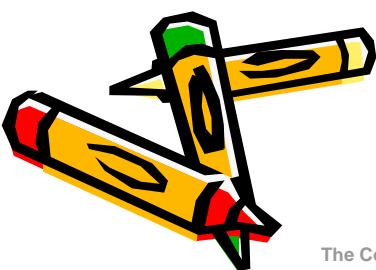


Quantitative Analysis

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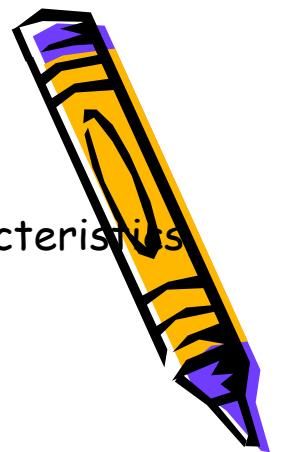
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- Quantitative Research refers to counts and measures of things
- Qualitative Research refers to the meanings, concepts, definitions, characteristics, metaphors, symbols, and description of things
- In quantitative research, you generally end up with data reduced to numbers, which are analyzed using statistics
- In qualitative research, you will describe and analyze a phenomenon using words.
- Qualitative research generates rich, detailed and valid (process) data that contributes to in-depth understanding of context
- Quantitative research generates reliable population based and generalizable data and is well suited to establishing cause-and-effect relationships.



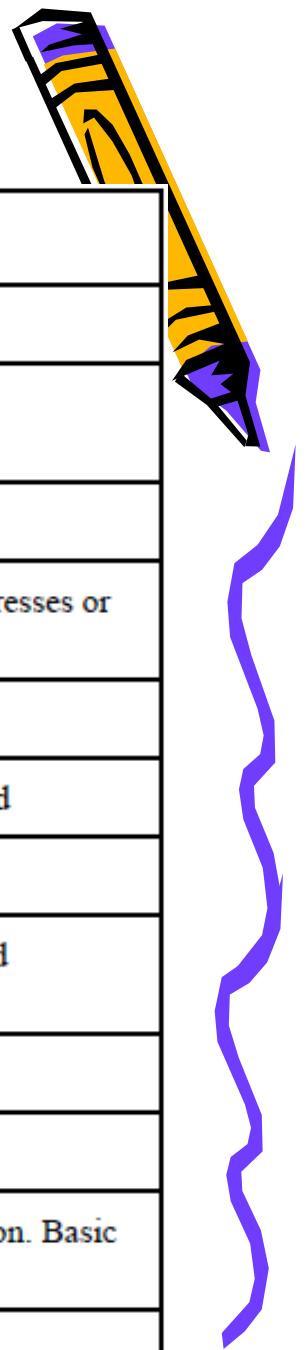
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Characteristics of quantitative and qualitative research

Quantitative	Qualitative
Objective	Subjective
Research questions: How many? Strength of association?	Research questions: What? Why?
"Hard" science	"Soft" science
Literature review must be done early in study	Literature review may be done as study progresses or afterwards
Tests theory	Develops theory
One reality: focus is concise and narrow	Multiple realities: focus is complex and broad
Facts are value-free and unbiased	Facts are value-laden and biased
Reduction, control, precision	Discovery, description, understanding, shared interpretation
Measurable	Interpretive
Mechanistic: parts equal the whole	Organismic: whole is greater than the parts
Report statistical analysis. Basic element of analysis is numbers	Report rich narrative, individual; interpretation. Basic element of analysis is words/ideas.
Researcher is separate	Researcher is part of process



Characteristics of quantitative and qualitative research

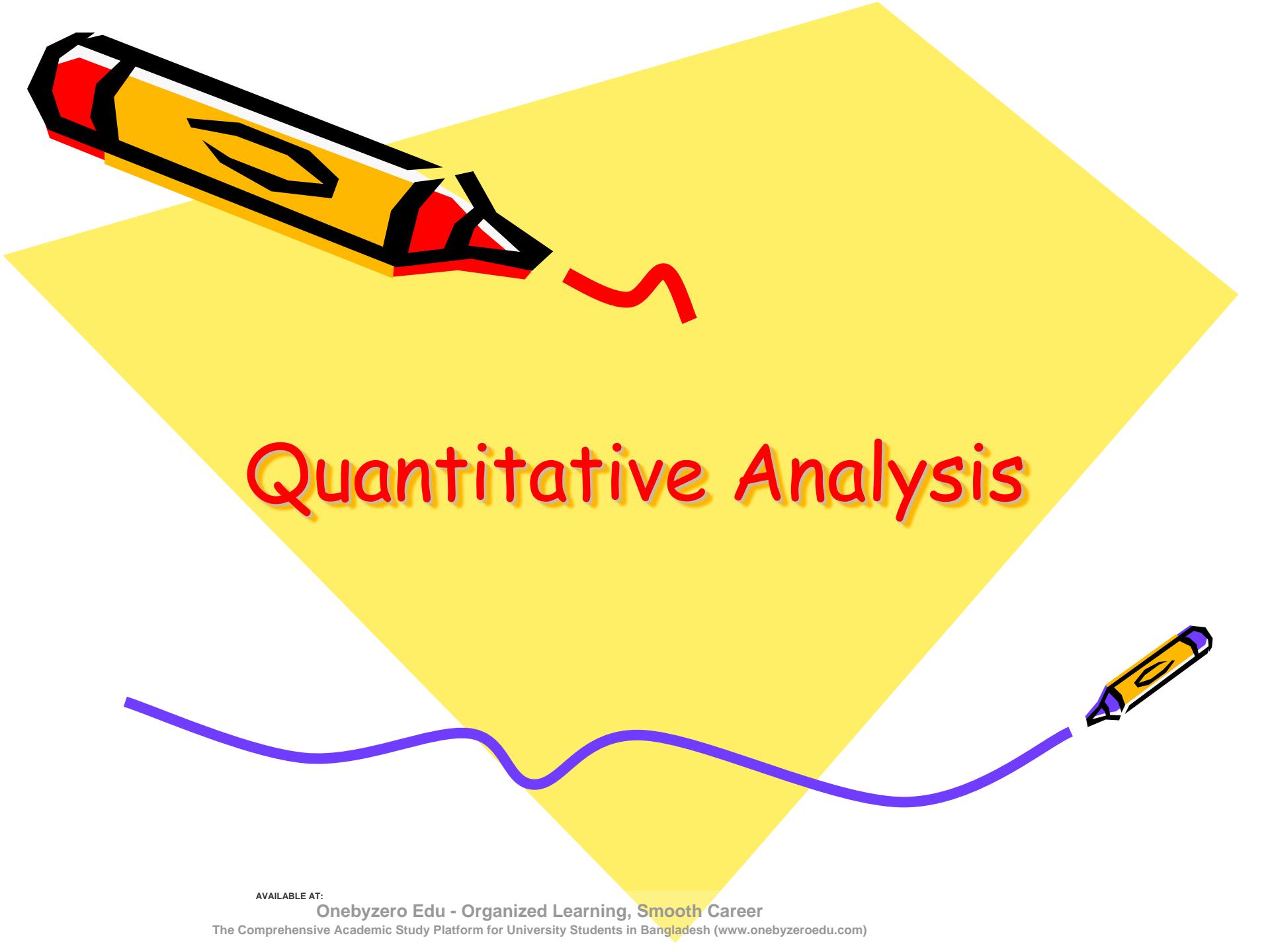
Quantitative	Qualitative
Subjects	Participants
Context free	Context dependent
Hypothesis	Research questions
Reasoning is logistic and deductive	Reasoning is dialectic and inductive
Establishes relationships, causation	Describes meaning, discovery
Uses instruments	Uses communications and observation
Strives for generalization Generalizations leading to prediction, explanation, and understanding	Strives for uniqueness Patterns and theories developed for understanding
Highly controlled setting: experimental setting (outcome oriented)	Flexible approach: natural setting (process oriented)
Sample size: n	Sample size is not a concern; seeks "informal rich" sample
"Counts the beans"	Provides information as to "which beans are worth counting"

	Quantitative Research	Mixed Research	Qualitative Research
Scientific method	Deductive or “top-down” The researcher tests hypotheses and theory with data	Deductive and inductive	Inductive or “bottom-up” The researcher generates new hypotheses and grounded theory from data collected during fieldwork
Nature of observation	Attempt to study behavior under controlled conditions	Study behavior in more than one context or condition	Study behavior in natural environments Study the context in which behavior occurs
Nature of reality	Objective (different observers agree on what is observed)	Commonsense realism and pragmatic view of world (i.e., what works is what is “real” or true)	Subjective, personal, and socially constructed
Form of data collected	Collect quantitative data based on precise measurement using structured and validated data collection instruments (e.g., closed-ended items, rating scales, behavioral responses)	Multiple forms	Collect qualitative data (e.g., in-depth interviews, participant observation, field notes, and open-ended questions) The researcher is the primary data collection instrument
Nature of data	Variables	Mixture of variables, words, and images	Words, images, categories
Data analysis	Identify statistical relationships	Quantitative and qualitative	Search for patterns, themes, and holistic features
Results	Generalizable findings	Corroborated findings may generalize	Particularistic findings Representation of insider (i.e., “emic”) viewpoint Present multiple perspectives
Form of final report	Statistical report (e.g., with correlations, comparisons of means, and reporting of statistical significance of findings)	Eclectic and pragmatic	Narrative report with contextual description and direct quotations from research participants

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Significance of findings)

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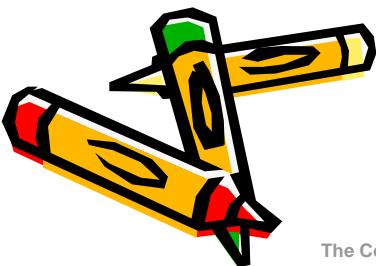
Quantitative Analysis

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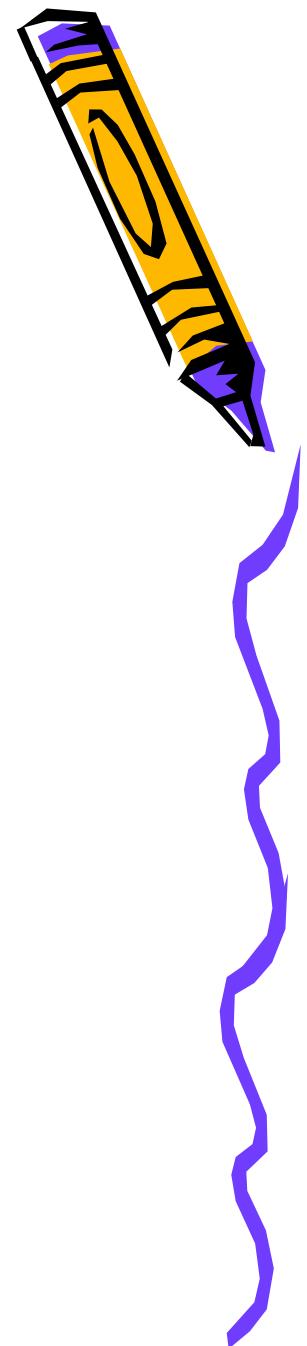
Quantitative Analysis

Comparison of CEC 2005 papers
(See File 1 and File 2)



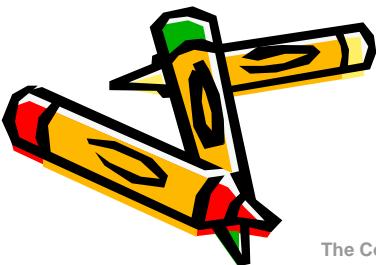
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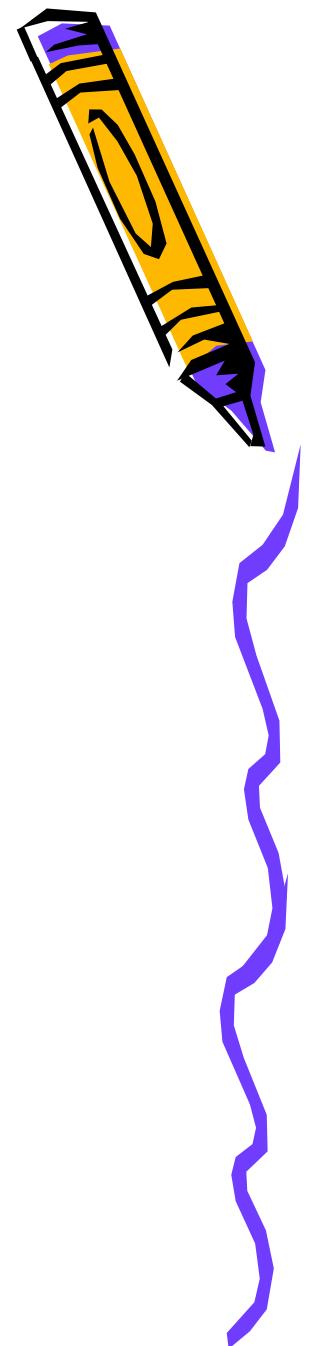
Quantitative Analysis

ECHT and EPSDE papers



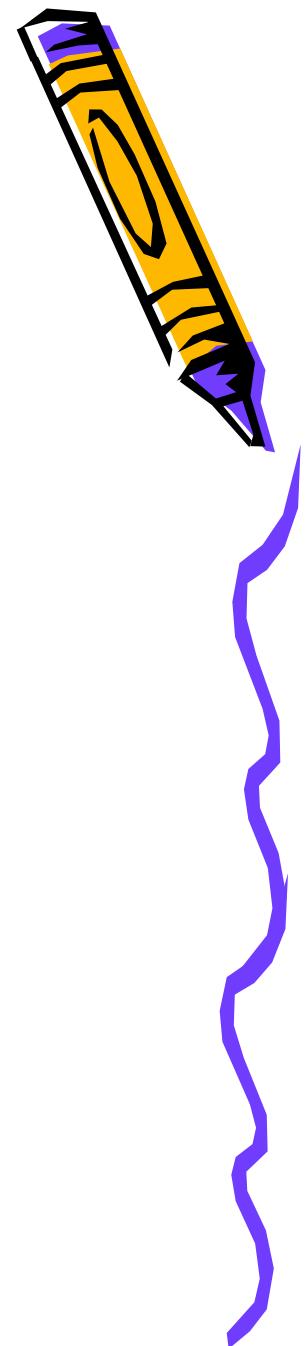
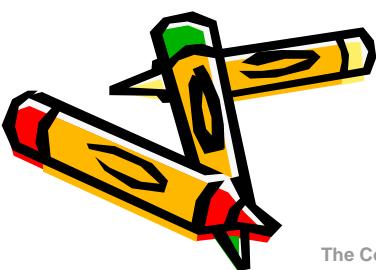
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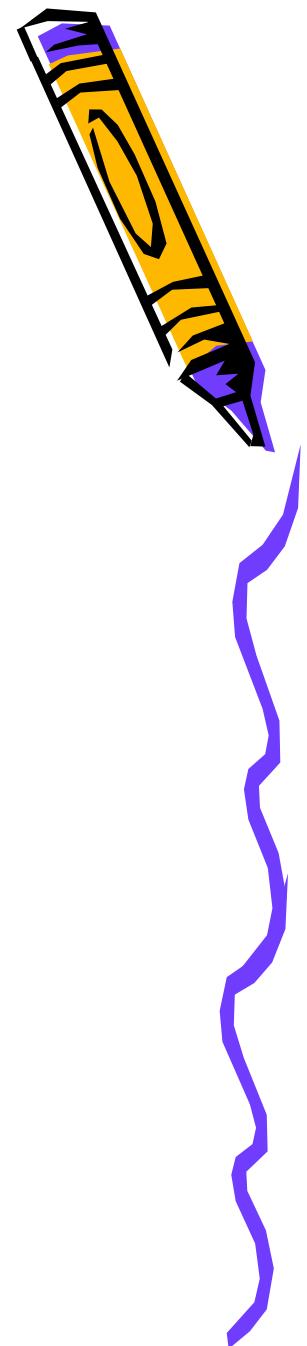
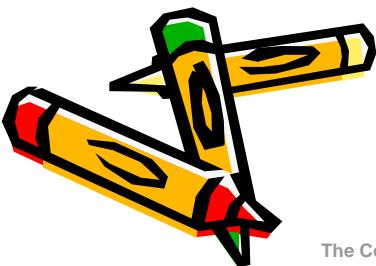
Quantitative Analysis

Neurocomputing Journal Paper



Methods

- Chi-square
- t-tests
- Analysis of Variance (ANOVA)
 - One way ANOVA
 - Two way ANOVA
- Analysis of Covariance (ANCOVA)
- Multivariate Analysis of Variance (MANOVA)

