Automated Pairing of Clients to Job Opportunities based on a Quantitative Assessment of Skills and Abilities

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Open Avenues

Headquartered in Rogers, Arkansas, Open Avenues (OA) is a non-profit organization that helps enable adults with disabilities in the Northwest Arkansas area. Their services include transportation to and from their facility, classroom teaching for lesser-enabled clients, assembly jobs within their facility, and placement in jobs within community businesses for clients.

Transportation	Classroom	Facility Jobs	Community Jobs

Clients typically begin their journey at Open Avenues within the facility, learning valuable work skills through the assembly line processes used. Clients who demonstrate a readiness and willingness to move outside of the facility go through a process to place them in opportunities that match their capabilities.

1 Clients work in OA facility, receiving job training and education

2 OA staff determine a client is prepared to venture into community employment

3 Clients work with the Community Employment Manager to identify jobs using Indeed

4 Clients begin their roles and are assisted by their job coaches for three months

Community Job Placements for Clients

OA asked us to develop a system that would be able to efficiently find occupations that fit a specific client's skills and abilities, thus helping clients retain jobs longer. We found three main areas of improvement within the community jobs placement process.
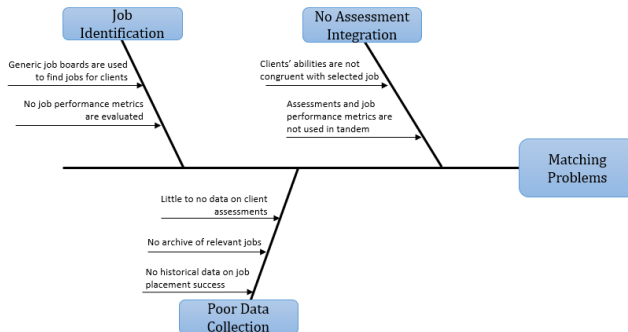
Our Approach

We decided that a Microsoft Excel decision support tool with three overarching requirements would be the most efficient way to create this system. Each requirement has sub-requirements to help create a system designed specifically for OA needs.

Functionality	45%
Quantitative Matching Algorithm	22.5%
Fitting of Assessment and ONET Data	15%
Ranking of Relevant Opportunities	7.5%

Database	25%
Occupational Data Incorporation	12.5%
Client Assessment Record Storage	7.5%
Community Job Availability	5%

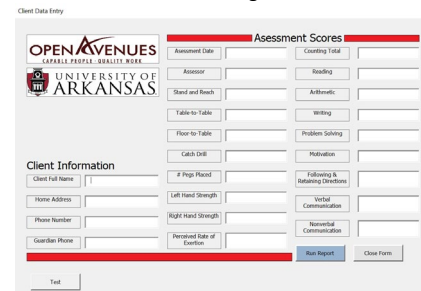| User Interface	30%
Client Data Entry Form	12.5%
Error Prevention	7.5%
Instructions	5%
Job Addition	5%

ONET Jobs Database

ONET, a US Department of Labor sponsored organization, holds a database of quantitatively assessed jobs. These jobs were filtered to client-relevant occupations by our team and specific metrics from the database were selected and paired with assessment metrics.

Assessment Metric	Task	OA Scale	Associated O*NET Ability
Hand – Eye Coordination	Peg Placing	0-10	Manual Dexterity
Multi-Limb Coordination	Catch Drill	0-9	Multi-Limb Coordination
Counting	Count Shapes	0-10	Information Ordering
Arithmetic	Math Problems	0-22	Number Facility
Verbal Communication	Evaluator Decision	0-2	Oral Comprehension
Reading	Read Sentences	0-14	Reading Comprehension
Writing	Write Sentences	0-7	Writing
Problem Solving	Puzzles	0-21	Critical thinking
Follow/Retain Direction	Evaluator Decision	0-6	Active Listening

Job Title	Active Listening	Critical Thinking	Dynamic Strength	Extent Flexibility
Cashiers	2.88	2.62	1.25	2.12
Cooks, Fast Food	2.38	2.38	1.88	2
Cooks, Institution and Cafeteria	3	2.88	2	2.12
Cooks, Private Household	2.88	3	2	2.5
Cooks, Restaurant	3	3	2	2.75

Client Data Collection

The tool allows OA to more easily and efficiently store client information relating to their personal and skills/assessment data through user forms.
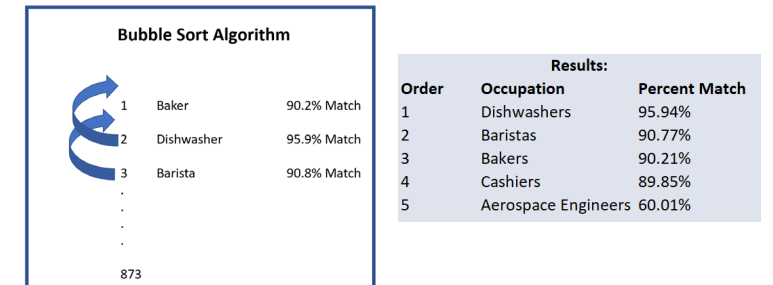

Matching Algorithm

The actual matching algorithm uses a selected client's data and calculates the percent difference between their scaled assessment score and the required score for each given category in an occupation. It iterates through each occupation in the database, averaging the percent match values of each category, and then averages the overall occupation percent match.

Client Name	Patrick Dougherty	Occupation	Dishwashers
Active Listening	2.33	Active Listening	2.25
Critical Thinking	0.33	Critical Thinking	0.33
Dynamic Strength	3.00	Dynamic Strength	3.00
Extent Flexibility	1.75	Extent Flexibility	1.75
Information Ordering	1.17	Information Ordering	1.17

	% Match
Active Listening	100.0%
Critical Thinking	15.7%
Dynamic Strength	100.0%
Extent Flexibility	63.6%
Information Ordering	55.0%
Average	66.9%

Result Collection

Using a pre-defined user selection, the tool displays the specified number of occupations in order from highest overall percent match to lowest by using a bubble sort algorithm.

Bubble Sort Algorithm

1	Baker	90.2% Match
2	Dishwasher	95.9% Match
3	Barista	90.8% Match
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873		

Results:

Order	Occupation	Percent Match
1	Dishwashers	95.94%
2	Baristas	90.77%
3	Bakers	90.21%
4	Cashiers	89.85%
5	Aerospace Engineers	60.01%

Impact

In a normal year, Open Avenues can expect to successfully place 40 clients into community jobs. While the quantitative impact of this system is not known precisely, Open Avenues can expect to place between 10-35% more clients leading to a respective increase in funds from the state.

Increase in Clients Retained	Additional Number of Placements	Funding Increase
10%	4	$22,000
15%	6	$33,000
20%	8	$44,000
25%	10	$55,000
30%	12	$66,000
35%	14	$77,000