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Technology abandonment may have serious repercussions for individuals with disabilities and for society. The purpose of this study was to determine how technology users decide to accept or reject assistive devices. Two hundred twenty-seventy adults with various disabilities responded to a survey on device selection, acquisition, performance, and use. Results showed that 29.3% of all devices were completely abandoned. Mobility aids were more frequently abandoned than other categories of devices, and abandonment rates were highest during the first year and after 3 years of use. Four factors were significantly related to abandonment—lack of consideration of user opinion in selection, easy device procurement, poor device performance, and change in user needs or priorities. These findings suggest that technology-related policies and services for individuals with disabilities and long-term needs of consumers to reduce device abandonment and enhance consumer satisfaction.

Key Words: Assistive technology—Abandonment—Consumer satisfaction.

Assistive technology can assist individuals with disabilities to achieve optimal function and independence and has become an increasingly accepted intervention. However, there are numerous reports of dissatisfaction and removal of technology by consumers (1-9). Technology abandonment can have serious repercussions. For individuals, non-use of a device may lead to decreases in functional abilities, freedom, and independence, and increases in monetary expenses. On a service delivery level, device abandonment represents an ineffective use of limited funds by federal, state, and local government agencies, insurers, and other provider organizations (1). These costs could spiral as the number of people with disabilities, particularly those with severe disabilities, continue to increase. A better understanding of how and why technology users decide to accept or reject a specific device is critically needed to improve the effectiveness of assistive technology interventions and enhance consumers' satisfaction with devices.

BACKGROUND

Device abandonment research falls into three important areas of study—users' personal characteristics and technology acceptance, device attributes consumers prefer, and device utilization surveys. Work examining the relationship of personal characteristics to technology acceptance is largely anecdotal. Carolyn Vash (8) presents a variety of personal issues that affect device use and acceptance such as disability acceptance, motivation, perceived life, work, and educational balance. She concludes that disability acceptance and goal-directedness are related to positive attitudes toward devices. Devices that enable the user to complete important tasks are more likely to be used. Wright (10) states that individuals who recognize the difficulties of their disability, but focus on managing them are more likely to use assistive devices. Scherer's (11) findings, based on comparative case studies of five persons with cerebral palsy and five with spinal cord injury, discuss similar patterns.

Zola (9) points out that consumers prefer devices that facilitate independence associated with social and psychological freedoms, not just physical functioning. Furthermore, Navins (12) suggests that when “clients are subjected to massive doses of technology they may react negatively and come to view technology as another burden. In a survey of 525 disabled scientists, Brooks (13) found that those who reported themselves adjusted to their disability were less likely to use personal care, housekeeping, transportation, or mobility devices. He hypothesized that because these device types require repeated, intimate use, they may signify dependence to the well-adjusted user. This finding suggests that a consumer's personal concept of independence may influence assistive device acceptance and use.

A few studies have investigated device characteristics that consumers prefer. In one study, 12 experienced technology users with sensory and mobility impairments identified and ranked ordered 17 criteria for making technology purchasing decisions (1). The four most important criteria were 1) effectiveness—how well the device enhances the user’s functional capability, 2) affordability—how much it costs to purchase, maintain, and repair the device, 3) operability—how easy the device is to operate, and 4) dependability—how long the device operates without reduced performance or breakdowns. Data from a series of focus groups on product design are consistent with the previous study’s results (14). Cost to purchase, durability, reliability, ease of use, safety features, aesthetics, ease of repairs, maneuverability/portability, and good instructions were the most important characteristics of a good device.

Brooks and Hoyer (15) examined the relationship of two social settings with device characteristics. Two matched groups of 12 people each were interviewed about their device preferences. Results showed that device characteristics such as ruggedness, efficiency, and durability were most important to users for employment-related devices. For devices used mainly for independent living, device characteristics related to the user-device interface such as simplicity, ease of use, and comfort were most valued. These results suggest that user requirements for devices may vary according to the customary environment.

