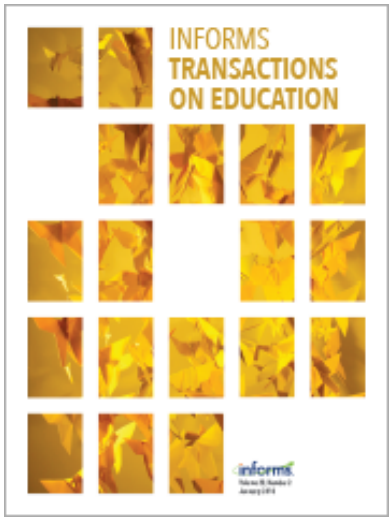

INFORMS Transactions on Education

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To cite this article:
Nazli Turken, Avinash Geda, Jeffrey Cummings (2026) Case—HCell and E-Waste Collection: An Analytics Case for Business Decision Making. INFORMS Transactions on Education 26(3):215-217. https://doi.org/10.1287/ited.2024.0106cs

https://pubsonline.informs.org/journal/ited

INFORMS TRANSACTIONS ON EDUCATION
Vol. 26, No. 3, May 2026, pp. 215–217
ISSN 1532-0545 (online)

Case

HCell and E-Waste Collection: An Analytics Case for Business Decision Making

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Received: July 26, 2024
Revised: July 1, 2025
Accepted: July 10, 2025
Published Online in Articles in Advance: August 25, 2025

https://doi.org/10.1287/ited.2024.0106cs

Keywords: Python • sensitivity analysis • social innovation • sustainable development goals

1. Introduction

HCell was founded in 2005 by a group of engineers in Seoul, Korea who were passionate about creating cutting-edge cell phone technology. The company's founders had a vision of designing phones that were sleek, stylish, highly functional, and intuitive to use. From the beginning, HCell's focus on innovation and customer satisfaction helped them gain a loyal customer base, and the company quickly became a major player in the cell phone industry. Over the years, HCell has continued to push the boundaries of cell phone technology with groundbreaking innovations, such as long-lasting battery life and advanced camera systems. The company's commitment to quality and customer service has also remained strong, with a dedicated team of customer support specialists who ensure that every customer's needs are met. The organization has set a goal of expansion into the European market. To expand into the new market, HCell has hired you as a consultant to support this transition.

2. Strategic Expansion: Optimizing HCell's European Supply Chain Network

As the global demand for smartphones continues to grow, HCell's management team recognizes the importance of expanding their market to Europe. They understand that Europe presents an enormous market opportunity, with millions of potential customers who are eager for the latest cell phone technology. Management has decided to open new production plants as well as warehousing facilities in Europe instead of using HCell's current operations in Asia. Europe has some of the world's most stringent regulations regarding product safety, environmental protection, and workers' rights. By moving its production plants to Europe, HCell will be able to ensure that its products comply with these regulations, which could help improve its reputation and competitiveness in the market. However, they also know that expanding into a new region will be a significant challenge, requiring careful planning and analysis to ensure success. Therefore, they turned to their analytics team to help them make data-driven decisions about the optimal locations for their manufacturing plants and warehouses.

2.1. Case Analysis Part 1—Firm Facility Location Selection and Demand Satisfaction

The first decision that HCell's management team had to address was searching for potential locations for their manufacturing plants and warehouse. For manufacturing, they quickly identified Berlin and Barcelona as viable options as both cities offered skilled and experienced workers. However, there are going to be differences in the availability of qualified workers for certain types of jobs in both cities as well as differences in regulations around labor, taxes, and environmental concerns in each city. Because of these differences, HCell

estimates that the capacity of the manufacturing plant in Barcelona will be higher at 17,187 units produced per year compared with 12,426 units produced per year in Berlin. The team estimates that the fixed cost of opening a plant in either city will be the same at €760,553.

The search for warehouse locations also presented a similar challenge for HCell's management team. They recognized that Paris, Milan, and Warsaw are all centrally located within the target regions, which would allow HCell to efficiently and effectively serve its customers in London, Lisbon, Vienna, and Helsinki. This will also help them to respond more quickly to customer demands as well as provide better customer service. The locations of Paris, Milan, and Warsaw make them easily accessible via major transportation routes, including highways, railways, and airports, making it easier and quicker to transport products from the manufacturing plants to the warehouses and from the warehouses to the customers. Having multiple warehouses in different locations would provide HCell with more flexibility in terms of logistics and allow them to better manage inventory. On the other hand, the fixed cost of opening a warehouse is estimated to be €695,736, which can add up to significant costs if multiple warehouses are opened. Additionally, managing multiple warehouses in different locations can be complex and requires efficient coordination and management to ensure smooth operations and effective inventory management. However, they have yet to make a final decision on the number and location of the warehouses as they want to assess the feasibility and cost-effectiveness of each location.

