

Disposition and End-of-Life Options for Products: A Green Design Case Study

Teachers Guide

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Use of Case Study: This case study is intended to introduce modeling of product disposal fates to a general audience. It was prepared with financial support from the National Science Foundation, EEC-9700568. Reproduction is permitted by the authors for educational purposes. **Contact:** cth@cmu.edu

Objectives and Concepts

This case study is intended to have students begin to think about the fate and potential disposal paths for engineered products. It uses personal computers as an example, but the type of analysis can be widely applied. Some particular concepts introduced include:

1. Shared responsibility for product fate among consumers, re-cycling companies and the public as a whole.
2. Forecasting for sales and disposal decisions into the future.
3. Deterministic simulation over time of product flows from one state to another.
4. Alternative disposal paths for products.
5. Public policy and green design options which might influence disposal decisions.

Teaching Approach

For class discussion and presentation, one possible approach is to introduce issues in the following order:

1. Decision making – introduce disposal options (or channels) for used computers. Elicit a flow model from the class participants. A concept diagram could be introduced, such as the illustrative diagram shown below representing influences on the decision to replace a computer.
2. Flow diagrams – develop product flow diagrams, similar to those in Figure 1 and 2 in the case study. Discuss the effects of alternative assumptions in Figures 1 and 2.

3. Spreadsheet application – discuss the implementation options for calculating flows over time. Examples of flows appear in the appendices.
4. Extensions – numerous issues can be discussed which build upon the material in the case study. Examples include:
 - changes in the forecast rate of growth of computers over time (normally one would expect the growth rate to slow as the market matures and eventually decline as competitive products become available),
 - stochastic models of the disposal decisions,
 - estimation of costs and environmental impacts associated with different disposal options, and analysis of policy options with regard to disposal regulation (e.g. prohibition on disposal of any hazardous material in ordinary landfills).

Student Assignments

Several student assignment possibilities are given in the case study itself. The various extensions described above could also be the basis for assignments.

Concept Diagram

Following is a construction of the key concepts required to understand the case.