Many studies quantifying device utilization appear in the literature. These studies investigate utilization of devices related to the health care programs, such as hospitals, specialized rehabilitation programs, home care services, and rehabilitation engineering services. The follow-up periods range from 3 months to an average of 8 years postdischarge. Definitions of utilization varied, but most included device use at the time of the survey as one measure. Although a variety of disability groups are represented, individuals with orthopedic impairments and spinal cord injuries are most prevalent. The devices examined range from elastic stockings to customized seating systems. Four studies focused primarily on children, and two focused on older persons. Most of the studies were conducted in foreign countries, which may limit generalization to U.S. populations and service delivery systems. A wide range of utilization rates was reported for various device categories. These findings show that while the majority of assistive devices are used, a significant proportion of devices are discarded by consumers for a number of reasons.

Aids for Activities of Daily Living (ADL)—Overall usage rates of bathroom and toilet aids ranged from a low of 4% (9) to a high of 9% (17). Usage rates of grooming and dressing aids ranged from 29% (13) to 8% (17). Other investigations found rates ranging from 35% to 78% utilization (2,16-18). Studies with the shortest follow-up time tended to show higher utilization rates. The reasons for nonuse of ADL aids most commonly cited were improved functioning, device unnecessary, device ineffective, and alternative solutions discovered.

Mobility Aids—Overall usage rates for mobility aids such as wheelchairs, canes, and walkers ranged from 5% (16) to 89% (22). Studies with adults found utilization rates around 70% (19-21). Studies with children showed higher rates of utilization (22,23). Again, the reasons for decreased device usage were changes in functional abilities and device ineffectiveness.

Two studies specifically examined usage rates of orthotic devices by adults. Kaplan et al. (4) found that only 21% of braces were used by patients who had been discharged an average of 8 years. Coghlan et al. (24) found 41% of braces were used by paraplegics who had been discharged an average of 61 years. The primary reasons given for disuse of braces were that they were difficult to use, took too much energy, and wheelchairs were preferred.

The findings from psychosocial, consumer preference, and utilization studies provide valuable information about the person-device interface. Psychosocial studies focus on individual psychological and social influences on device use. Consumer preference studies describe device qualities sought by users. Utilization studies track use and remove of prescribed technologies. Most of the investigations completed in the United States have examined a limited number of devices provided through particular clinical programs and have employed relatively small samples. This study will describe general patterns of device use and abandonment in the United States. The study’s scope is broad, incorporating a national sample, multiple disability
groups, a range of devices, and various service delivery settings (i.e., clinical, vocational, self-purchase). It will examine relationships of the service delivery process, device performance, and long-term use with abandonment.

METHOD
Survey Development
An interview-style survey was developed based on literature review, consumer advisory panel input, and pilot testing. The survey was designed to be administered by a trained researcher via telephone. Later in the study, the survey format was altered to allow participants to respond in writing. The survey content remained the same. The final draft included sections on demographics, six device category sections, and corresponding questionnaire pages. The demographic data covered information such as age, sex, ethnicity, onset and nature of disability, income, education, employment, and independence level in daily activities. Numerous assistive devices (120 devices in total) in six different categories were included in the survey. The six categories were: Kitchen and Other Household Activity Aids, Leisure and Transportation Aids, Communication Aids, Broad Use Devices, Mobility Aids, and Personal Use Devices. A questionnaire page was completed for each device an individual had ever used (see Appendix). Twenty-six yes-no and multiple choice items and open-ended questions addressed issues of selection, acquisition, device performance and use, and device use over time.

Sample
The study's target population was a nationwide sample of adult technology users with a variety of disabilities. To recruit the sample, disability interest groups across the country were contacted, announcements were placed in disability-related publications, and flyers were distributed at local, regional, and national disability-related conferences. Participants had to be 18 or older, capable of responding to the survey questions, and experienced with at least one assistive device.

Definitions
For this study “abandonment” was defined as non-use of a device type or category at the time of the survey. For example, a device that sits in the closet is abandoned. If an individual switched from a cane to a walker, the cane is considered abandoned. If an individual substituted an aluminum straight cane for a wooden straight cane or switched from a Brand A quad cane to a Brand B quad cane, the cane is not considered abandoned. If an individual switched from a straight cane to a quad cane, the straight cane is considered abandoned. Older devices replaced with the same device type are not considered abandoned, but older devices replaced with a different device type are considered abandoned.

