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# Improving Individual and Team Decisions Using Iconic Abstractions of Subjective Knowledge

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# Background:

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- Research has shown that in a group decision making environment, members usually discount any uniquely held information that gets shared with the group.\*
- This shared, uniquely held information typically does **not** significantly impact the final decision.
  - “You can lead a group to information, but you can’t make it think.”\*\*
  - **Why is this true?**

\*Stasser et al, 85, 96, 98

\*\*Dennis, 1996



# Hypothesis

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- (1) A group member already has a high cognitive burden in processing the information he has found.
- (2) Shared information from other members usually arrives in an unprocessed form:
  - “Here’s a relevant report you should read”
- (3) The new information is not integrated into the decision process because it causes too great of a cognitive burden on the recipient.



# Approach

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- Exchange processed, subjective assessment information:
  - “Read this report” vs.
  - “Read this report if you wish. I found that this report has high credibility, the information is timely, backed up by facts, is of high importance and has a strong negative effect on use of option C. ”
  - **How do we encapsulate/display these subjective assessments?**

# Information Object (IOB)

An IOB is an iconic encapsulation of the subjective assessments an individual has assigned to a particular information item.

It is automatically created from an abstraction template.

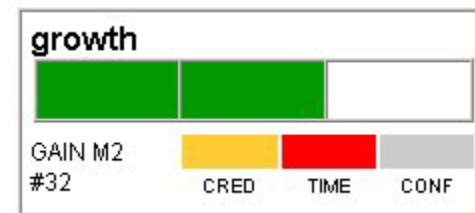
It is analogous to military tactical symbology.



Original document



IOB Representation of subjective assessments



# IOBs Convert IMPLICIT subjective estimates into EXPLICIT estimates.

**SPECIAL REPORT**  
**THE STERILE AIRPORT**

Near-total airport security is possible. Technologies are in sight to seal the leaks, spot the bad guys, find the bombs.

by Dan Tynan

1 | 2 | 3 | 4

**AIRPORT SECURITY FOR THE 9/11 AGE**

Recent dummy-weapon tests at airports show it's still possible to get guns through security, here's how a super-secure airport would work.

We asked Isotec Inc., a Denver-based security systems design firm, to help us engineer an airport that would target terrorists without gumming up passenger traffic. We also sought input from CompuDyne Corp., Vilsage Technology, General Defense Systems, and other companies that make and install security equipment. In this exercise, money was no object; safety was our only concern.

We set a target date of five years from now. But much of the technology is available, or will be very soon. The goal: Every person, every bag, and all supplies and equipment in an airport will be tagged, tracked, and instantly locatable.

**1. CHECK-IN AND SECURE ID**

Initial safeguards appear a mile outside the airport. Scanners at tollbooth-like structures along access roads aim their laser scanners at

Illustration by Jameson Simpson

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Credibility?



Effect/Impact?



Importance?



Timeliness?

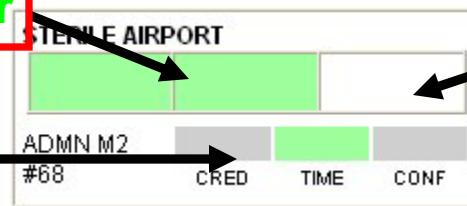


**Encapsulate the scores into an IOB that displays information quality, impact and importance**

**Effect/Impact: Color**

**Quality of information**

**Information Importance: Size of color bar (1, 2 or 3 sections filled)**



**IOB**

# IOB creation process



Step 1: Select document for retention

Title:

Criterion:  HIST  ADMN  GAIN  PROB

V.Low/Poor Avg. V.High/Good

Credibility:      ?  ?

Step 2: Activate Abstraction Template

Title:

Criterion:  HIST  ADMN  GAIN  PROB

V.Low/Poor Avg. V.High/Good

Credibility:      ?  ?

Timeliness:      ?  ?

Confidence:      ?  ?

V.Neg. Neutral V.Pos.

Effect:      ?  ?

Importance:     ?  ?

Discard (1)Avg. (2)High (3)V.High

[Close](#)

Step 3: Complete Assessment

Software creates and stores an **Information Object (IOB)** in designated database

growth

GAIN M2 #32

CRED TIME CONF









# Research Question:

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- IOBs may be a convenient way of exchanging subjective assessments about an information item, but.....

Does the use of IOBs improve decision making performance?



