

Agent Modeling using Static and Dynamic DISC Behavioral Profiles

by

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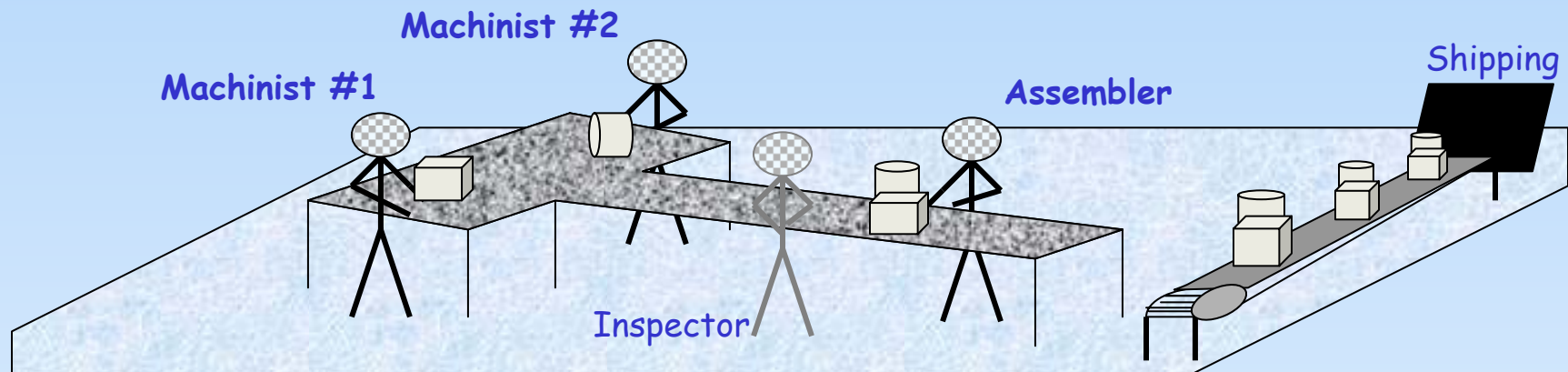
Overview:

- A small assembly line and its human operators
- Simulating the system without operators
- DISC profiles can predict task suitability
- Static DISC mismatch affects productivity
- Dynamic state can also affect productivity
- Final Comments



Agent Modeling using Static and Dynamic DISC Behavioral Profiles

A small assembly line and its human crew:



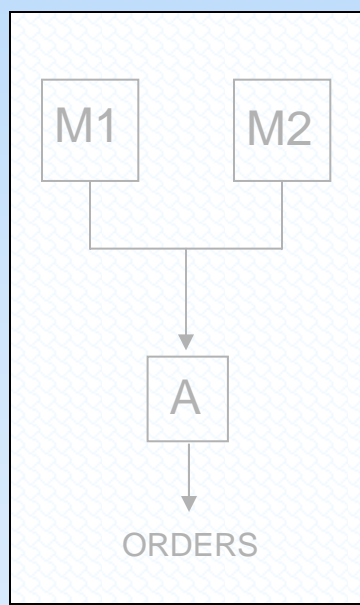
- The parts for each order come in pairs, one to each machinist.
- Machined parts are passed along to the assembler.
- An inspector may send pairs back for further machining.
- Completed and inspected parts are forwarded to Shipping.



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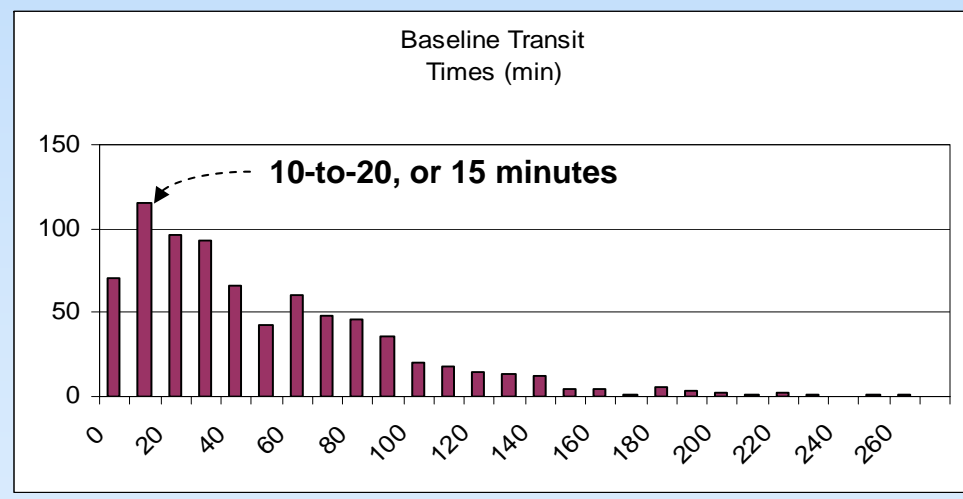
Simulating the system without operators:

- Simulation Results:



Operator utilization:
M1=35% M2=38% A=51%

**Orders completed
Per shift: 7.6**



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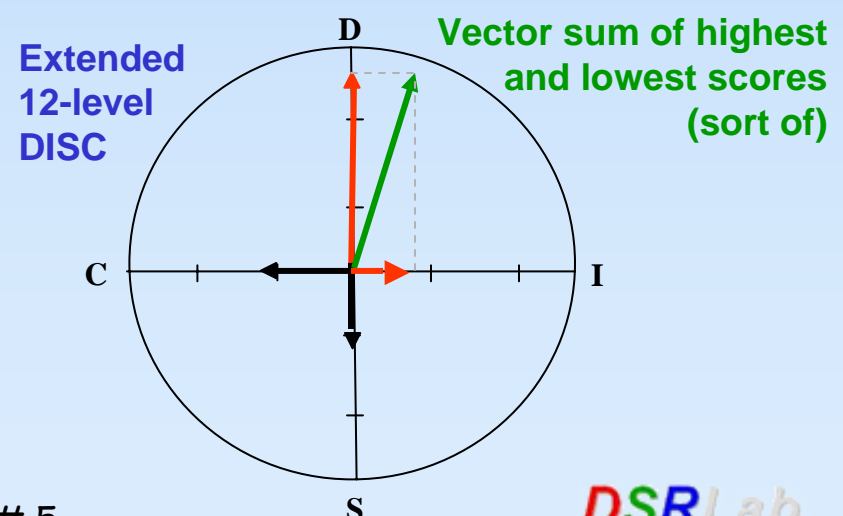
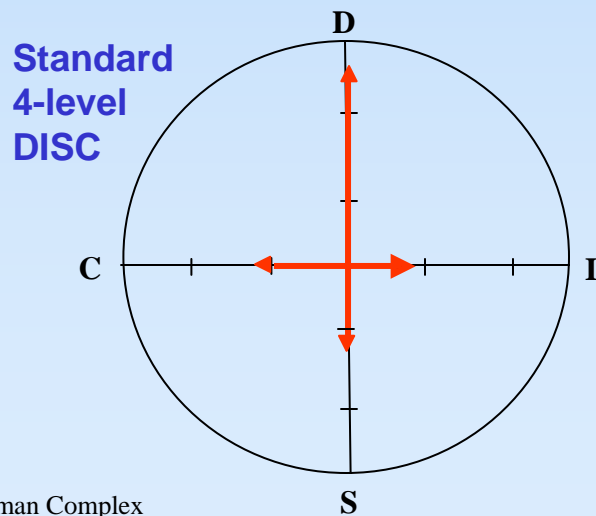
DISC profiles can predict task suitability:

D – Dominance: the trait that describes an individual’s assertiveness, power and control.

I – Influence: describes a person’s role in social situations and their style of communication.

S – Steadiness: refers to the levels of patience, persistence, and thoughtfulness.

C – Compliance: describes a person’s reaction to structure and organization



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DISC profiles can predict task suitability:

Efficiency – high D, low I: results oriented.

Self-motivation – high D, low S: self-starter.

Independence – high D, low C: self-reliant.

Friendliness – high I, low D: open and warm to others.

Enthusiasm – high I, low S: animated, expressive behavior.

Self-confident - high I, low C: socially and publicly confidence.

Patience - high S, low D: calm and unobtrusive.

