Technical Report - Outcome Measures Used in AT Research & Development (version 1.0)

Kathy Longenecker Rust, MS, OTR & Roger Smith, PhD, OT

Executive summary

Very little published research exists to describe how product developers view outcomes measurement. This paper presents the results of a two-fold survey conducted to assess the views of product developers and manufacturers towards assistive technology outcome measurement. Federally funded assistive technology investigators who received funding in the year 2001 received an open-ended request for their methodologies. A random sample of product developers drawn from the ABLEDATA database, and technology exhibitors at the 2001 RESNA and AOTA conferences were sent a survey. The data show that developers acknowledge the usefulness of outcomes data and relate that they would use outcomes information if available. The study is an important first step in attempting to quantify how product developers feel about outcome measures and their products.

Rationale for scan

In the field of assistive technology outcomes it has long been recognized that there are a multitude of stakeholders. Clients, clinicians, administrators, and payers are the stakeholders listed by DeRuyter, (1998) when he states that the clinical service delivery system must respond to multiple performance monitoring dimensions. It is interesting that "product developers" do not make his list. Indeed, very little is known about how product developers view AT outcomes. Therefore, as part of its comprehensive needs assessment, the ATOMS project developed this field scan to attempt to fill this gap. From a literature review and from the results of the ATOMS Project Service Director's Focus Group (April, 2002), several research questions for two categories of product developers evolved.

a) For the federally funded research sector:

Research question #1: What do AT outcomes data look like in currently funded federal projects?

b) For commercial product developers:

Research question #2: What importance do product developers place on outcome dimensions of AT?

Research question #3. How frequently do product developers use specific strategies to measure outcome during development?

Research question #4: How frequently do product developers use specific types of formal instrumentation to quantify outcome?

Research question #5: How do product developers perceive the appropriateness of different types of standardized instrumentation?

Research question #6: How would product developers use valid outcome data?

Description of scope of scan

Two methods identified federally funded investigators. The CRISP (Computer Retrieval of Information on Scientific Projects) database, maintained by the Office of Extramural Research at the National Institutes of Health, was searched for the year 2001 on "assistive" and "assistive technology"(National Institutes of Health).   The search identified 32 appropriate projects. The NIDRR Program directory web page (National Rehabilitation Information Center) listed 61 records for their category "Research Priority: Technology for Access and Function." A review of these abstracts identified 24 appropriate projects. In all, 56 projects were identified (with 3 researchers having two funded projects each).

Several sources identified commercial product manufacturers. First of all, the "Directory of Manufacturers and Distributors" available on the ABLEDATA website (May, 2002) provided a population of commercial product developers. It contained more than 2,500 listings. Prior to random selection the list was limited to companies in the United States that were listed 1) as active, and 2) as manufacturers. They totaled 1,124. A random sample of 500 was created in SAS (Statistical Analysis System). Secondly, we identified all of the US based technology exhibitors from the RESNA 2001 Conference (n=33) and the American Occupational Therapy Association (AOTA) 2001 Conference (n=35). Some manufacturers exhibited at both conferences. The random sample was crosschecked with the exhibitor lists, removing duplicates, for a final set of 555 companies.

Data collection procedures

1. Sources:

a) Federally funded projects

Due to the proprietary nature of much of the content of grant proposals, only the abstracts are available as public information. To obtain the necessary information, the project sent the 53 identified principal investigators a

letter explaining the purpose of the study and requesting the methodology as submitted with their proposal to test the outcomes of their product(s) under development.

b) Commercial product developers

We developed and mailed a survey to the set of 555 companies. Content for the survey evolved from two efforts: 1) a literature review of CINAHL and MEDLINE databases and 2) focus group discussions held with the ATOMS project collaborating subcontractors during the first year of the project. Integral to the work of the ATOMS Project is the breadth and depth of these collaborations among agencies. The subcontractors provide essential perspective from the field and access to consumer/user groups.

2. Steps and iterations:

a) Federally funded projects

From the mailing to the fifty-three Principle Investigators (PI's), four letters came back as undeliverable after two attempts. Twenty-seven projects contributed their methodologies for a 51% response rate. Their methodologies were coded to correspond to the questions in the product developer survey that included strategies for measuring outcomes and types of measures.

b) Commercial product developers

One hundred thirty-five of the 555 surveys mailed came back as undeliverable. Of the remaining 420 surveys, 10 individuals responded that they were no longer involved in production of AT devices or that they did not wish to participate. We received a total of 40 competed surveys. The overall response rate is 12%.

This low response rate was perplexing. We initiated a post-hoc data analysis to further investigate. We wondered if perhaps there were two different types of companies that we reached through our sampling efforts? Indeed, the ABLEDATA Directory of Manufacturers and Distributors contains many companies who do not specialize in adaptive equipment (3M Co., Kohler Co., L.L. Bean, and Union Carbide Corporation, to list a few). It would not be surprising that these companies would not be motivated to respond to a survey about AT outcomes. First of all, we identified companies that were originally entered into the study because of their exhibitor status. Of the 40 returned surveys, 15 responses (or 38%) came from companies that had exhibited at either the AOTA or RESNA conferences in 2001. Secondly, we wondered if any companies in our sample were members of the Assistive Technology Industry Association (ATIA). We retrieved the membership list from the ATIA website to see if any of the companies in our sample were members. From the original

mailing of 555, fifteen of the surveys were sent to companies that belonged to ATIA. Two of these were returned as undeliverable. Five surveys were returned from the remaining 13 companies for a response rate of 38%. The exhibitor companies and ATIA companies were combined, removing duplicates, to form the new category "disability manufacturers". The remaining companies became "non-disability manufacturers". See Table 1 for percentages of response rate for these two categories.

Table 1: Percent of Survey Response by Type of Company

	Responded	No Response
Disability Manufactures	38%	62%
Non-Disability Manufacturers	9%	91%
Total	12%	88%

3. Analysis procedures

We coded the responses from the PI's as detailed above. For the data from the Product Developers Survey, we performed descriptive statistical analyses, as appropriate, with SPSS (Statistical Package for the Social Sciences) Version 11.5 for Windows.

4. Findings

a) Federally funded projects

Research question #1: What do AT outcomes data look like in currently funded federal projects?

Results of the coding of the federally funded project methodologies are reported in Table 2. Due to the number of variables and the complexity of the development process it was not uncommon for a reviewed project to have more than one method or type of instrumentation. The categories are the same as were used in the Product Developer AT Outcomes Survey: Question #2: "The following are outcome dimensions of assistive technology. Please rate how important you believe each one of these dimensions is for product outcomes." and #3: "How frequently have you used any of the following strategies to measure outcome during your process of product development?" That there were no projects that fell into the "other" categories for either measurement strategies or instrumentation speaks to the validity of these categories established during the ATOMS focus group process.

