## Integrating Implementation Measurement into a Stage Model of Digital Intervention Development

<table>
<thead>
<tr>
<th>Construct</th>
<th>Stages of Intervention Development Most Relevant*</th>
<th>Intended Recipient</th>
<th>Measure</th>
<th>Citation</th>
<th># items</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Implementation Outcomes</strong></td>
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</tbody>
</table>
| Acceptability | Stages 1-5 | Client | • Unified Theory of Acceptance and Use of Technology Questionnaire 2 (UTAUT2)  
• All items measured on a 7-point Likert scale: Strongly Disagree-Strongly Agree  
| | | | • Acceptability of Intervention Measure (AIM)  
• All items measured on 5-point Likert scale: Completely Disagree-Completely Agree  
| | Stages 1-5 | Provider/Administrative Stakeholder | • Unified Theory of Acceptance and Use of Technology (UTAUT)  
• Original article does not provide information about item scales or scoring, we recommend using a 7-point Likert scale: Strongly Disagree-Strongly Agree for all items  
• Measure can be scored by calculating subscale means or totals | Venkatesh V, Morris MG, Davis GB, Davis FD. User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*. 2003;27(3):425-478. | 31 |
| | | | • Acceptability of Intervention Measure (AIM)  
• All items measured on 5-point Likert scale: Completely Disagree-Completely Agree  
| Appropriateness | Stages 1-5 | Client and provider/admin stakeholder | • Intervention Appropriateness Measure (IAM)  
• All items measured on 5-point Likert scale: Completely Disagree-Completely Agree  
| Costs | Stages 3-5 | Client | • Drug Abuse Treatment Cost Analysis Program (DATCAP) - Client  
• Used to calculate costs incurred by patients receiving inpatient or outpatient substance use treatment.  
• Instrument interpreted by calculating total costs associated with attending treatment.  
• Can be used for evaluating cost-effectiveness.  
• European Quality of Life Measure – 5 Dimension – 3 levels (EuroQOL-SD-3L)  
• Items 1-5 are measured on a 3-point Likert scale: no problems-extreme problems. Item 6 asks the participant to rate their health on a scale of 0-100  
• Can be used for evaluating cost-effectiveness  

* *MIS Quarterly* is a peer-reviewed journal that publishes original research on the management of information systems and the use of technology in organizations. *Implementation Science* is a journal that publishes research on the implementation of healthcare innovations and technologies.
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<th>Characteristics</th>
<th>Perceived Intervention Characteristics</th>
<th>Usability</th>
<th>Stages 1-5</th>
<th>Client and Provider</th>
<th>• Fidelity</th>
<th>• Penetration</th>
<th>• Sustainability</th>
<th>Provider/Admin Stakeholder</th>
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<td>• Non-Study Medical Services</td>
<td>• Program Sustainability Assessment Tool</td>
<td>• System usability Scale (SUS)</td>
<td>Provider/Admin Stakeholder</td>
<td>• Brief Drug Abuse Treatment Cost Analysis Program (Brief DATCAP)</td>
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<td>• Penetration is defined as the reach of a given intervention within a service setting or system. Penetration can be calculated as the number of eligible persons who use an intervention divided by the total number of persons eligible for the intervention. Penetration can be assessed at both client/patient/consumer and provider levels. Tracking features can be integrated in software to monitor digital intervention reach.</td>
<td>• Program Sustainability Assessment Tool</td>
<td>• All items measured on a 7-point Likert scale: Little or No Extent - Very Great Extent, with the option to select not able to answer.</td>
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<td>• Used to measure service utilization and costs incurred by patients outside of services provided by the study</td>
<td>• Perceptions of Computerized Therapy Questionnaire-Patient</td>
<td>• Directions for scoring provided by authors, requires conversions</td>
<td>Client Provider/Admin Stakeholder</td>
<td>• Perceived Intervention Measure (FIM)</td>
<td>• Fidelity is defined as the degree to which an intervention is implemented as intended. This implementation outcome will vary by intervention. With digital interventions, tracking features can be integrated in software to allow for tracking of usage to automatically monitor fidelity (e.g., # logins, time on program, areas visited and how long, etc.) Digital interventions can also be specifically developed to deliver interventions according to prescribed protocols.</td>
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**Characteristics of Intervention**

**Usability**
- Stage 0
  - Client and provider/admin stakeholder
- • System usability Scale (SUS)
- • All items measured on a 5-item Likert scale: Strongly Disagree-Strongly Agree
- • Directions for scoring provided by authors, requires conversions

**Perceived Intervention Characteristics**
- • Relative Advantage
- • Stages 1-5
  - Client
  - • Perceptions of Computerized Therapy Questionnaire-Patient
  - • All items measured on a 7-point Likert scale: Strongly Disagree-Strongly Agree

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**References**


- Carper MM, McHugh RK, Murray HW, Barlow DH. Psychometric Analysis of the Perceptions of Computerized Therapy

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**Notes**

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- Usability
  - Stage 0
  - Client and provider/admin stakeholder
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**Tables and Figures**

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- Table: Perceived Intervention Characteristics
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<td>Measure is scored by calculating subscale means</td>
<td>Moore GC, Benbasat I. Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation. Information Systems Research. 1991;2(3):192-222. doi: 10.1287/isre.2.3.192</td>
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* Stages of intervention development are based on the Stage Model of behavioral treatment development described in: