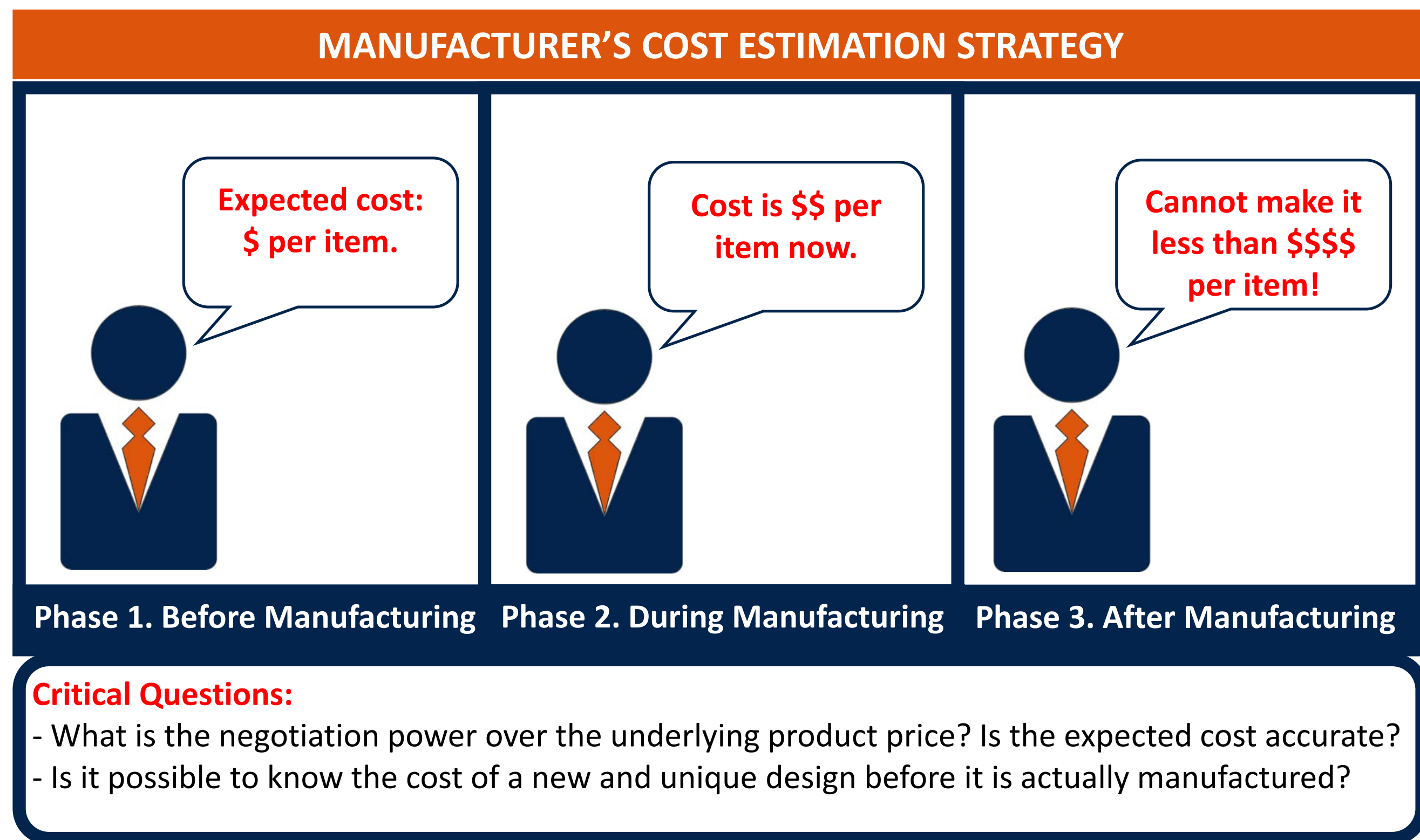


INTRODUCTION

1

When manufacturing a new unique design, the focal point is to establish a price which maximizes customer value while being profitable.



