Who Forget	25	Infinite
Number Of Social Sciences Students Who For	20	Infinite

OUTPUTS

Identifier	Value
System.NumberOut	.00000

Beginning replication 2 of 4

ARENA Simulation Results  
IE - License: STUDENT

Summary for Replication 2 of 4

Project: IE306HW4 Run execution  
date :12/19/2022  
Analyst: Omercan Misirlioglu Model revision  
date:12/19/2022

Replication ended at time : 480.0 Minutes (Monday, December 19, 2022, 00:50:12)  
Base Time Units: Minutes

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62 Identifier          Average   Half Width  Minimum
63 Maximum Observations
64
65 Time Spent in Service Queue      22.089      (Insuf)      .00000
66 43.155      199
67
68 DISCRETE-CHANGE VARIABLES
69 Identifier          Average   Half Width  Minimum
70 Maximum Final Value
71
72 Utilization of food servers by eng.student .80415      (Insuf)      .00000
73 2.0000      2.0000
74 Utilization of food servers by Soc.Sci.Stu 1.0875      (Insuf)      .00000
75 2.0000      .00000
76 Utilization of cashier by eng.students .44167      (Insuf)      .00000
77 1.0000      .00000
78 Utilization of cashier by Soc.Sci.Students .55251      (Insuf)      .00000
79 1.0000      1.0000
80 Average Length of Food Service Queue 9.9163      (Corr)      .00000
81 21.000      19.000
82 Average Length of Payment to Cashier Queue 34.155      (Corr)      .00000
83 78.000      77.000
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85 COUNTERS
86 Identifier          Count   Limit
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88 Number Of Engineering Students Who Forget 20   Infinite
89 Number Of Social Sciences Students Who For 22   Infinite
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91 OUTPUTS
92 Identifier          Value
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94 System.NumberOut .00000
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96 Beginning replication 3 of 4
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98 ARENA Simulation Results
99 IE - License: STUDENT
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101 Summary for Replication 3 of 4
102
103 Project: IE306HW4 Run execution
104 date :12/19/2022
105 Analyst: Omercan Misirlioglu Model revision
106 date:12/19/2022
107
108 Replication ended at time : 480.0 Minutes (Monday, December 19, 2022, 00:50:12)
109 Base Time Units: Minutes
110
111 TALLY VARIABLES
112 Identifier          Average   Half Width  Minimum
113 Maximum Observations
114
115 Time Spent in Service Queue      11.227      (Insuf)      .00000
116 38.134      202
117
118 DISCRETE-CHANGE VARIABLES
119

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Identifier	Average	Half Width	Minimum
Utilization of food servers by eng.student	.88371	(Insuf)	.00000
Utilization of food servers by Soc.Sci.Stu	.93318	(Insuf)	.00000
Utilization of cashier by eng.students	.46454	(Insuf)	.00000
Utilization of cashier by Soc.Sci.Students	.53125	(Insuf)	.00000
Average Length of Food Service Queue	4.7592	(Corr)	.00000
Average Length of Payment to Cashier Queue	38.013	(Corr)	.00000

COUNTERS

Identifier	Count	Limit
Number Of Engineering Students Who Forget	21	Infinite
Number Of Social Sciences Students Who For	27	Infinite

OUTPUTS

Identifier	Value
System.NumberOut	.00000

Beginning replication 4 of 4

ARENA Simulation Results  
IE - License: STUDENT

Summary for Replication 4 of 4

Project: IE306HW4  
date :12/19/2022  
Analyst: Omercan Misirlioglu  
date:12/19/2022

Run execution  
Model revision

Replication ended at time : 480.0 Minutes (Monday, December 19, 2022, 00:50:12)  
Base Time Units: Minutes

TALLY VARIABLES

Identifier	Average	Half Width	Minimum
Time Spent in Service Queue	38.113	(Insuf)	.00000

DISCRETE-CHANGE VARIABLES

Identifier	Average	Half Width	Minimum
Utilization of food servers by eng.student	.76172	(Insuf)	.00000
Utilization of food servers by Soc.Sci.Stu	1.1014	(Insuf)	.00000
Utilization of cashier by eng.students	.39167	(Insuf)	.00000
Utilization of cashier by Soc.Sci.Students	.59291	(Insuf)	.00000



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170 Average Length of Food Service Queue 17.659 (Corr) .00000
    38.000 29.000
171 Average Length of Payment to Cashier Queue 30.036 (Corr) .00000
    74.000 73.000
172
173 COUNTERS
174
175 Identifier Count Limit
176
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178 Number Of Engineering Students Who Forget 14 Infinite
179 Number Of Social Sciences Students Who For 23 Infinite
180
181 OUTPUTS
182
183 Identifier Value
184
185
186 System.NumberOut .00000
187
188
189 ARENA Simulation Results
190 IE - License: STUDENT
191
192 Output Summary for 4 Replications
193
194 Project: IE306HW4 Run execution
    date :12/19/2022
195 Analyst: Omercan Misirlioglu Model revision
    date:12/19/2022
196
197
198 OUTPUTS
199
200 Identifier Average Half-width Minimum Maximum
    # Replications
201
202
203 System.NumberOut .00000 .00000 .00000
    .00000 4
204
205 Simulation run time: 0.02 minutes.
206 Simulation run complete.
207

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