Table 2: Percentage of Methodology and Instrumentation Choices for 26 Funded Projects
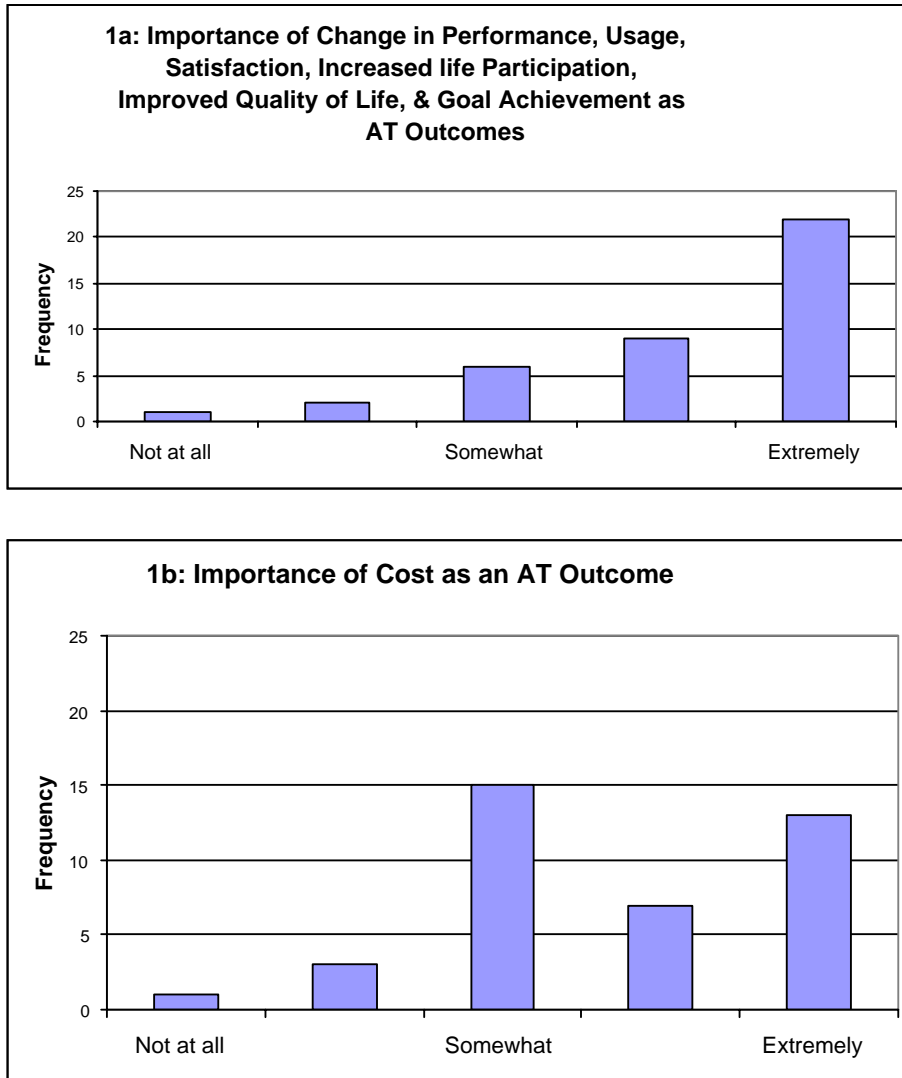
Strategy/Method	% of uses
Strategies for measuring outcome during product development	
Testing in lab by developers	27%
Focus groups of providers	12%
Focus Groups of persons with disabilities	15%
User usability testing in lab	23%
General field testing soliciting feedback from persons with disabilities	19%
General field testing soliciting feedback from providers	12%
Formal research design: Single Subject design	35%
Formal research design: Group comparison	58%
Other	0
Use of formal instrumentation	
Standardized, valid measure of functional status	70%
A "homemade" or adapted measure of improved functional performance	62%
A measure of client satisfaction	23%
A measure of cost	15%
Other	0

b): Commercial product developers

Research question #2: What importance do product developers place on outcome dimensions of AT?

Respondents were asked to rate seven outcome dimensions of assistive technology on a scale of "not at all important" to "extremely important". Again, the seven categories evolved from the focus group process mentioned earlier, and correlate with DeRuyter's (1998) categories. The categories were: change in performance of function, cost, usage-why or why not used, consumer satisfaction, increased life participation, improved quality of life, and clinical result/goal achievement. The histogram of response to the category "Increased Life Participation" is shown in Figure 1a. It demonstrates the similar pattern of response that was observed for six of the seven categories. Cost, however,

---

demonstrated a significantly different pattern with a bi-modal distribution, as demonstrated in figure 1b.

1a: Importance of Change in Performance, Usage, Satisfaction, Increased life Participation, Improved Quality of Life, & Goal Achievement as AT Outcomes

1b: Importance of Cost as an AT Outcome

Figure 1: Distribution of product developer's responses for importance of AT outcomes. Six of seven categories show distributions similar to 1a. The importance of Cost (1b) demonstrates the seventh, a bi-modal distribution.

Table 3 lists the mean responses to all categories in this question. While the mean score for the importance of cost is slightly lower than for the other

categories, the bi-modal distribution of this variable suggests that the importance of cost as an outcome is important, but not for everybody.

Table 3: Mean responses to importance of specific AT outcomes, product developers	
Category	Mean
Change in performance or function	4.5
Cost	3.7
Usage: Why or why not used	4.2
Consumer satisfaction	4.6
Increased life participation	4.2
Improved quality of life	4.4
Clinical result/goal achievement	4.1

Research question #3. How frequently do product developers use specific strategies to measure outcome during development?

  Table 4 lists the frequency reported by the product developers for their use of specific strategies. The results are not surprising. Formal research designs are the least frequently employed strategies for this group. While it is difficult to compare the results of the open ended question responses of the federally funded researchers with the Likert-like scale responses from the survey, the PI's reported using single subject designs 36% of the time and group comparison designs 58% of the time (see Table 1). Interesting, however, was one comment from a respondent from the federally funded group. That researcher, receiving SBIR funding, complained about how difficult it was to set up a solid research design to meet the requirements of the grant. She felt strongly that there are not adequate resources available for small businesses to achieve consulting services at reasonable costs.

Table 4: Frequency of methodology use, product developers			
	Not at all	Less than half of the time	More than half of the time
Testing in lab by developers	12.5%	12.5%	75%
Focus groups of providers	25%	30%	44%
Focus groups of persons with disabilities	17.5%	32.5%	48%
User usability testing in lab	22.5%	22.5%	55%
General field testing soliciting feedback from persons with disabilities	10%	15%	75%
General field testing soliciting feedback from providers	20%	17.5%	62%
Formal research: Single subject design	45%	15%	35%
Formal research: Group comparison design	45%	10%	37%
Other	0%	0%	0%

Research question #4: How frequently do product developers use specific types of formal instrumentation to quantify outcome?

Table 5 contains the aggregated response data from the question, "If you have used formal instrumentation as a form of quantifying outcome during product development, how frequently have you used…?" for those who responded that they used formal instrumentation.
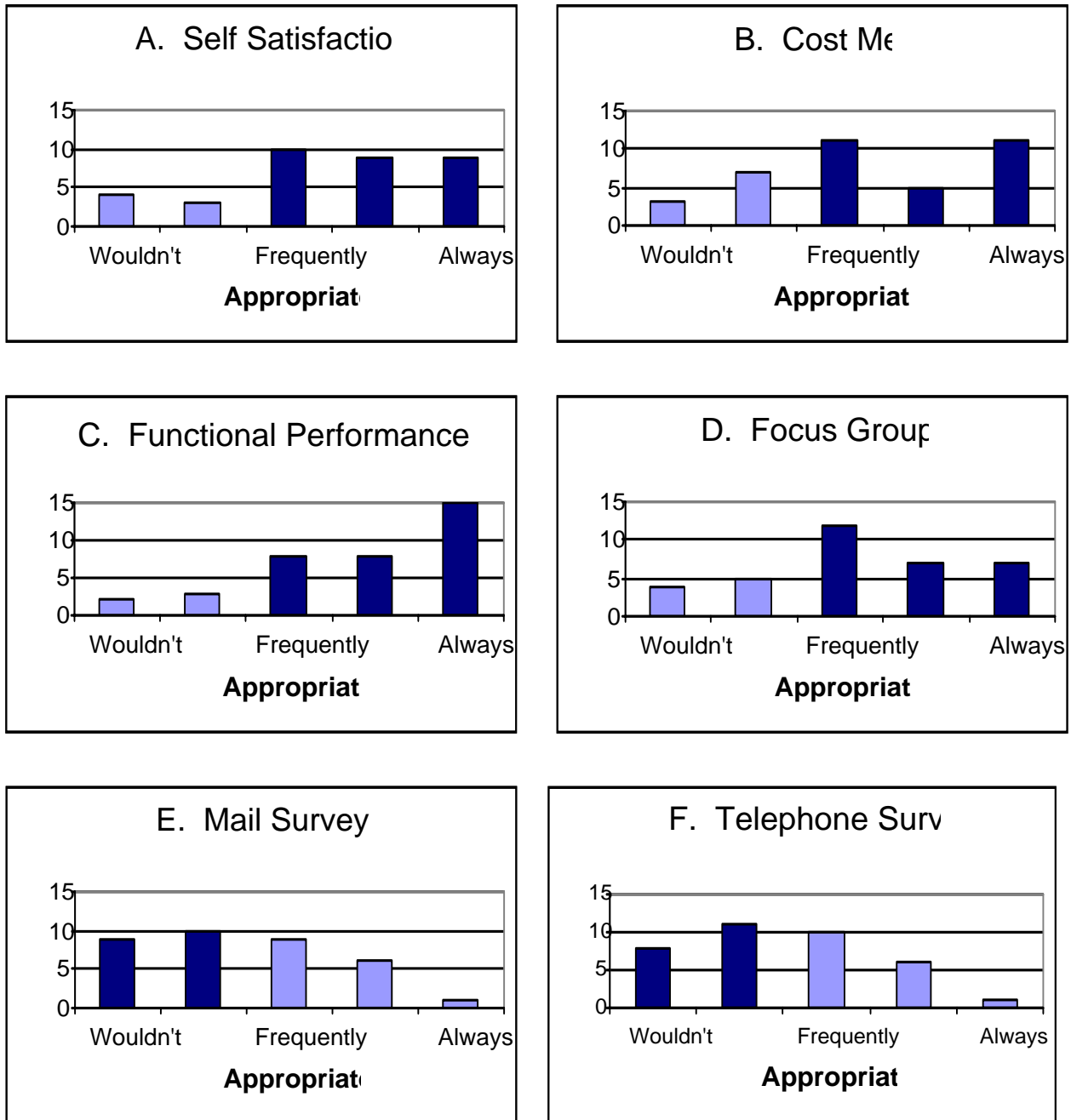
Table 5: Frequency of use of formal instrumentation during product development for commercial product developers				
	Did not use	Less than half of the time	More than half of the time	
Standardized measure of functional performance	47.5%	12.5%	40%	100%
A "homemade" or adapted measure of improved functional performance	35%	15%	50%	100%
A measure of client satisfaction	25%	7.5%	67.5%	100%
A measure of cost	20%	22.5%	57.5%	100%
Other	0%	0%	0%	0%