2.2. Case Analysis Part 2—Collection and Storage of Electronic Waste

The second decision that the management team must address is collecting and storing electronic waste. As an electronics manufacturer in Europe, HCell is subject to the Waste Electrical and Electronic Equipment (WEEE) regulation, a directive created by the European Union to address the environmental concerns associated with the disposal of electronic devices, which include cell phones. WEEE regulations require manufacturers to take responsibility for the entire life cycle of their products, including the end-of-life stage. In practice, this means that cell phone manufacturers must develop and implement recycling programs to collect and recycle at least 75% of their electronic waste, including damaged or obsolete devices. Failure to comply with WEEE regulations can result in legal penalties, fines, and reputational damage for cell phone manufacturers.

HCell is considering two options to collect and store electronic waste returns: (1) retrofit warehouses (in Warsaw, Paris, and Milan) or (2) open new collection centers in Bruges and/or Paris. Option 1 would use the warehouses chosen earlier in the case as collection and storage centers. This will require them to retrofit the warehouses to store returns and cost an additional 25% of the original fixed cost of opening a warehouse. For example, if warehouse 1 is used both to send products from the warehouse to the customer and to store returns from the customers, the fixed cost of opening this warehouse will be 1.25 times the original fixed cost. The per unit cost of shipping returns from customers to the warehouses (reverse flow) is identical to the per unit cost of shipping products from the warehouses to the customers (forward flows). Option 2 would involve the creation of a collection center only in Bruges and/or Paris. The cost of opening these additional collection centers is estimated to be 25% of the cost associated with opening a plant. For example, to open the collection center in Paris, it would cost 25% of €760,553.

HCell would like to figure out the best plan for their European market expansion taking into account both forward and reverse flows in reaching such a plan. HCell analysts estimate the following information that could be useful in this analysis.

- The per unit transportation cost is assumed to be €1 for each kilometer traveled for all flows.
- The distances between locations are provided by the instructor.
- The demand for each location is shown in Table 1.

Based on your analysis, answer the following questions.

1. What type of analytics (i.e., descriptive, predictive, or prescriptive) should be adopted to answer HCell's decision? Why?
2. Create and implement a forward network model for the plant and warehouse locations (part 1). Are you missing any data? If yes, how can you obtain these data? (Include the second question if the students are expected to estimate the distances.)
3. Create and implement a network model incorporating both forward and reverse flows for the two options (i.e., retrofit existing warehouses or build new warehouses) listed in part 2. What do you think are the shortcomings of your model from part 2? How could you address these shortcomings?
4. What should HCell's final decision be?
5. By how much would the fixed costs for opening a plant or warehouse need to increase for the optimal manufacturing and warehouse location decisions to change? For example, what percentage increase in fixed

Table 1. Location Demand

Location	Demand (units)
London	20,404
Lisbon	3,288
Vienna	3,823
Helsinki	2,098

costs would make one warehouse more favorable than two warehouses?

6. How does adjusting the per unit cost of shipping impact the logistics network? If shipping costs increase or decrease by 15% or more, how would this influence warehouse locations and the distribution plan?

7. Extended producer responsibility (EPR) regulations in the European Union require manufacturers to manage the end-of-life processing of their products, including collection, recycling, and safe disposal. These regulations can be implemented through different policy mechanisms. In this case, HCell's modeling approach implicitly reflects an individual producer responsibility (IPR) framework, wherein each producer is accountable for handling waste associated with its own products. An alternative approach—collective producer responsibility (CPR)—involves pooling obligations across producers who share the costs and operational responsibilities for electronic waste collection and recycling. Critically evaluate whether IPR or CPR would be more appropriate for a company like HCell as it enters the European market. In your analysis, consider the following trade-offs.

   a. Incentives for environmentally conscious design. Which approach more effectively encourages producers to invest in design for recyclability or reduced environmental impact?

   b. Cost efficiency and operational feasibility. Which system offers greater scalability and logistical efficiency, particularly for a new market entrant with limited local infrastructure?

   c. Equity and strategic implications. How are costs and responsibilities allocated in each system? To what extent do these mechanisms prevent or permit free-riding behaviors?

Based on your analysis, what form of EPR implementation should HCell support, and why?

More details about further questions to address for the case will be provided by your instructor.