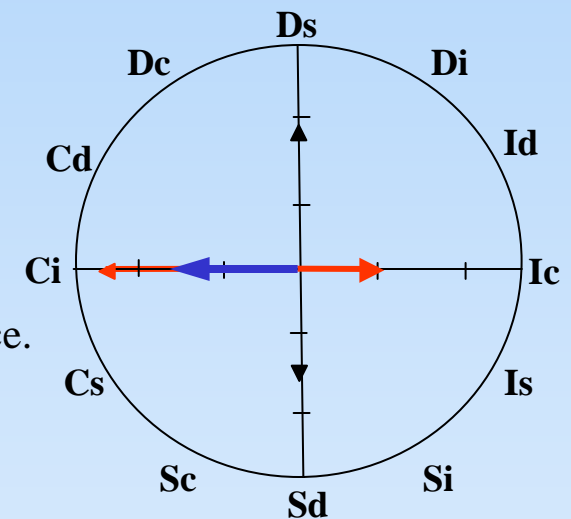
Thoughtfulness - high S, low I: deep and thorough.

Persistence - high S, low C: dogged and tenacious.

Cooperation – high C, low D: team-oriented.

Accuracy/Caution - high C, low I: attention to detail.

Sensitivity – high C, low S: observant and aware.



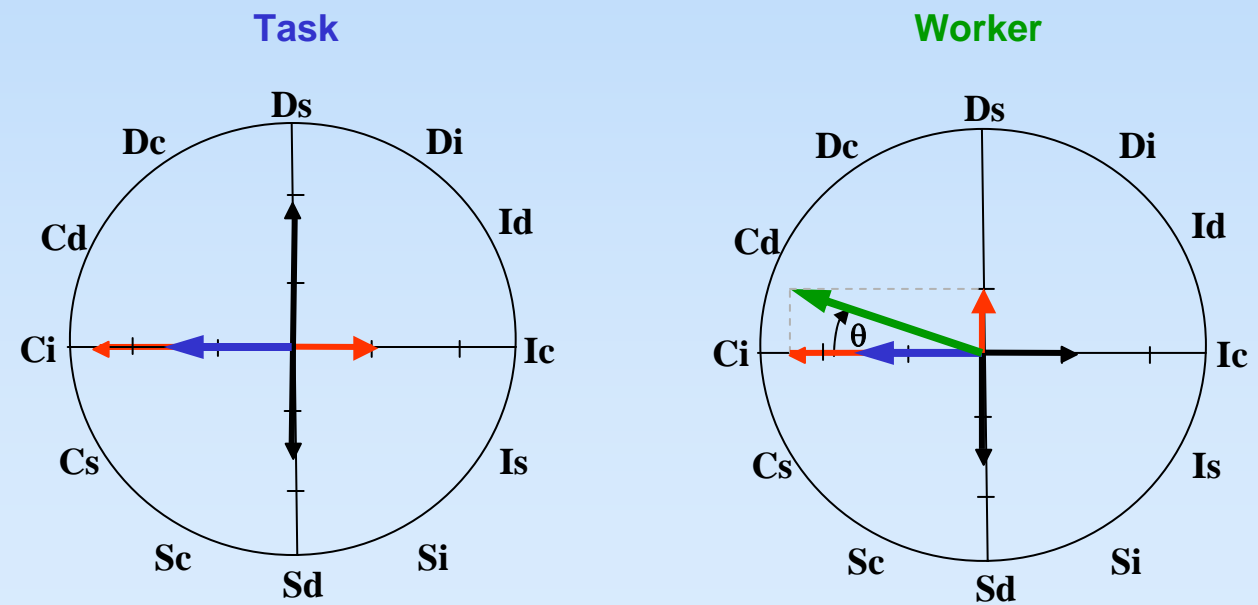
Ideal Operator Profile



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Static DISC mismatch affects productivity:

- Identifying the mismatch between a task and a worker's profile:



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Static DISC mismatch affects productivity:

$$\begin{aligned} \text{Degradation} &= \sin\left(\frac{\theta}{2}\right) \\ &= \sin\left(\frac{10^\circ}{2}\right) \\ &= \sin(5^\circ) \\ &= 0.087 \end{aligned}$$

