



KEY POINT SUMMARY

OBJECTIVES

A cost-benefit analysis of a web-based navigation system was developed to evaluate the business case of a proposed mobile wayfinding system.

Implementation of a navigation system: Economic verification in a local hospital

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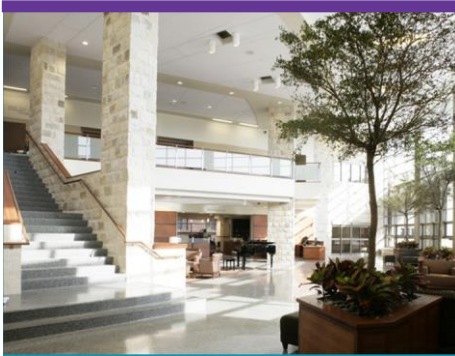
Key Concepts/Context

Wayfinding is a long-standing challenge in healthcare facilities. Multiple studies have evaluated the cost-benefit of traditional wayfinding systems with respect to cost (e.g., staff time spent direction giving) and benefits (e.g., improved patient experience). The authors of this study found that despite high initial costs of a digital wayfinding system, the payback period was just under one year with a good benefit-cost ratio.

Methods

The authors developed a cost-benefit analysis (CBA) using net present value (NPV) with a uniform rate for discounted cash flow of 3% for 11 years. The net present value (NPV) is defined as the difference between the present value (the discounted cash flows of benefits and costs) and the initial investment at Year 0. As a ratio, the benefit-cost calculation is independent of a specific currency. The profitability index determines the effectiveness of an investment by establishing the ratio of the NPV and the initial investment. The payback period establishes the length of time to recoup the costs of the initial investment.

For purposes of the study, the costs included the digital solution development (wages of the development team, equipment costs, and maintenance). The benefits included the cost avoidance of the time staff (doctors, nurses, non-medical staff) giving directions (as established by a respondent questionnaire completed by 173 participants in 2019) multiplied by the average wage in 2021. No benefits were reported in Year 0 (2020), as there were only development costs and equipment purchases. Based on the system going into testing late in Year 1 (2021), a proportional rate of benefits was reported, with full benefits, labor, and maintenance costs reported in Year 2 (2022). In Year 3 (2023), labor costs for development are excluded, but maintenance costs for staff to keep the system operational are incorporated. In 2026, costs are incorporated to replace the equipment (e.g., kiosks, tablets, and clipart) nearing the end of its service life.



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Findings

As summarized by the authors, the initial cost of development (Years 0-2 = 4,943,000 CZK) is offset by an annual cost avoidance for direction-giving by staff of 2,672,000 CZK (Years 2-11). Maintenance costs were estimated at 12,000 CZK annually, and as indicated in the methods, additional equipment costs of 131,000 CZK were included in Year 6. Based upon these estimates, discounting cash flow at 3%, the authors report the NPV as 19,375,000 CZK, the BCR as 5.27, profitability as 9.53, and the payback period as 0.96 (less than one year).

Limitations

The authors point out maintenance does not include electricity costs or any special labor costs, as maintenance is largely assumed to be absorbed into the daily operations of staff. There also were no costs associated with theft or damage of equipment. A further author-identified limitation is the lack of a quantifiable benefit for an improved patient experience. It should be noted that the authors assume no verbal directions are required following implementation, maintenance costs are fixed over time, and the replacement value of equipment in Year 6 matches the initial cost.

Design Implications

With a positive return on investment, digital solutions can be an effective component to an integrated wayfinding system that balances traditional methods (a well-designed signage and numbering strategy, an approach for clarity and consistency in verbal directions, and paper-based materials) with electronic information.

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