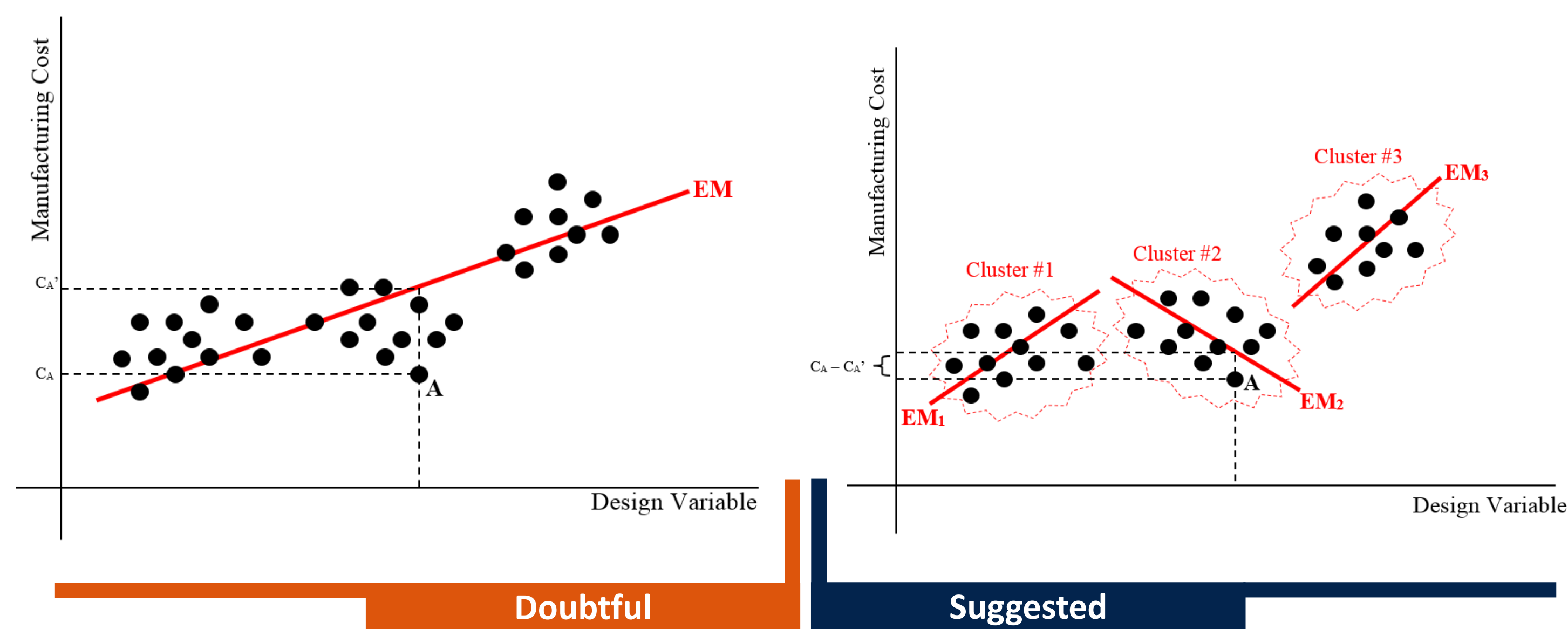
Two unfavorable consequences due to poorly established cost:

- (1) A monetary loss: the gap between the actual and the estimated cost
- (2) A loss of goodwill: higher quoted prices compared to competitors

MOTIVATION

2

- (1) Making parametrical distribution assumptions for design attributes can be arbitrary.
- (2) Many cases, costs are estimated based on primitive heuristic approaches that are far from reality and accuracy.
- (3) Over a diverse product family, establishing only a single accurate estimation model is challenging and doubtful.



OBJECTIVES

3

- (1) To accurately and quickly estimate the cost of a particular design before it is manufactured
- (2) To deploy clustering techniques to achieve improved accuracy in the estimation
- (3) To find appropriate number of clusters for a given case and series of products