Not surprisingly, standardized measures are infrequently used by commercial manufacturers. This is compared to a 70% use rate for the federally funded projects (see Table 1). Clearly, client satisfaction dominated as the type of instrumentation used by these manufacturers.

Returning to the issue of cost, it is interesting that cost is reported as being used so frequently, despite it's low ranking on the importance dimension (commercial product developer research question #1, above). Considering that the survey question asks about use of formal instrumentation, it could be argued that cost data is much easier for commercial manufacturers to get their hands on.

Research question #5: How do product developers perceive the appropriateness of different types of standardized instrumentation?
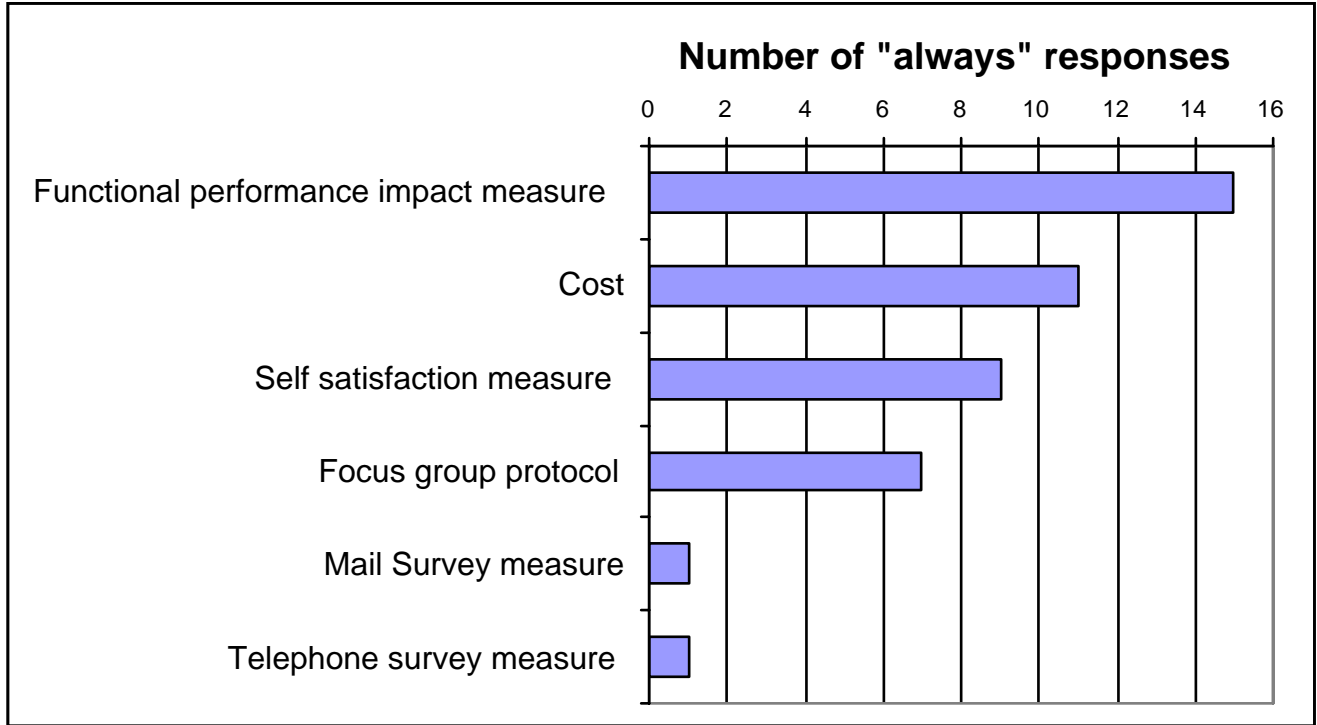
Figure 2 shows the commercial product developers responses to the question, "If standardized instrumentation were available for each of the following outcomes, How appropriate would each of the following be for your product development?"