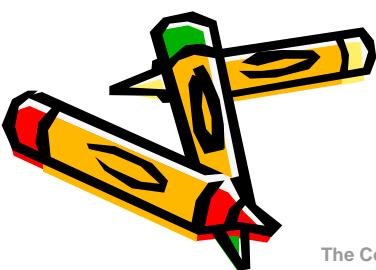


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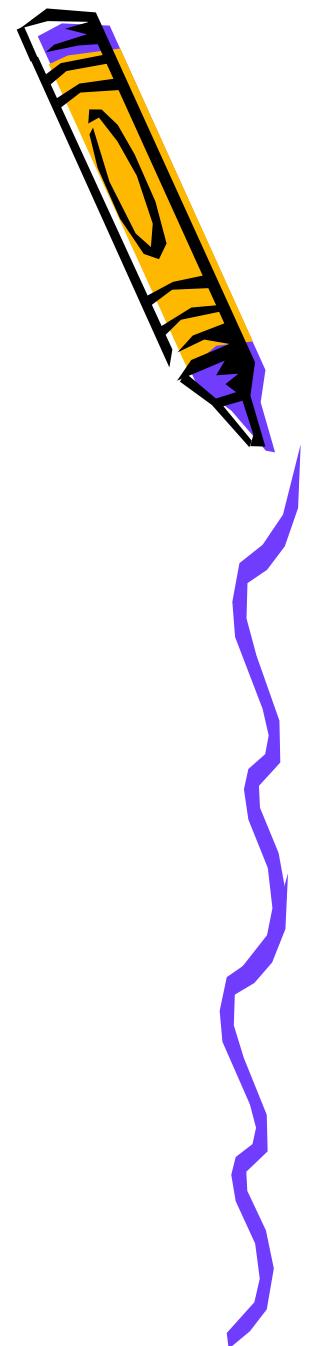
Methods

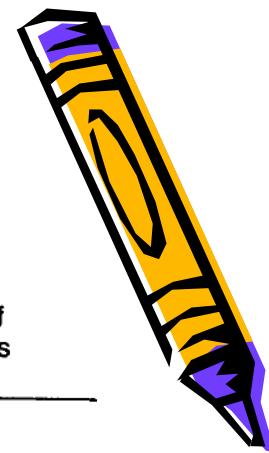
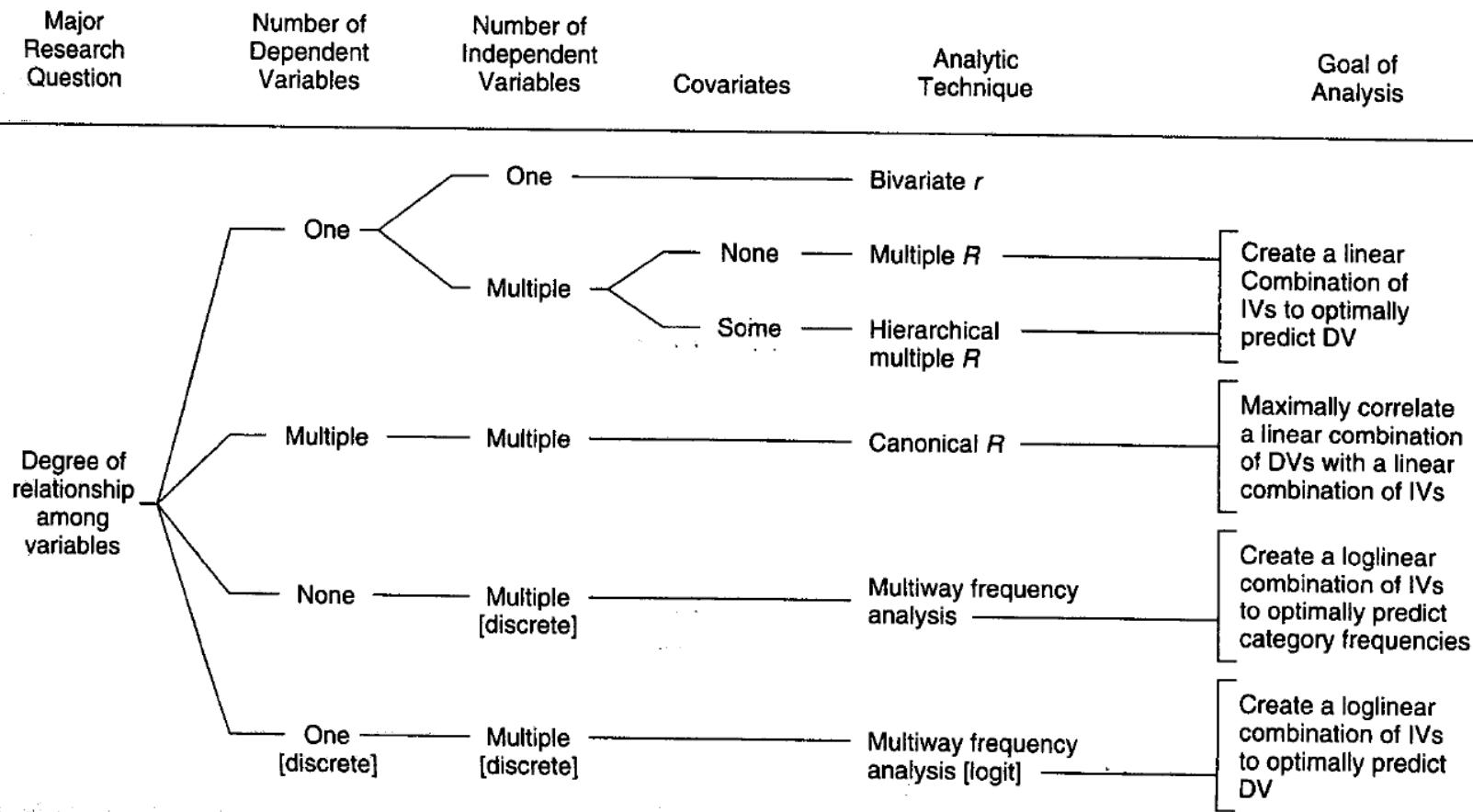
- Factor Analysis
 - Exploratory Factor Analysis
 - Confirmatory Factor Analysis