Procedure
Participants volunteered in response to recruitment efforts. If they met the selection criteria, a letter with informed consent was mailed. When the paperwork was returned, a telephone interview was scheduled. Each interview took approximately 1 hour to complete, depending on the number of devices an individual had used. Some interviews were completed in small groups. The interviewer met with participants and responded to questions as each person completed their individual questionnaire in writing.

Data Analysis
Simple descriptive statistics (frequencies for categorical variables and medians for continuous variables) were computed for all demographic variables. The relationship of participant demographics to device abandonment was not examined because the demographic data apply to individuals and the abandonment data apply to devices. More complex statistical methods were applied to the 30 device-related variables from the questionnaire. Seven variables were not analyzed due to a high proportion of “Not Applicable” or missing responses (items marked with asterisks in the questionnaire). Two questions had multiple response options that were collapsed into two groups. Factor analysis (based on the principal component method that extracts the maximum amount of variance for each factor is calculated) of 13 device-attribute variables was conducted to determine whether an underlying relationship pattern (factors) existed in the data. Four distinct factor variables (Table 1) emerged. The first factor, Performance, loads heavily on operational performance variables such as “did the item help you perform better,” and “was it safe to use.” The second factor, Energy Demand, groups variables related to effort required to use the device. The third factor, Convenience, loads on two closely related variables—“was it easy to store” and “was it easy to transport.” The fourth factor, Assistance, loads on two variables that address assistance required from others.

TABLE 1. Factor loadings of device attributes (R values)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Performance</th>
<th>Convenience</th>
<th>Assistance</th>
<th>Energy Demand</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perform better</td>
<td>0.744</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reliable</td>
<td>0.761</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comfortable</td>
<td>0.776</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Easy to use</td>
<td>0.560</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safe</td>
<td>0.886</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wear wall</td>
<td>-0.479</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training required</td>
<td>0.756</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Easy to assemble</td>
<td>0.684</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand energy (self)</td>
<td>0.499</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Easy to store</td>
<td>0.881</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Easy to transport</td>
<td>0.886</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Required aid</td>
<td>0.541</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand energy (other)</td>
<td>0.773</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These selected factors, along with the remaining variables were used in a logistic regression analysis to determine which variables related to abandonment. Logistic regression was chosen as the abandonment measure (dependent variable) is dichotomous (yes-no). Finally, a forward stepwise technique available in logistic regression was employed to build a predictive model. “Length of time the device was used” was not included in logistic regression, but analyzed separately.

RESULTS
Demographics
Two hundred twenty-seven adults with physical disabilities responded to the survey. Twenty-eight states were represented, but the majority of the sample was from the Washington, DC metropolitan area. Table 2 illustrates the disability profile of the participants. The most prevalent diagnoses were multiple sclerosis (MS), spinal cord injury (SCI), cerebrovascular accident (CVA), low vision and blindness (LVB), arthritis (AR), cerebral palsy (CP), and amputation (AM). Other diagnoses included spinal bifida, hearing impairments, muscular dystrophy, and multiple impairments, representing 26.4% of the total sample. Approximately 48% of all participants had their disability for less than 15 years.

Independence in daily activities was derived from selfratings on a five-point scale for eating, personal hygiene, transferring, and communication. The median score for participants in the AM and LVB groups was higher than for the total sample, while the median score for the SCI and CP groups was lower.

Table 3 presents a general sociodemographic profile of the respondents by medical diagnosis. Fifty-six percent were female. Forty-three percent were less than 45 years of age. The age distribution indicates that half of the participants were between 35 and 54 years of age and 16% were age 65 or older. Participants with CP, LVB, and SCI were the youngest groups and individuals with CVA the oldest. Forty-two percent represented non-white populations (Black, Hispanic, Asian). More individuals represented minority populations in the CVA group than in any other. Participants’ education level was high—more than 60% had some college education. In every group except CP, over half the participants had this education level. However, only 43.2 of the total sample population held full- or part-time jobs. LVB participants reported higher employment levels than other groups, and CVA participants reported lower levels.