# PG School Experiment 18 Officers



- Display: Text vs. IOBs
- Decision: Positive\* vs. Negative\*

		Display		
		Text Only	IOBs	
Decision	Positive	N=5	N=5	N=10
	Negative	N=4	N=4	N=8
		N=9	N=9	N (tot)=18

\*Positive = Yes, use Islandia      Negative = No, don't use Islandia



# Task:

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- Volcanic disaster in the Pacific
- Should we recommend Islandia as the refugee site?
  - Sees 30 information items (randomized)
    - 5 decision criteria
      - 6 items per criteria



# The Five Decision Criteria

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[ **COM**munications - **TSP**ortation - **LAB**or - **ADM**inistration - **SAN**itation ]

- **Communications Facilities (COM):** Assess the communication facilities that are available in Islandia, including land telephone systems, radio, TV, cellular phone availability and coverage, etc.
- **Transportation Facilities (TSP):** Assess the transportation facilities that are available in Islandia, including roads, docks, airports, etc.
- **Labor Pool (LAB):** Assess the labor pool that would be available to staff the camp in Islandia, including size of the pool, quality of workers, work ethic/tradition, etc.
- **Administrative Requirements (ADM):** Assess the administrative requirements needed to set up the camp in Islandia, including, permits, fees, environmental considerations, bureaucratic red tape, graft, bribes, etc.
- **Sanitation/Health/Medical conditions (SAN):** Assess the sanitation, health and medical conditions expected in Islandia, including drinking water, sewerage disposal, medical facilities, infectious diseases, etc.



# Decision Tasks:



	Very Neg.				Very Pos.
COM:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
TSP:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LAB:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ADM:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
SAN:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overall Recommendation:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="button" value="Submit"/>	<input type="button" value="Reset"/>			

**5 Criteria Decisions,**

**1 Overall Decision**

# Text Condition (9 subjects)

1/30

...A cultural tradition in Islandia is that each worker is given a single two month vacation each year, which he can take any time during the year. All the employee has to do is give the employer a one week notice before going on vacation. This has caused unexpected and disrupted work shortages when several employees elect to take the vacation at the same time...

Criterion:

COM <input type="radio"/>	TSP <input type="radio"/>	LAB <input type="radio"/>	ADM <input type="radio"/>	SAN <input type="radio"/>
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Submit >

[ **COM**munications - **TSP**ortation - **LAB**or - **ADM**istration - **SAN**itation ]

- **Communications Facilities (COM):** Assess the communication facilities that are available in Islandia, including land telephone systems, radio, TV, cellular phone availability and coverage, etc.
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Read this, then assign it to one of the five criteria

(do 30 of these)

# IOB Condition (9 subjects)

1/30

The environmental protection effort in Islandia is poorly organized and has had little effect. Environmental impact is not a consideration in any awarding of construction permits.

Title:

Criterion:  COM  TSP  LAB  ADM  SAN

Effect:  Very Neg.  Neg.  Pos.  Very Pos.

[COMmunications - TSPortation - LABor - ADMistration - SANitation]

- **Communications Facilities (COM):** Assess the communication facilities that are available in Islandia, including land telephone systems, radio, TV, cellular phone availability and coverage, etc.
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Read this, then:

Assign a keyword

Assign it to a criterion

Evaluate its effect on the criterion

(This experiment uses only the subjective assessment of EFFECT, does not tap Importance, Credibility, etc.)



# IOBs Explained

## INSTRUCTIONS

You have now evaluated all 30 items. Your last task is to assign rating scores to each criterion, as well as one final overall rating. Your previous scoring of the items has been used to create an "Information Object" (IOB) for each information item.

This IOB includes the information you previously assigned, i.e. the key words, the criterion and the rating. The key words are hyperlinked to the original text item so that you can call it up for review by simply clicking on the key words. When you do this, the text will appear in a window to the right of the display. The effect you selected for each item is represented by the color bar in the IOB. A sample IOB is presented below:



Your Keyword

Your criterion Assignment

Your assessment of the Effect on selecting Islandia

The IOB items are available to you for review using a drop-down sorting menu that can present all the IOBs associated with all the criterion or you can elect to see only the IOBs associated with one individual criterion.



How to sort your data

# Decision Display: IOB

View:

### Communications

104: <a href="#">77</a> COM	109: <a href="#">99</a> COM	95: <a href="#">666</a> COM
114: <a href="#">567</a> COM	121: <a href="#">rttt</a> COM	99: <a href="#">11</a> COM
120: <a href="#">ertt</a> COM		

### Transportation

100: <a href="#">22</a> TSP	105: <a href="#">775</a> TSP	96: <a href="#">777</a> TSP
94: <a href="#">ports</a> TSP	93: <a href="#">666</a> TSP	92: <a href="#">66</a> TSP
112: <a href="#">777</a> TSP	118: <a href="#">dfgg</a> TSP	

Very Neg. Very Pos.

COM:					
TSP:					
LAB:					
ADM:					
SAN:					
Overall Recommendation:					
	<input type="button" value="Submit"/>	<input type="button" value="Reset"/>			

Click on the hyperlinked titles in the IOB to display the original text here.