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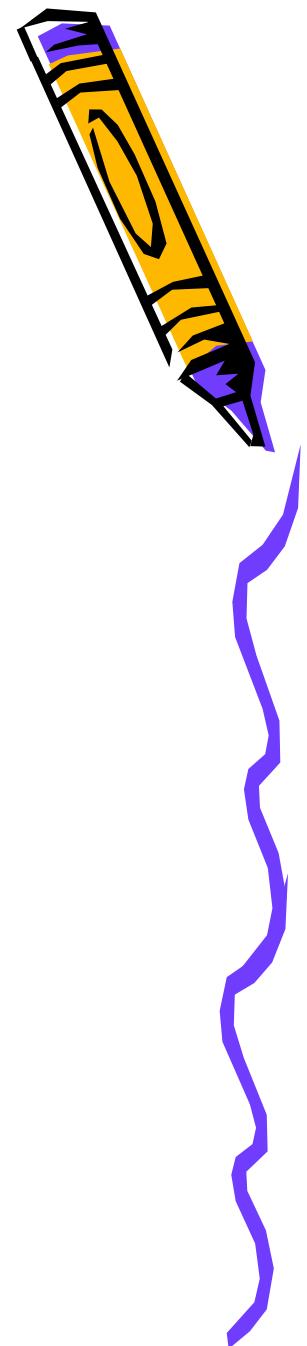
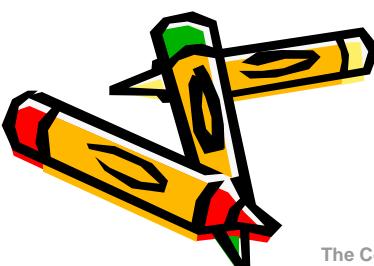


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Major Research Question	Number of Dependent Variables	Number of Independent Variables	Covariates	Analytic Technique	Goal of Analysis	
Significance of group differences	One	One	None	One-way ANOVA or <i>t</i> test	Create a linear combination of DVs to maximize group differences	
			Some	One-way ANOVA		
	Multiple	None	Factorial ANOVA			
		Some	Factorial ANCOVA			
	Multiple	One	None	One-way MANOVA or Hotelling's <i>T</i> square		
			Some	One-way MANCOVA		
	Multiple	Multiple	None	Factorial MANOVA		
			Some	Factorial MANCOVA		
	One	Multiple [one within-S]				Profile analysis of repeated measures
		Multiple [commensurate]	One			Profile analysis
Multiple	Multiple [one within-S]			Doubly multivariate profile analysis		

Prediction of group membership	One [multiple differ on one attribute]	Multiple	None	One-way discriminant	Create a linear combination of IVs to maximize group differences [DVs]
			Some	Hierarchical one-way discriminant function	
	Multiple [groups differ on several attributes]	Multiple	None	Factorial discriminant function	
			Some	Hierarchical factorial discriminant function	
Structure	Multiple [observed]	Multiple [latent]		Principal components [empirical]	Create linear combinations of observed variables to represent latent variables
				Factor analysis [theoretical]	



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