TABLE 2. Respondent disability profile

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total</th>
<th>MS</th>
<th>SCI</th>
<th>CVA</th>
<th>LVB</th>
<th>CP</th>
<th>AR</th>
<th>AM</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset</td>
<td></td>
<td>199</td>
<td>22</td>
<td>54</td>
<td>21</td>
<td>17</td>
<td>15</td>
<td>14</td>
<td>13</td>
</tr>
<tr>
<td>&lt;15 years</td>
<td>47.0%</td>
<td>45.0%</td>
<td>51.2%</td>
<td>95.2%</td>
<td>91.8%</td>
<td>55.7%</td>
<td>53.8%</td>
<td>93.5%</td>
<td></td>
</tr>
<tr>
<td>Indepen-</td>
<td>medium</td>
<td>17</td>
<td>19</td>
<td>19</td>
<td>20</td>
<td>14</td>
<td>18.5</td>
<td>20</td>
<td>19</td>
</tr>
<tr>
<td>dence</td>
<td>score</td>
<td>19</td>
<td>19</td>
<td>19</td>
<td>20</td>
<td>14</td>
<td>18.5</td>
<td>20</td>
<td>19</td>
</tr>
</tbody>
</table>

Abbreviations: MS, multiple sclerosis; SCI, spinal cord injury; CVA, cerebrovascular accident; LVB, low vision and blindness; CP, cerebral palsy; AR, arthritis; AM, amputation.

TECHNOLOGY ABANDONMENT
TABLE 3. Respondent demographics by medical diagnosis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total</th>
<th>MS</th>
<th>SCI</th>
<th>CVA</th>
<th>LVR</th>
<th>CP</th>
<th>AR</th>
<th>AM</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>227</td>
<td>46</td>
<td>12</td>
<td>9</td>
<td>14</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Gender, female</td>
<td>56.4</td>
<td>58.8</td>
<td>56.4</td>
<td>56.7</td>
<td>58.6</td>
<td>58.5</td>
<td>57.7</td>
<td>58.6</td>
<td>58.3</td>
</tr>
<tr>
<td>Age &lt;45 years</td>
<td>43.6</td>
<td>50.9</td>
<td>43.4</td>
<td>40.9</td>
<td>45.6</td>
<td>47.6</td>
<td>41.2</td>
<td>43.5</td>
<td>42.6</td>
</tr>
<tr>
<td>Ethnicity, white</td>
<td>58.1</td>
<td>53.8</td>
<td>58.1</td>
<td>58.0</td>
<td>58.9</td>
<td>62.8</td>
<td>59.5</td>
<td>58.9</td>
<td>58.3</td>
</tr>
<tr>
<td>Education, some</td>
<td>66.4</td>
<td>68.4</td>
<td>66.4</td>
<td>66.8</td>
<td>66.7</td>
<td>66.4</td>
<td>64.7</td>
<td>64.3</td>
<td>64.1</td>
</tr>
<tr>
<td>Employment, full</td>
<td>43.2</td>
<td>43.2</td>
<td>43.2</td>
<td>43.2</td>
<td>43.2</td>
<td>43.2</td>
<td>43.2</td>
<td>43.2</td>
<td>43.2</td>
</tr>
<tr>
<td>% Abandoned</td>
<td>45.0</td>
<td>45.0</td>
<td>45.0</td>
<td>45.0</td>
<td>45.0</td>
<td>45.0</td>
<td>45.0</td>
<td>45.0</td>
<td>45.0</td>
</tr>
</tbody>
</table>

All values are percentages. For abbreviations see Table 2.

Device Use and Abandonment

Two hundred twenty-seven respondents reported having experience with a total of 1,792 different devices and 29.3% (507 of 1,730) had been abandoned. The most frequently reported devices were wheelchairs (224), canes (116), bath chairs (91), walkers (84), and long-handled reachers (62). Items with the highest occurrence of abandonment (proportion of devices abandoned to total number of devices reported) in descending order were treadsplints, crutches, lower extremity braces, walkers, canes, wheelchair cushions, standard wheelchairs, dressing aids, and electric scooters (Fig. 1). Some device classifications, such as communication and leisure aids were not well represented due to sampling biases, therefore information on abandonment of these devices is not available.