A. Self Satisfactio

B. Cost Me

C. Functional Performance

D. Focus Group

E. Mail Survey

F. Telephone Surv

Figure 2: Appropriateness of each type of standardized instrumentation, if available, for commercial product developers

Commercial product developers felt that self-satisfaction measures, cost measures, functional performance measures and focus group protocols would all be appropriate measures for them if standardized instrumentation were available. The mail

---

www.r2d2.uwm.edu

and survey measures were not considered as useful. These findings reflect the "hands-on" perspective of manufacturers with less of a mandate for longer-term follow-up, presumably the function of mail and telephone surveys. Figure 3 shows the rank ordering of the categories when focusing only on those who responded "always" for potential use of each of the types of standardized instrumentation.   It appears that standardized instrumentation for change in functional performance would be useful for product developers.

Number of "always" responses

Functional performance impact measure		15
Cost		11
Self satisfaction measure		9
Focus group protocol		7
Mail Survey measure		1
Telephone survey measure		1

Scale: 0 2 4 6 8 10 12 14 16

Figure 3: Number of product developers responding "always" (giving a score of 5) for potential use of each type of standardized instrumentation if available

Research question #6: How would product developers use valid outcome data?

Figure 4 shows the distribution of responses to the question, "If you had valid outcome data about your products, how likely would you be to use it for the following business purposes?" The lines on each graph separate the responses and form two general categories, "wouldn't be used much" and "would be used a lot."
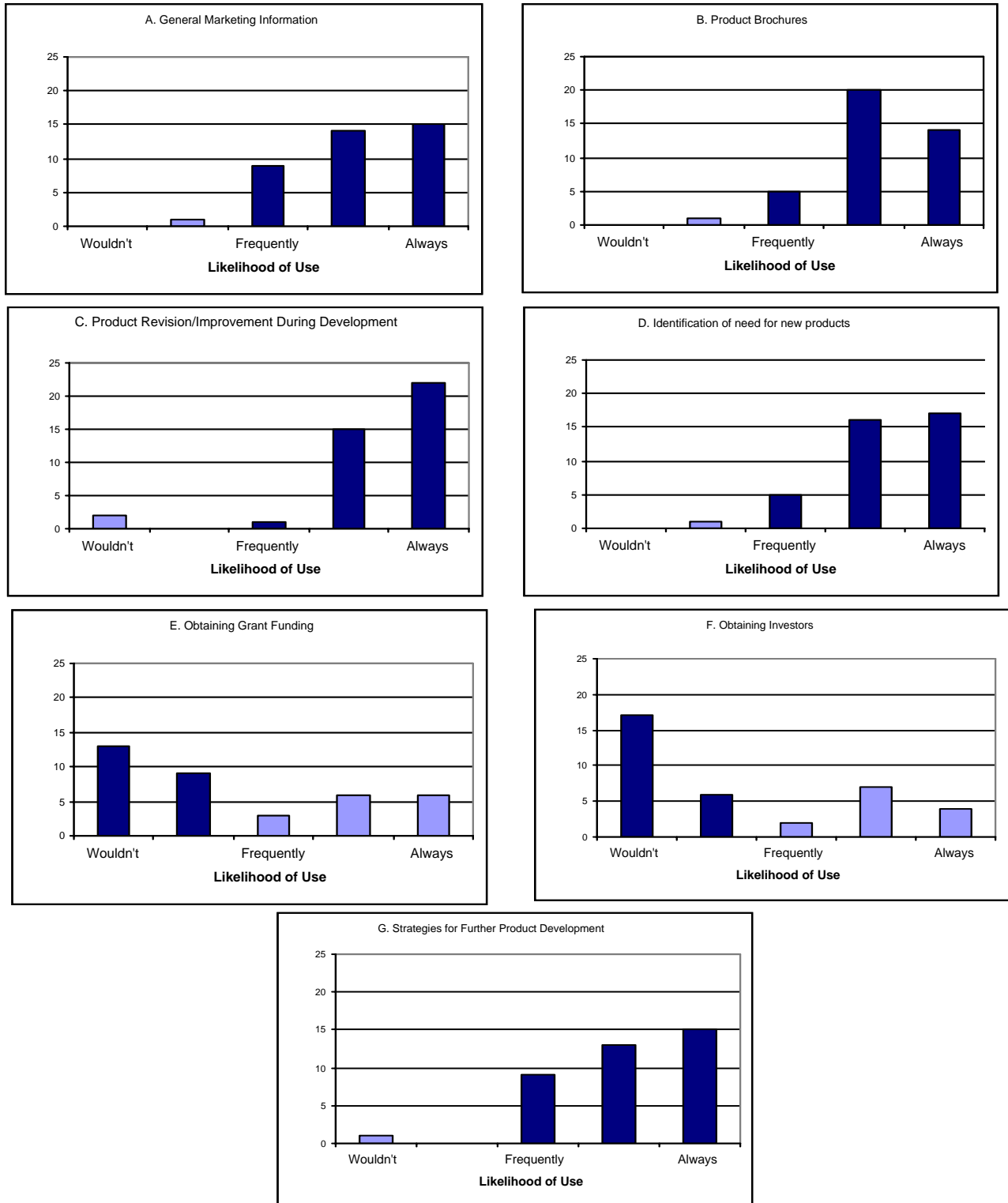
Figure 4: Commercial product developers likelihood of use of valid outcomes data if available