**Hyperlinked**

# Decision Display: Text

View: All [Go]

## Communications

The environmental protection effort in Islandia is poorly organized has has little effect. Environmental impact is not a consideration is any awarding of construction permits.

A recent disaster simulation exercise in Islandia showed that the Emergency Medical were very inadequate in terms of handling anything other than the smallest disaster situation.

\* ... The major ports of Islandia are less than three days sailing from the primary disaster recovery supply center at Naha. Naha also has three supply ships that are permanently loaded to be used in quick response assistance...\*

Every small town in Islandia has at least one phone

\* ...The major air route to Islandia is from Chenche. That route, however, requires that we fly over the nation of Gambist, and Gambist has denied permission to fly over their airspace. The two options are to modify the flight plan or to use another departure airport. Both of these options results in excessively long flights, limits cargo capacity, and reduces the daily amount of supplies that can be transported to Islandia...\*

Very Neg. Very Pos.

COM:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
TSP:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LAB:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ADM:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
SAN:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overall Recommendation:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Submit Reset

**The items the subject assigned to the Communications criterion**



# IOB Subjective Assessment

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One Last Request: Please select one of the options below in terms of how useful the IOBs were in making your scoring decision (this would be as versus just seeing the text listing of the items you assigned to each criterion)

Somewhat distracting	No Effect	Helped Somewhat	Helped a lot
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
			<input type="submit" value="Submit"/>



# Positive vs Negative

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**1/2 of Subjects should make a decision that is **Positive**:**

**3 of 5 criteria are Positive**

**1/2 of Subjects should make a decision that is **Negative**:**

**3 of 5 criteria are Negative**

**Positive Criterion: 4 of the 6 statements are positive**

**Negative Criterion: 4 of the 6 statements are negative**

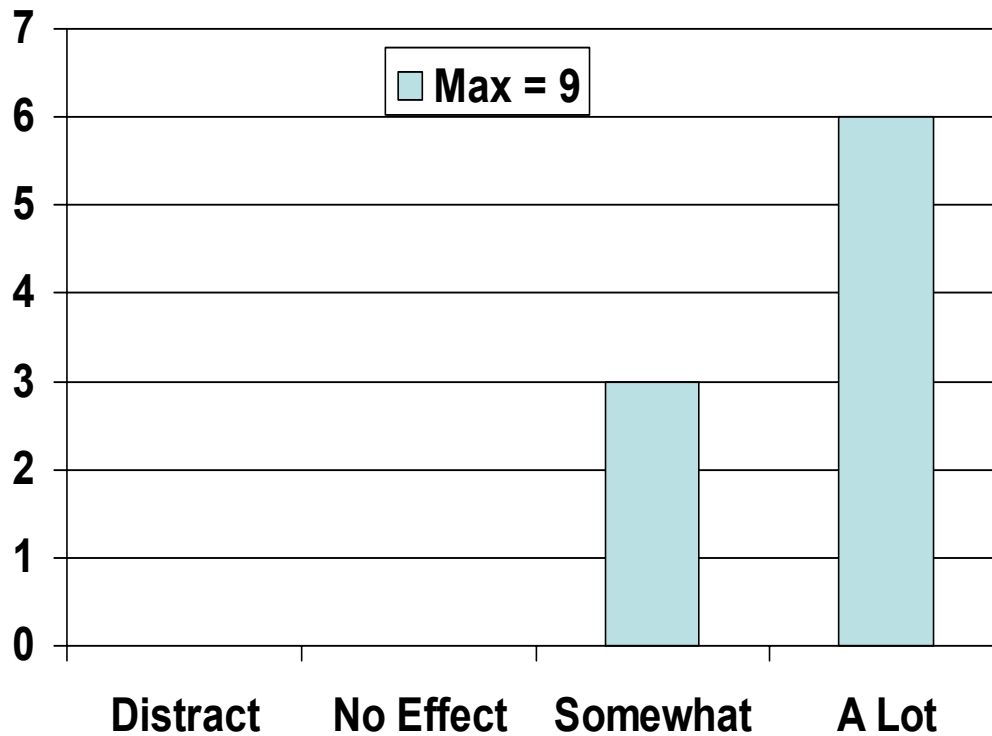


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# RESULTS

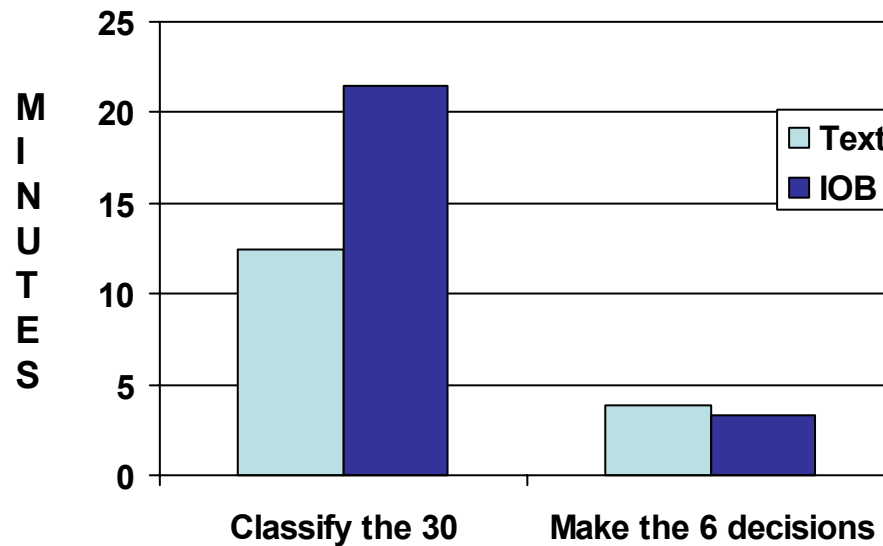


# Subjective Assessment



**IOBs HELP?**

# Time Factor

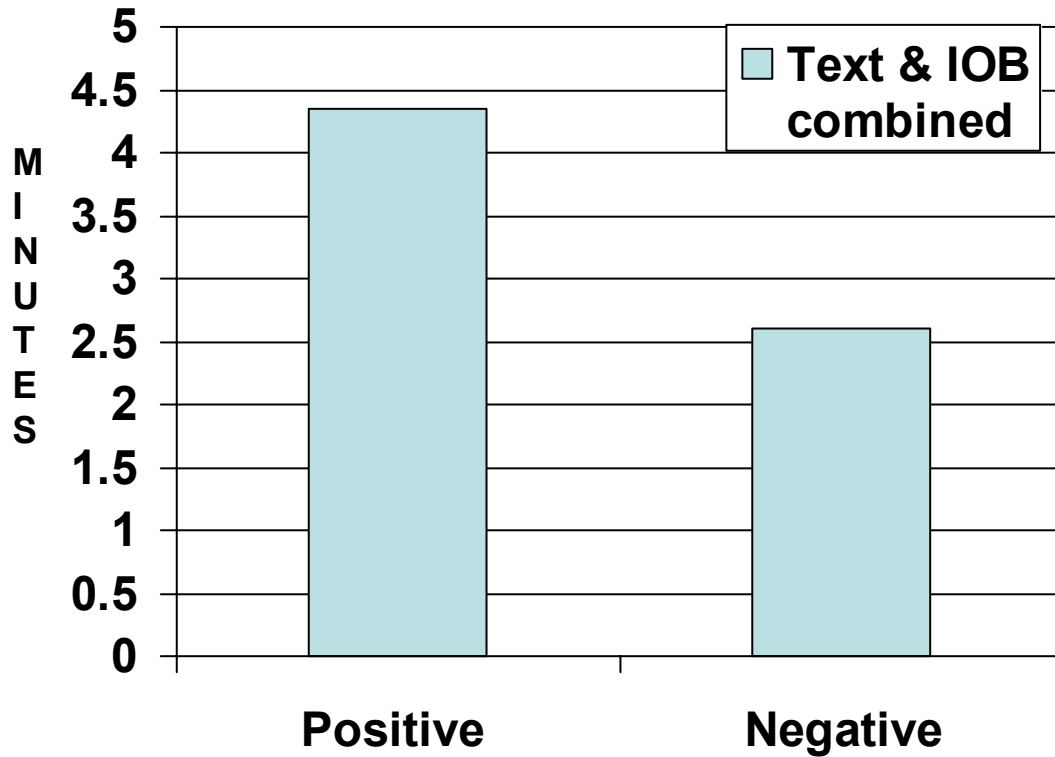


**IOB subjects took an average 18 seconds longer per item to enter keyword and make evaluation**





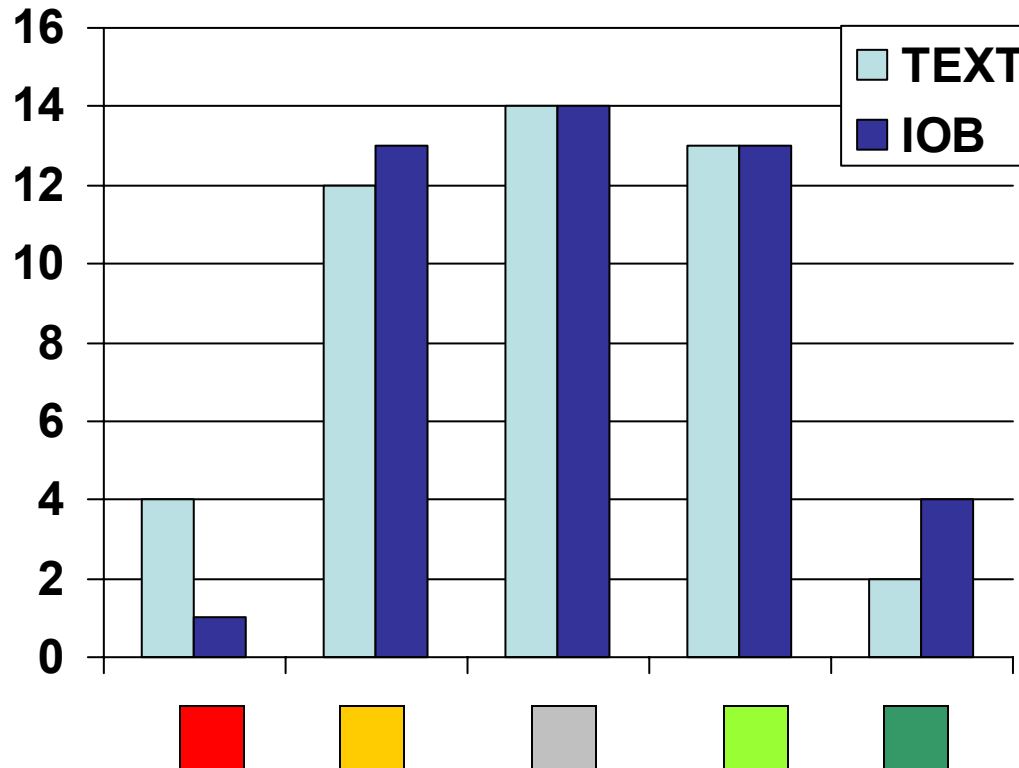
# TIME TO MAKE DECISIONS



**Significant Difference**



# Score Assignment to Criteria





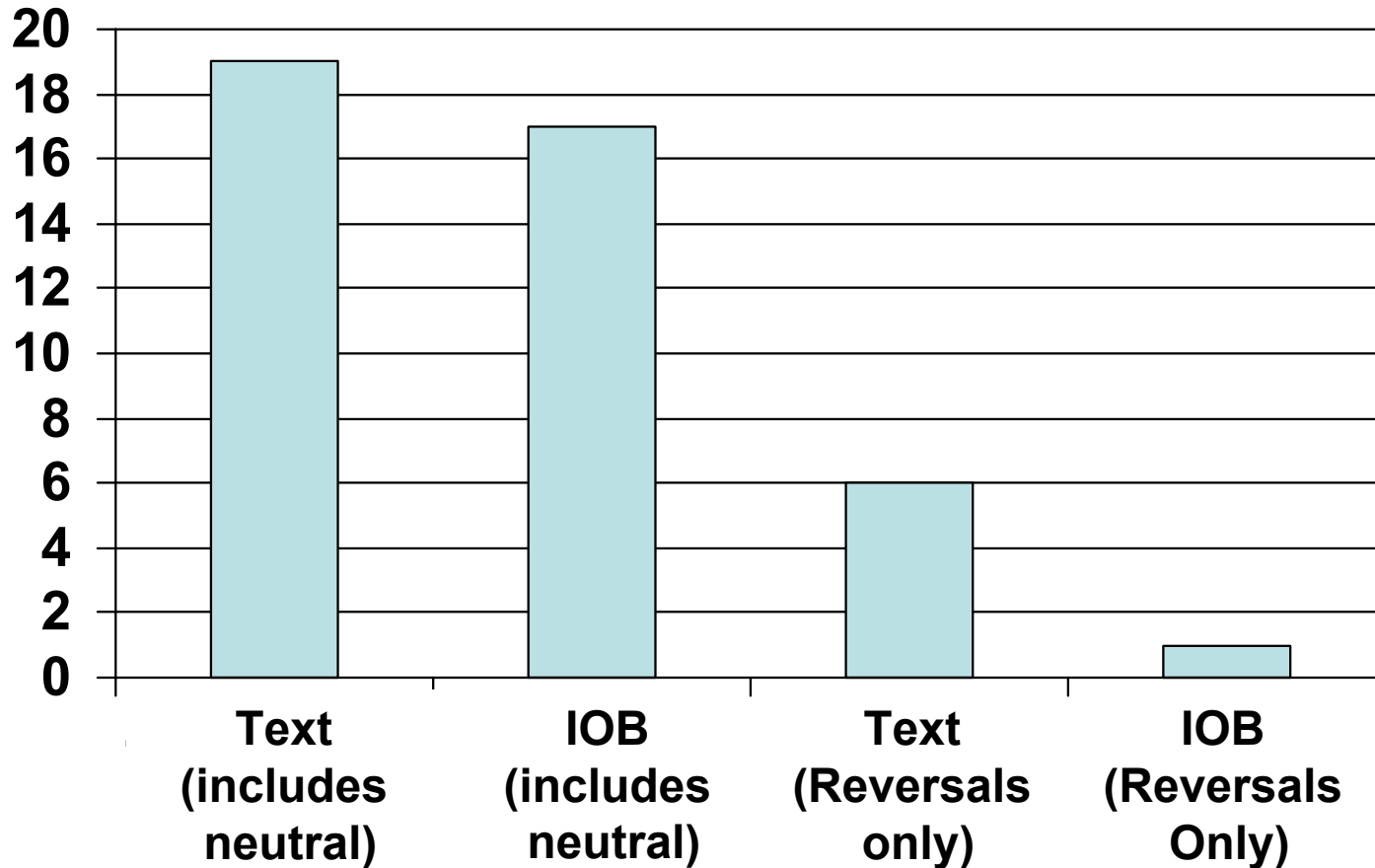
# Errors:

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- All criteria should have been scored as either positive or negative
  - Assignment of a neutral rating is scored as an error
  - For the IOB subjects, whether the correct decision was Positive or Negative was based on the subject's ratings
  - For the Text subjects, correct decision was based on experimenter's classification
  - Reversal Error (most serious): Positive group of information given a Negative rank (or vice versa)

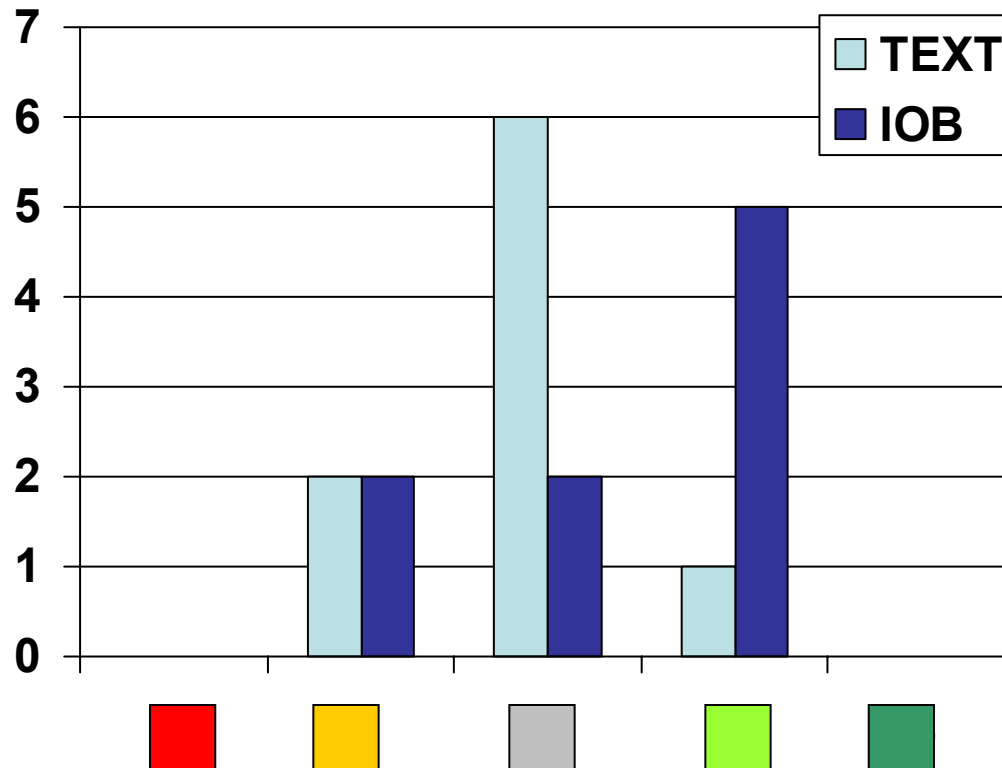


# Errors in Criterion Scoring



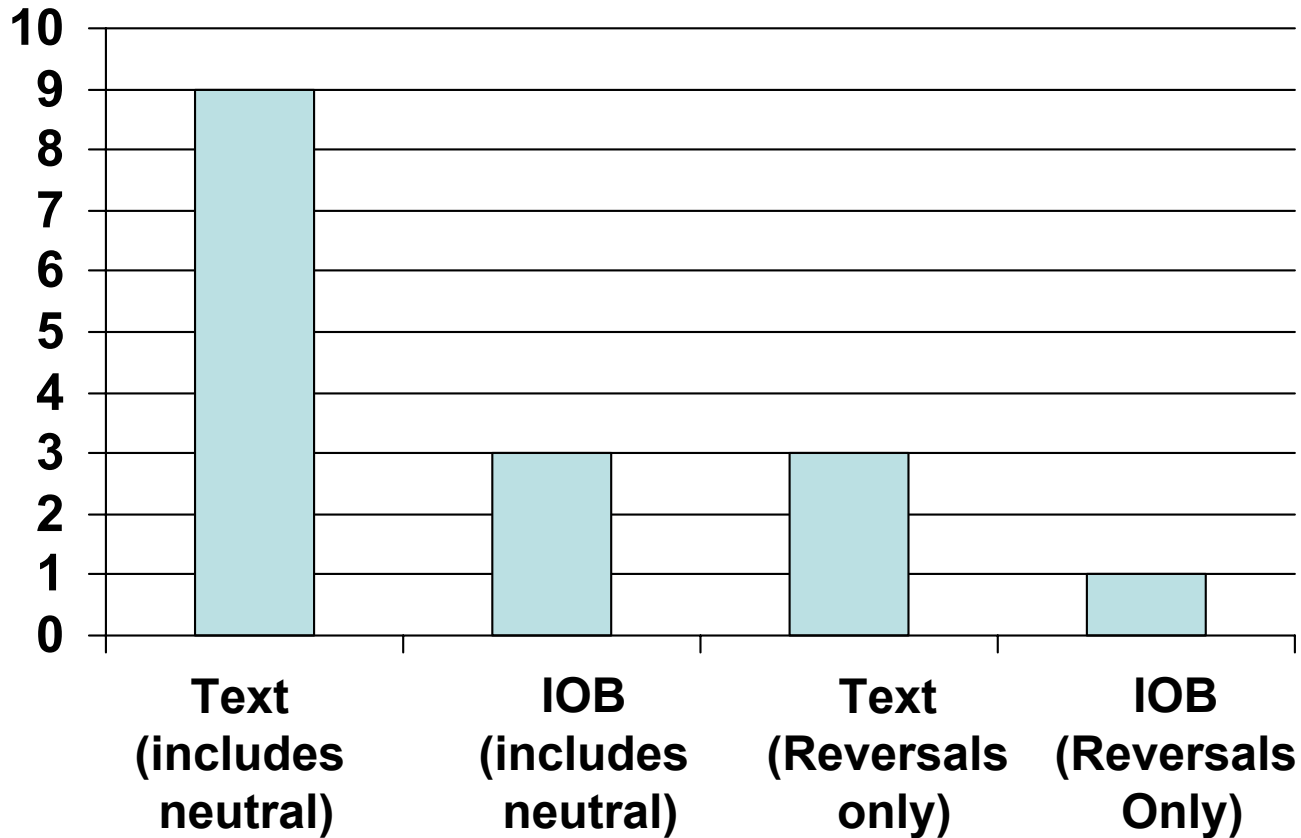


# Score Assignment to Overall

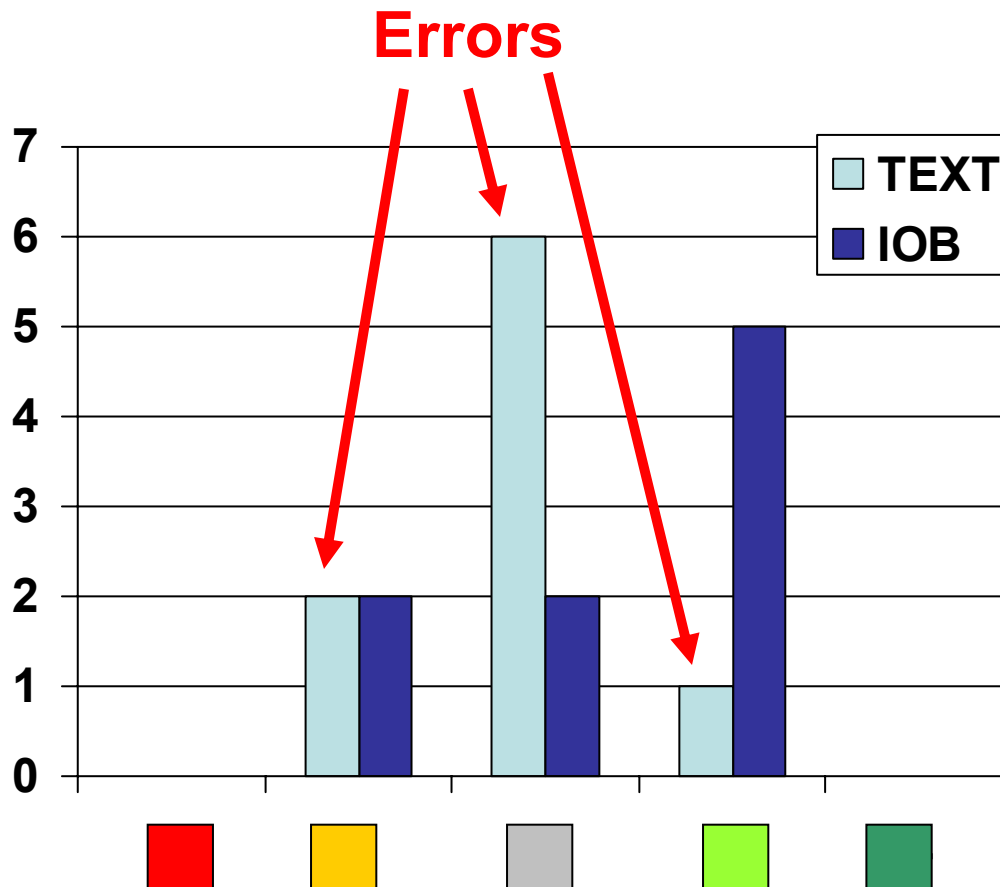




# ERRORS OVERALL

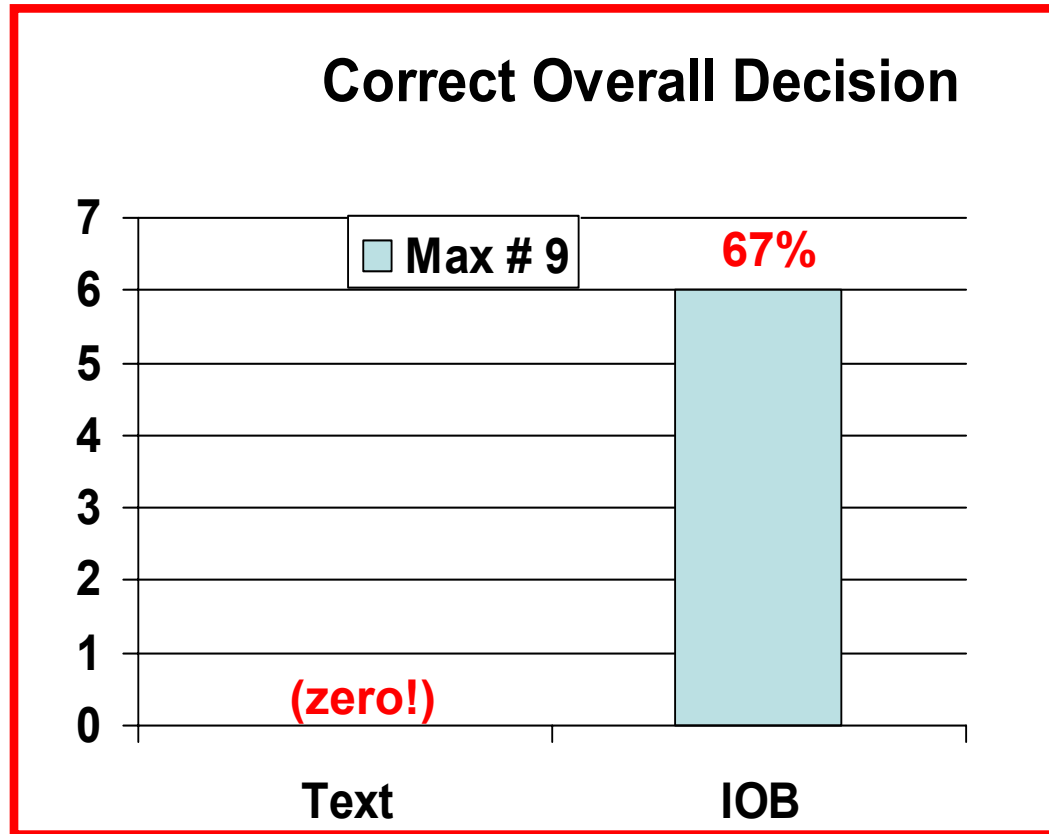


# Score Assignment to Overall





# Bottom Line:







# Summary

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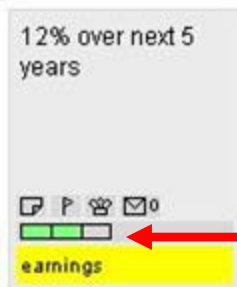


- No members of the Text group made a correct Overall decision:
  - Preferred the neutral rating
- Six of the nine IOB group made a correct Overall decision
- Subjects took longer to make a decision when preponderance of data was Positive
- IOB subjects gave favorable ratings to use of IOBs in decision making



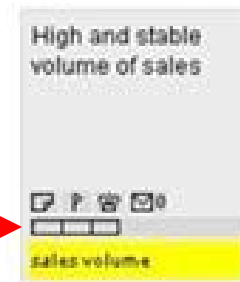
# Preliminary Follow-up Data

- 36 Subjects at Colorado State
- Rank Order 3 companies in terms of a good stock investment
  - Standardized test used in other studies
- Compare decision performance of subjects who used IOB subjective assessment color bar (Effect and Importance) vs. those that did not.



Used Subjective assessment

Did not use Subjective assessment



# Use of Subjective Assessments