When length of time the device was used was compared to abandonment, a clear pattern emerged (Table 4). This analysis is based on a total of 1,181 devices as participants did not respond to length of time used for 55% of the reported devices. Almost half of all devices (48.4%) were used for more than 5 years while only 3.3% were used for less than 3 months. Of devices used less than 3 months, 5.2% were abandoned, of those used 3–12 months 8.0% were abandoned and of those used more than 5 years 19.7% were abandoned. These abandonment data suggest that most abandonment occurs after 5 years or within the first year of use.

Predictors of Device Abandonment

Logistic regression analysis was conducted on 12 variables related to device attributes, selection and acquisition procedures, and ongoing device use. Four variables were found to be significant (items marked with asterisks in Table 5). The significant abandonment predictor variables were "change in needs/priorities," "ease of obtaining the device," "device performance," and "personal opinion considered in selection." These variables were applied to the original data to develop the predictive model. The overall correct classification of abandonment was 84.24% using these four predictors.

A "change in needs of the user" showed the strongest association with abandonment (B = 2.562, p < 0.001). When a user's needs or priorities changed, devices were more likely to be abandoned. Changes in users' needs or priorities included improvements or decline in medical/functional abilities and changes in personal activities/goals such as return to work or other community activities.

The second strongest predictive variable was "ease of obtaining the device from the supplier" (B = 1.325, p < 0.001). Devices that were easier to obtain from suppliers were more likely to be abandoned. "Source of identifying need," "source of payment," and "ownership" were not significantly related to device abandonment.

Device performance was the third strongest predictive variable (B = 0.873, p < 0.001). Of the four factors related to the device itself, only performance was significant. If a device met the user's expectations for effectiveness, reliability, durability, comfort, safety, and ease of use, the user was more likely to keep the device. The convenience, energy demand, and assistance factors were not significantly related to abandonment.

The next strongest predictive variable was whether the "user's opinion was considered in the selection process" (B = 0.762, p < 0.001). The odds that the device will be retained were significantly greater when users feel their opinions were taken into account in the decision process.

TABLE 4. Use and abandonment during specific time periods (n = 1,181)

<table>
<thead>
<tr>
<th>Months</th>
<th>Years</th>
<th>&lt;3</th>
<th>1-2</th>
<th>2-5</th>
<th>&gt;5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Devices used for specific time period (n)</td>
<td>8.3</td>
<td>13.2</td>
<td>13.7</td>
<td>15.4</td>
<td>49.4</td>
</tr>
<tr>
<td>Devices abandoned for specific time period (n)</td>
<td>5.2</td>
<td>5.0</td>
<td>3.2</td>
<td>4.4</td>
<td>10.7</td>
</tr>
</tbody>
</table>

TABLE 5. Logistic regression estimates of probability of device abandonment

<table>
<thead>
<tr>
<th>Variables</th>
<th>B (beta)</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical attributes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance</td>
<td>0.873*</td>
<td>0.099</td>
</tr>
<tr>
<td>Convenience</td>
<td>0.181</td>
<td>0.094</td>
</tr>
<tr>
<td>Energy demand</td>
<td>-0.021*</td>
<td>0.094</td>
</tr>
<tr>
<td>Assistance</td>
<td>-0.135</td>
<td>0.101</td>
</tr>
<tr>
<td>Selection and acquisition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opinion considered</td>
<td>0.762*</td>
<td>0.306</td>
</tr>
<tr>
<td>Easy to obtain</td>
<td>1.326*</td>
<td>0.418</td>
</tr>
<tr>
<td>Identified need</td>
<td>0.014</td>
<td>0.231</td>
</tr>
<tr>
<td>Who paid</td>
<td>0.127</td>
<td>0.219</td>
</tr>
<tr>
<td>Who owns</td>
<td>-0.208</td>
<td>0.402</td>
</tr>
<tr>
<td>Accessible available</td>
<td>-0.003</td>
<td>0.278</td>
</tr>
<tr>
<td>Ongoing use</td>
<td>2.563*</td>
<td>0.308</td>
</tr>
<tr>
<td>Complaints from others</td>
<td>-0.005</td>
<td>0.282</td>
</tr>
<tr>
<td>Intercept</td>
<td>-2.672</td>
<td>0.668</td>
</tr>
</tbody>
</table>

Correctly classified at 84.24% *

DISCUSSION

Patterns of Device Abandonment

One of this study's major goals was to describe general patterns of device use and abandonment in the United States. The study was designed to encompass user experiences with a range of assistive devices and service delivery settings. Findings regarding overall abandonment rates, abandonment frequency by device type, and abandonment over time illustrate key aspects of device use and abandonment in this national sample.