This shows that if valid outcomes data were available, commercial product developers would most likely use it for advertising and product development. It does not appear that there is a strong interest by this group to use it for funding or monies acquisition.

Discussion

This study investigated the current use of outcomes measures by federally funded investigators and the use and perception of outcomes measures by commercial developers of AT. A specific limitation of this study was the low response rate for the commercial product developers. Compared to federally funded projects, commercial developers did not use standardized methodology or instrumentation as frequently. However, they did express an interest in outcomes. The reporting of the use of homemade measures of functional performance and client satisfaction measures represent their current efforts to keep the consumer in mind as they advance their technological solutions. They acknowledge that standardized outcomes data would be useful and relate that they would use standardized outcomes data if it was available. This is an important first step in attempting to quantify how a previously unheard from stakeholder group feels about outcome measures and their assistive technology products.

Implications for:

Next generation outcome measurement system; Product developers have an interest in AT outcomes measurement and need to be included as one of the stakeholders in the AT service delivery system. Both their contribution to outcomes data collection and their use of AT outcomes data need to be considered in this process.

Researchers: There has been limited research as to the concerns of AT product developers in the past. Researchers should view this study as an important first step in considering the opinions and needs of this group and should be aware of the need to include this group in future research. Additionally, it appears that for product developers, the development of formal outcomes measurement is highly desirable.

Consumers: The results of this study indicate that product developers have a significant interest in the outcomes of the products they create. Consumers need to provide their experiences with products to the manufacturers to continue to develop AT equipment that works for the individual.

References

ABLEDATA. *Directory of Manufacturers and Distributors*. Retrieved May, 2002, from
http://www.abledata.com/.

DeRuyter, F. (1998). Concepts and rationale for accountability in assistive technology, *Volume I: RESNA resource guide for assistive technology outcomes: Measurement tools* (pp. 2-14). Arlington, VA: RESNA.

National Institutes of Health. *CRISP - Computer Retrieval of Information on Scientific Projects*. Office of Extramural Research. Retrieved May, 2002, from the World Wide Web: http://crisp.cit.nih.gov/

National Rehabilitation Information Center. *NIDRR Program Directory*. Retrieved May, 2002, from the World Wide Web: http://www.naric.com/search/pd/

Acknowledgment