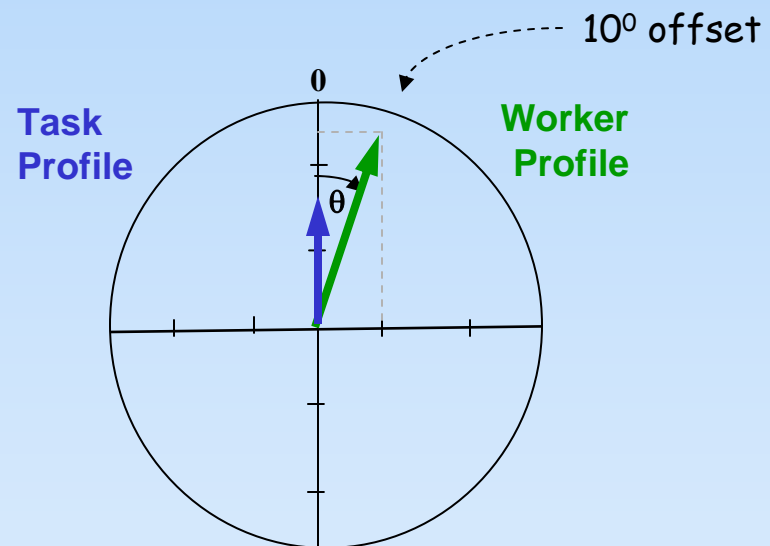
A task that an ideal worker can complete in 30 minutes requires

$$t = 30 + (30)(.087)$$

$$t = 30 + 2.6$$

$$t = \underline{33 \text{ minutes}}$$

We assume that a total mismatch will require twice the time.



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Static DISC mismatch affects productivity:

Run#	Machinists *	Assembler	Avg Transit
1	<div style="display: flex; align-items: center; justify-content: center;"> <div style="border-left: 1px solid black; border-right: 1px solid black; height: 20px; margin-right: 5px;"></div> <div style="border-left: 1px solid black; border-right: 1px solid black; height: 20px; margin-right: 5px;"></div> <div style="margin-right: 5px;">→</div> 0 </div>	0	53.9
2	<div style="display: flex; align-items: center; justify-content: center;"> <div style="border-left: 1px solid black; border-right: 1px solid black; height: 20px; margin-right: 5px;"></div> <div style="border-left: 1px solid black; border-right: 1px solid black; height: 20px; margin-right: 5px;"></div> <div style="margin-right: 5px;">→</div> 0 </div>	30	57.2
3	<div style="display: flex; align-items: center; justify-content: center;"> <div style="border-left: 1px solid black; border-right: 1px solid black; height: 20px; margin-right: 5px;"></div> <div style="border-left: 1px solid black; border-right: 1px solid black; height: 20px; margin-right: 5px;"></div> <div style="margin-right: 5px;">→</div> 30 </div>	0	52.4
4	<div style="display: flex; align-items: center; justify-content: center;"> <div style="border-left: 1px solid black; border-right: 1px solid black; height: 20px; margin-right: 5px;"></div> <div style="border-left: 1px solid black; border-right: 1px solid black; height: 20px; margin-right: 5px;"></div> <div style="margin-right: 5px;">→</div> 30 </div>	30	60.2
5	<div style="display: flex; align-items: center; justify-content: center;"> <div style="border-left: 1px solid black; border-right: 1px solid black; height: 20px; margin-right: 5px;"></div> <div style="border-left: 1px solid black; border-right: 1px solid black; height: 20px; margin-right: 5px;"></div> <div style="margin-right: 5px;">→</div> 30 </div>	60	61.7
6	<div style="display: flex; align-items: center; justify-content: center;"> <div style="border-left: 1px solid black; border-right: 1px solid black; height: 20px; margin-right: 5px;"></div> <div style="border-left: 1px solid black; border-right: 1px solid black; height: 20px; margin-right: 5px;"></div> <div style="margin-right: 5px;">→</div> 60 </div>	30	58.9
7	<div style="display: flex; align-items: center; justify-content: center;"> <div style="border-left: 1px solid black; border-right: 1px solid black; height: 20px; margin-right: 5px;"></div> <div style="border-left: 1px solid black; border-right: 1px solid black; height: 20px; margin-right: 5px;"></div> <div style="margin-right: 5px;">→</div> 60 </div>	60	64.7

* Note that both Machinists must complete their work before passing it to the Assembler.