Although the majority of assistive devices in this sample were well used by consumers, almost one-third were completely abandoned. This study employed a stringent definition of abandonment that described only one outcome of a "person-technology" interface. Changes in device brands that do not represent changes in device categories were not accounted for even though these changes may have been due to dissatisfaction with the original device. A limitation of this study is that it expected abandonment was not distinguishable from abandonment due to user dissatisfaction. That is, devices intended for temporary use were not separated from devices intended for long-term use but were rejected by the user. User dissatisfaction that did not result in abandonment was not measured in this study, yet may be a critical element to evaluating the success of assistive technology interventions. Still, these findings imply that a large proportion of devices are not meeting all of consumers' needs.

Of all device classifications, mobility aids tended to be abandoned more often. The abandonment rates for six mobility devices were higher than the overall abandonment rate. The higher rates may reflect this study's sample population characteristics. Many participants have long-term experience with disabilities that permanently affect mobility functions, so they may have simply required more changes in equipment over time.

Less obvious considerations may also contribute to these higher abandonment rates. Because mobility devices are often used in social, work, and community settings, users may apply different standards for these devices than for those used solely at home (8,13,15). How users perceive the device as supporting or detracting from their sense of

FIG. 1. Most frequently abandoned devices. Proportion of devices abandoned to devices reported.
that consumer involvement in planning and decision-making enhances the likelihood of a successful outcome. Comments from participants strongly support this finding:

“Talk to the user. Be a little more considerate of the end-user. “Don’t assume you know the consumer.” “Listen to me! I know what works for me.”

Abandonment could be decreased if a collaborative, consumer-oriented model was employed in all technology service delivery environments (25-28). In this model, all involved parties are recognized for their unique areas of expertise. Service providers contribute systems and applications knowledge. Consumers contribute knowledge of their personal needs, goals, values, and environment. Solutions are generated through open exchange of information and consumers make the final decision.

Another finding related to selection and acquisition raised the issue of access to technology. Somewhat surprisingly, the easier devices were more often obtained from suppliers (any source), the more likely they were to be abandoned. Easy access to technology does not always ensure the most appropriate device. Devices purchased directly from vendors (durable medical equipment dealers, local drug stores, mail-order catalogs, etc.) may be easy to obtain, but may be less useful if consumers have inadequate product information. Devices consumers receive directly from hospitals may also be considered easy to obtain. Hospitals often provide a standard “kit” of equipment for individuals with certain diagnoses. However, all of these items may not be helpful for all individuals with that diagnosis. One participant who had a stroke reported, “I stopped using six devices prescribed for me. They were useful in the hospital but not for home use.” This may be due in part to difficulties translating skills learned in an institutional setting to the home without follow-up (25,29).

Access to assistive technology without support services does not necessarily benefit users. Consumers need information about products and skills in technology decision-making to select the most appropriate devices. Follow-up services, such as training, provided in consumers’ usual environments would decrease the likelihood of device abandonment.

Ongoing Use. Devices consumers felt did not perform well were more likely to be abandoned. The aspects of device performance important to consumers were how well the device enhanced the user’s performance, and its reliability, comfort, ease of use, safety, and durability. These characteristics are generally consistent with the qualities identified in other studies examining consumer device preferences. Good device performance is fundamental to consumer satisfaction.

These consumer evaluations of performance are based on perceptions of device attributes, Variation in users’ judgments is not accounted for. For example, a wheelchair that needs repair twice a year may be perceived reliable by one person and unreliable by another. Although there may be individual differences, the data do describe consumers’ general requirements for an effective device. It is important to note too that these criteria may not be equally applicable to all specific devices and situations. Other characteristics may be more critical for particular devices. However, users, whether purchasing a device on their own or with the help of a service provider, can use these criteria as a decision-making framework. Discussion of these criteria can help elicit individual concerns and preferences that may be critical to technology acceptance.