CONTRIBUTIONS

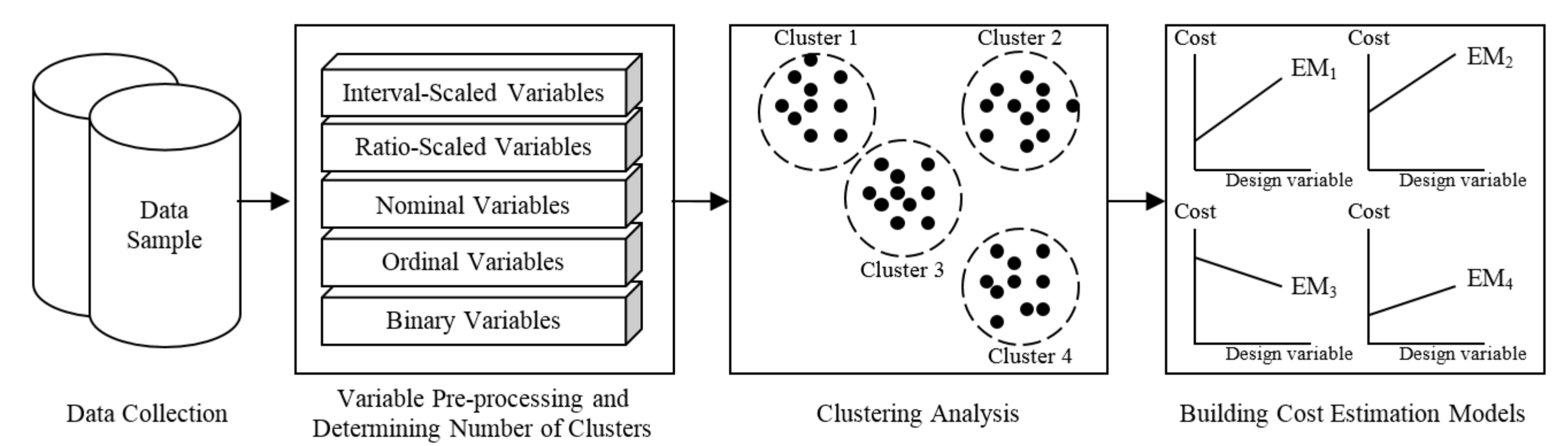
4

- (1) First to introduce a manufacturing cost estimation approach for mixed categorical and numeric cost drivers using clustering methods.
- (2) Implemented a simple heuristic to determine the appropriate number of clusters when there is no prior knowledge about the number of product groups.

METHODOLOGY

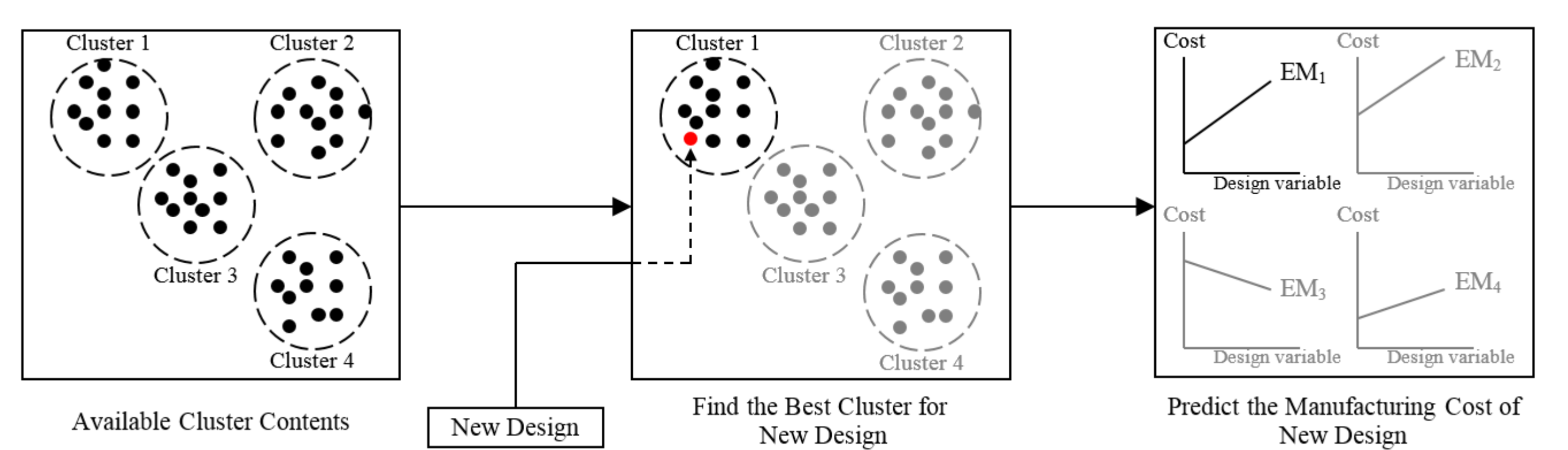
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Phase 1 – Model Building



The first stage of the methodology: cluster analysis (*k*-medoids) and building an estimation (regression) model for each cluster

Phase 2 – Cost Prediction



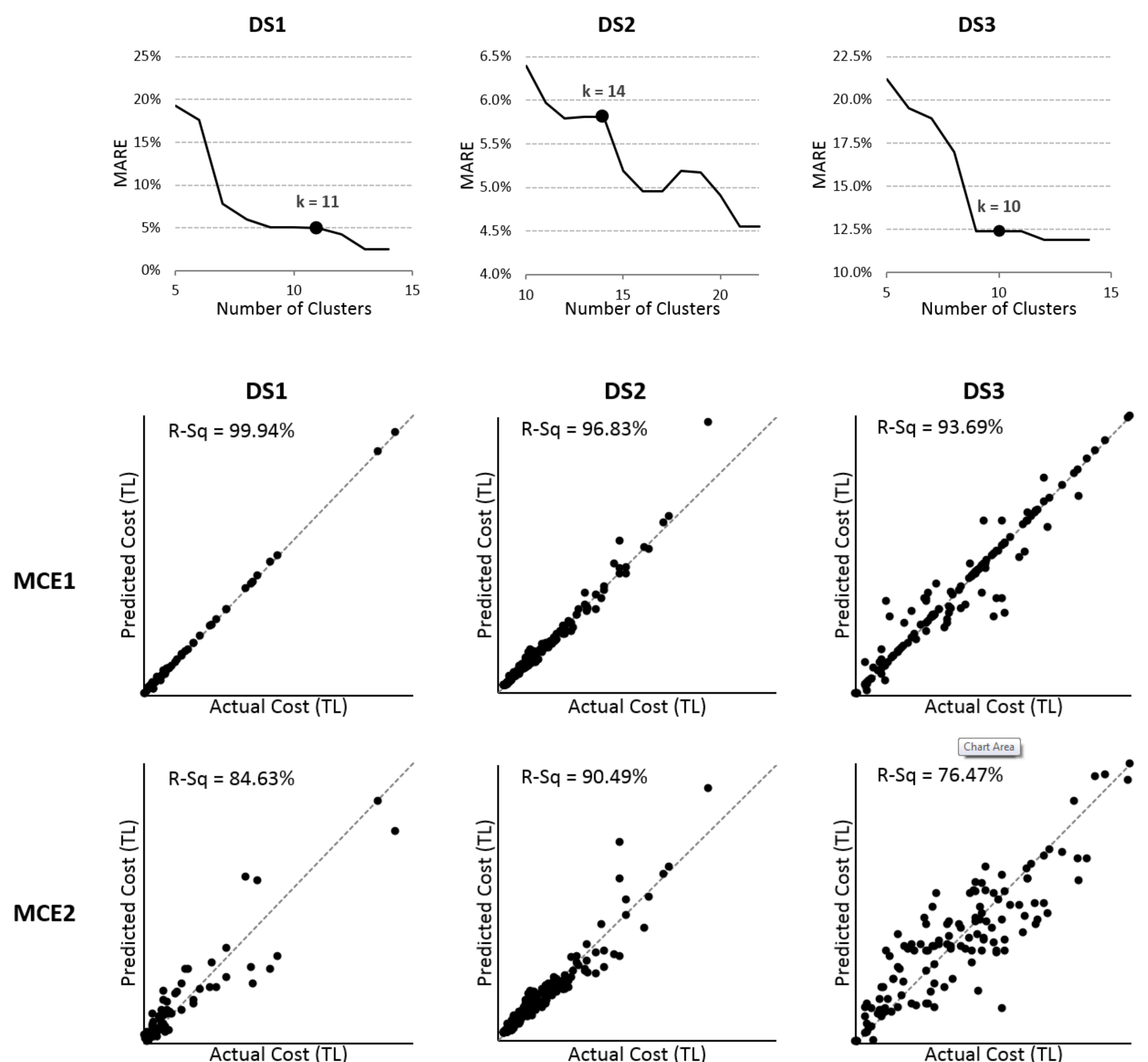
The second stage of the methodology: finding the best cluster and predicting the manufacturing cost of a new design

REAL WORLD APPLICATIONS

6

- DS1.** Electrical Grounding Parts > 12 variables and 68 Observations
- DS2.** Lightning Protection Parts > 10 variables and 197 Observations
- DS3.** Plastic Kitchen/House Tools > 51 variables and 130 Observations

- MCE1.** Manufacturing Cost Estimation with Clustering + Regression
- MCE2.** Manufacturing Cost Estimation with Regression (Traditional Way)



FUTURE RESEARCH

7

- (1) Developing a comprehensive similarity measure that demonstrates high discrimination power while handling mixed variable types
- (2) A mixed integer programming model can be implemented to obtain the optimal cluster contents
- (3) The information gain criterion can be considered when deciding on the inclusion of a candidate predictor in the cost estimation model.