Agent Modeling using Static and Dynamic DISC Behavioral Profiles

Dynamic state can also affect productivity:

- Just what is a *dynamic state*?

Consider a High-D (Dominance) operator: an efficient, self-confident and self-motivated individual. Now imagine such a person standing at a milling machine for thirty minutes waiting for the next order...

- How does dynamic state affect productivity?

Mood can affect one's motivation, concentration, and attitude toward their work. We chose High-C (Compliance) Low-I (Influence) as an ideal operator. We claim that boredom will decrease one's *compliance*, increase one's *dominance* and erode any *steadiness* felt while testing for DISC.



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Dynamic state can also affect productivity:

If an operator's DISC test results and their circumstances are known, we can translate a static rating into a dynamic one, reflecting current mood.

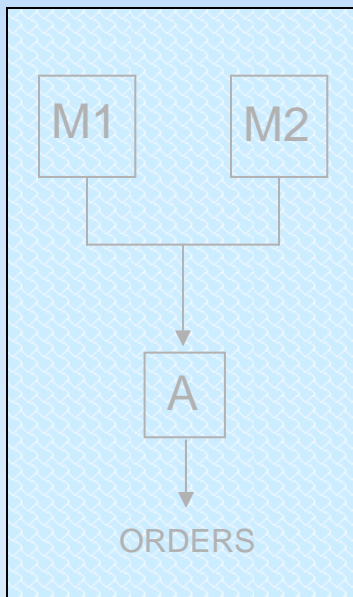
1. A High-C, Low-I (attention to detail) operator who waits over 30 minutes for incoming parts will experience a 15% degradation in performance.
2. That same operator who was recently busy for over an hour will benefit from a 10% increase in performance (on a roll).
3. Post-rest productivity is also increased by 10%, for an hour afterward.
4. Mid-afternoon doldrums can cause a 10% degradation in performance.
5. Post-meeting productivity may change anywhere from -10% to +10%.



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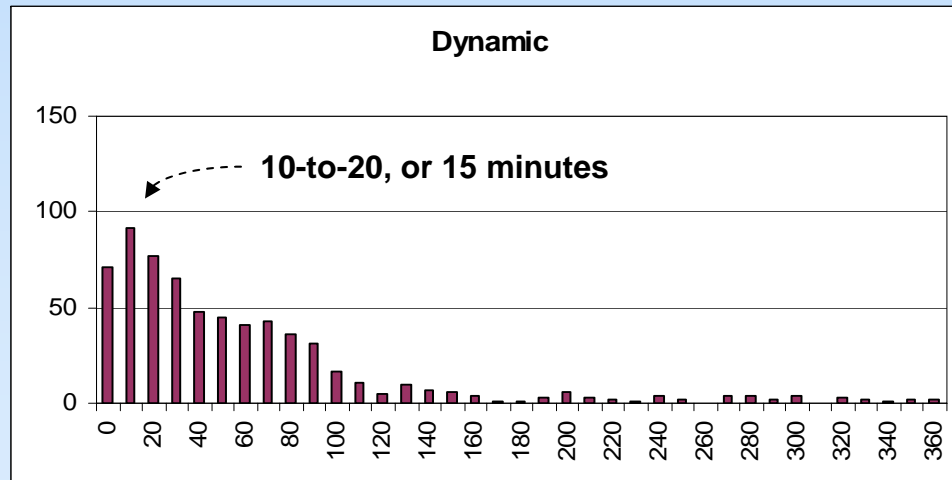
Dynamic state can also affect productivity:

- Simulation Results:



Operator utilization:
M1=47% M2=51% A=44%

Orders completed
Per shift: 6.7



Agent Modeling using Static and Dynamic DISC Behavioral Profiles

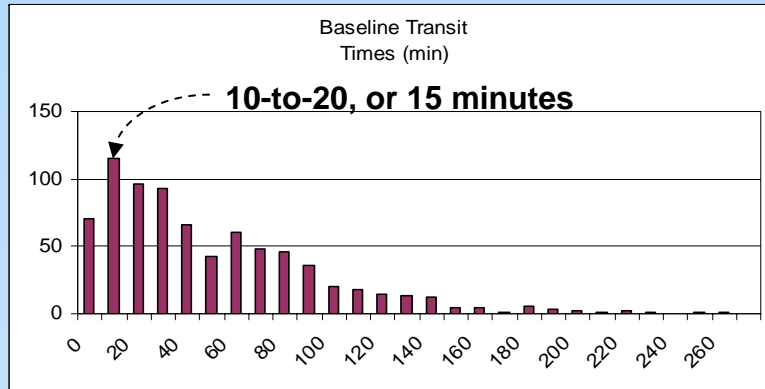
Final Comments:

1. Family problems, financial worries, and even traffic conditions can affect productivity, but were omitted for simplicity.
2. Adding a small productivity penalty to the Machinists has no effect because they are underutilized.
3. The "total mismatch requires twice the time" assumption is arbitrary.
4. All of the productivity improvements and degradations are estimates.
5. It's not clear how to answer questions concerning the validity of the static versus dynamic DISC profiles from our results.
6. We came here to find out how others approach such problems.

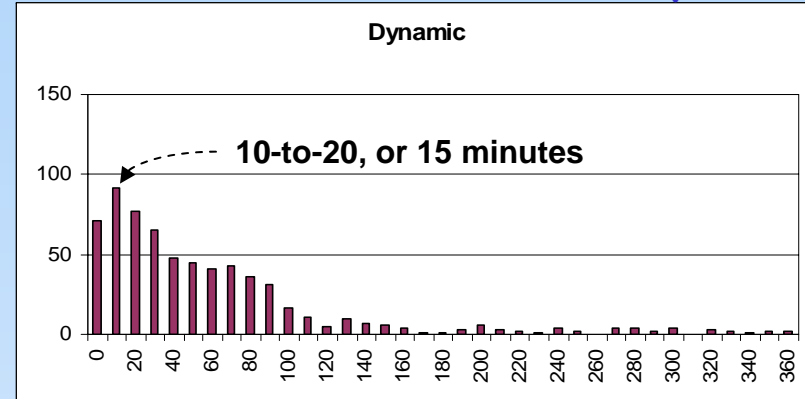


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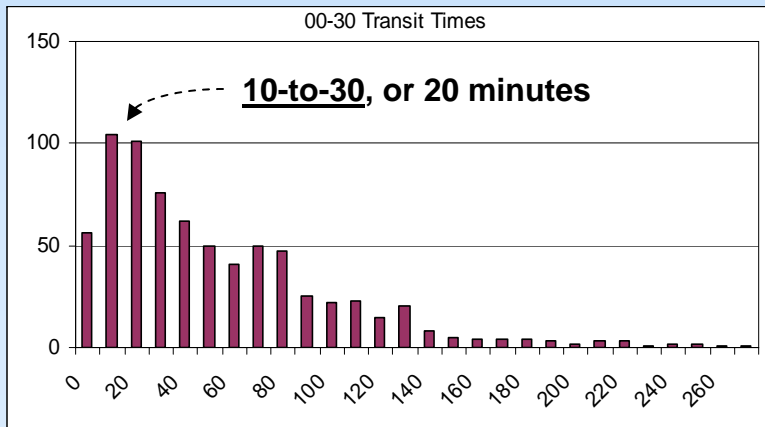
Run #1 Avg Transit = 53.9 M1=35, M2=38, A=51



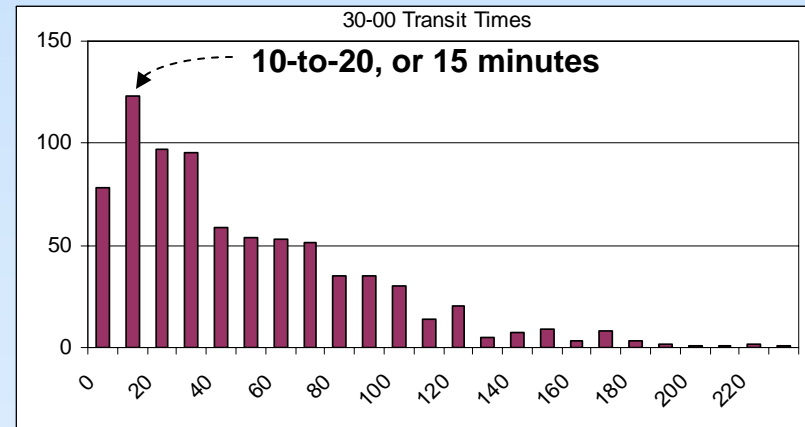
M1=47, M2=51, A=44 Avg Transit = 67.6 **Dynamic**



Run #2 Avg Transit = 57.2 M1=34, M2=37, A=57

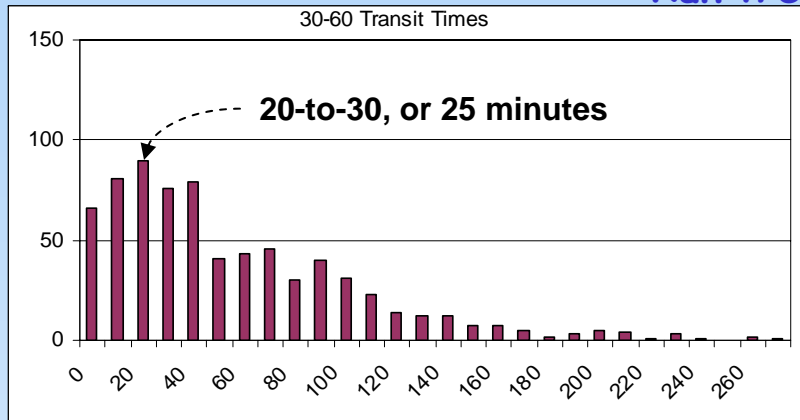
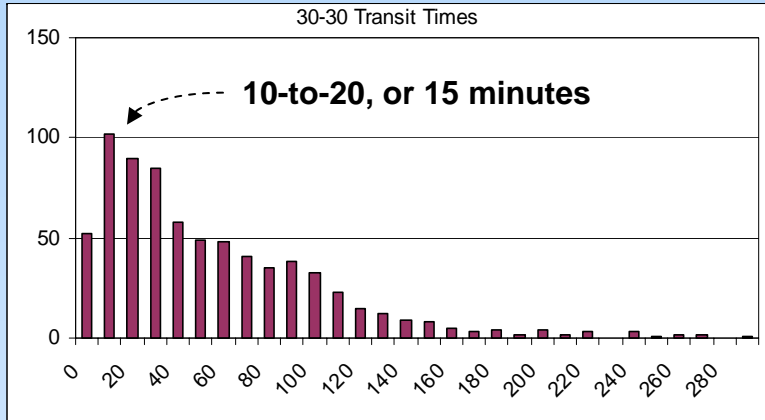


M1=36, M2=38, A=50 Avg Transit = 52.4 **Run #3**

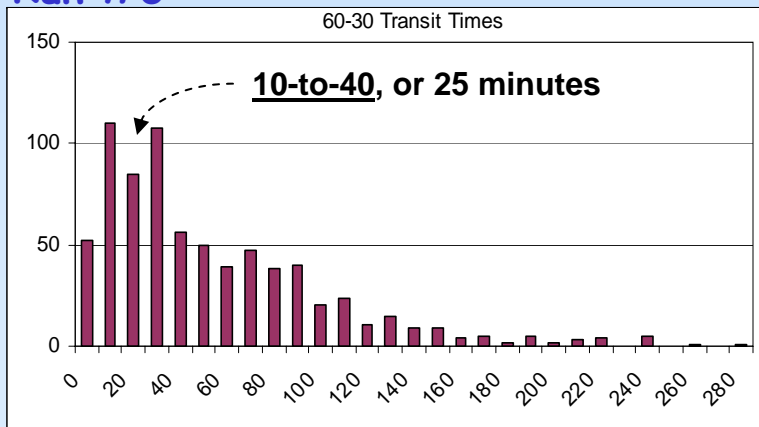


Agent Modeling using Static and Dynamic DISC Behavioral Profiles

Run #4 Avg Transit = 60.2 M1=37, M2=39, A=57 M1=32, M2=34, A=63 Avg Transit = 61.7 **Run #5**



Run #6 Avg Transit = 58.9 M1=36, M2=38, A=58



M1=33, M2=35, A=62 Avg Transit = 64.7 **Run #7**