A key aspect of ongoing device use revealed in this investigation is the element of change. Not surprisingly, change in technology users’ needs or priorities was a significant factor in device abandonment. Participants reported changes in their functional abilities over time, both improvements and declines. They also reported lifestyle and activity changes. In many cases, these changes required new or different technology to continue to maximize independence. For example, one participant who used adaptive dressing devices found that when he returned to work, it saved time and energy to dress with assistance from his wife and reserve his strength for work activities. Dressing independently became less important than performing well at work, so the dressing aids were abandoned.

Policy Implications

This study’s findings suggest that services designed to involve consumers and accommodate long-term technology needs will contribute to increased satisfaction with assistive technology and reduce device abandonment. The Independent Living (IL) Paradigm outlines an approach that fulfills these aims. The IL’s service provision principles are consumer control, environmental adaptation, ongoing support, self-help, and freedom of choice (30). Policies based on these principles and an understanding of the “consumer experience” will be more effective. This philosophy is reflected in recommendations for change in two policy areas—fund- ing and training.

Funding. Because abandonment rates are relatively high in the first year of device use, equipment could be loaned or rented during this time. This approach provides consumers an opportunity to “try out” devices in their own living environments. They may want to try several types of devices during this period to determine which would be most effective. After 1 year, revaluations would take place and final purchase decisions made. Essentially, this would be spent only on devices consumers will use long-term. Used equipment could be recycled through a loan closet program.

Funds saved through a loan or rental program during the first year could be used to support a funding system for long-term needs. To accommodate the natural changes in technology needs beyond the first year, reimbursement policies need to be more flexible and responsive. Policies designed to support future needs so individuals can continue to function at optimal levels would be based on a different philosophy than current policies. For instance, coverage might be determined on whether a device increases function rather than whether it replaces a body part, enhances employability, or is medically necessary. Long-range benefits would be available and arbitrary time restrictions eliminated (31). Under such policies, consumer satisfaction would be increased and unnecessary abandonment reduced.

Training. A renewed focus on technology training is needed to improve service delivery systems. Because technology use is an ongoing activity, consumers will likely be making technology purchase decisions throughout their lifetimes. Access to technology without objective information is inadequate. Opportunities for assistive technology training should be available and easily obtained. Standard training programs might be offered to individuals with disabilities and their families at key transition points such as entering grade school, college, community living, the workforce and retirement. Other transition points such as return to work, career change, and change in health status should be the focus of ongoing consumer satisfaction with assistive technology and reduce device abandonment. The Independent Living (IL) Paradigm outlines an approach that fulfills these aims. The IL’s service provision principles are consumer control, environmental adaptation, ongoing support, self-help, and freedom of choice (30). Policies based on these principles and an understanding of the “consumer experience” will be more effective. This philosophy is reflected in recommendations for change in two policy areas—funding and training.

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TECHNOLOGY ABANDONMENT
vice and continuing education programs. Programs for a higher level of specialist training, with certi-
fication, should be supported in all settings to in-
crease the availability of technology expertise. RESSNA, the American Occupational Therapy As-
sociation, and the National Association of Medical
Equipment Suppliers are three organizations in-
vestigating assistive technology service provider
certification. This is a beginning, but other organi-
sations representing service providers also need to
explore specialized training. With better education
about assistive technology, both consumers and ser-
vice providers can make more informed technology
decisions, which will diminish the likelihood of
device abandonment.

Recommendations for Future Research
This study provides a broad overview of impor-
tant factors in successful use of assistive technology by
dividuals with disabilities. Matching people and
technology is a complex process taking place in
an arduous service delivery milieu. More precise
research is needed to clarify and quantify the many,
and sometimes conflicting, elements affecting con-
sumer use of technology. Longitudinal outcome
studies that examine patterns of long-term tech-
nology use and the impact of the selection, pro-
curement, and training processes on satisfaction are
needed to improve service delivery practices. Cost-
benefit analyses of assistive technology interven-
tions are needed to stimulate positive changes at
the systems level.

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