Assessing the Motivation of MDs to use Computer-based Support at the Point-of-Care in the Emergency Department

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Acceptance of Clinical Decision Support Systems (CDSS) in practice

Intrinsic motivation
  - Intrinsic Motivation Inventory

Case Study

Results

Discussion
Acceptance of CDSS

- Devices and applications ranging from e-mail, alerts, reminders, PACS systems, to data- and expert-driven decision support

- Focus on the usability of systems
  - E.g. using Technology Acceptance Model (TAM)
    - Perceived usefulness
    - Perceived ease of use
Technology acceptance outside the clinical domain

- Motivation theory
  - Extrinsic
    - Incentives and rewards
  - Intrinsic
    - Inherent satisfaction a person derives from an activity

- Self-determination theory
  - Intrinsic motivation is the core type of motivation underlying participation in many types of activities including those associated with computing
Intrinsic Motivation Inventory (IMI)

- Multidimensional scale intended to assess a persons’ subjective experience related to a target activity

- IMI consists of a number of subscales:
  - Interest and enjoyment
  - Perceived choice
  - Perceived competence
  - Value and usefulness
  - Relatedness
  - Pressure and tension
  - Effort
Case study

- Prospective study of the MET3-AE (Mobile Emergency Triage – Asthma Exacerbation) CDSS
  - Treating and managing pediatric asthma patients

- 39 MDs
  - Pediatric Emergency Fellows
  - Senior Medical Residents
  - Staff ED MDs

- Participating MDs used Motion Computing C5 tablet computers
Case study design

- Two questionnaires
  - Part 1:
    - Usability evaluation of the MET3-AE CDSS
  - Part 2:
    - Motivation to use computer-based support at point-of-care measured using IMI tool
Usability: MET3-AE CDSS

- 60% of MDs found data collection using MET3-AE quicker than pen and paper and 20% found no noticeable difference between the two methods.

- 80% found the system very easy or easy to navigate.

- 100% found data entry features very intuitive or intuitive.

- 80% felt all the functionality they required, or anticipated requiring, was available in MET3-AE; whereas 20% of users were not sure how MET3-AE managed saved data.

- Overall experience: 40% found MET3-AE very easy or easy to use and 40% rated the experience as average.

- System is efficient, effective, and easy-to-use as per ISO definition of usability.
IMI: Interest and enjoyment

- Mean score of 5.58 (7)
  - Enjoyment is considered the most integral factor of intrinsic motivation
  - MDs find computer usage enjoyable and interesting and is a positive sign for the adoption and continued usage of computer-based support
IMI: Value and usefulness

- Mean score of 5.22 (7)
  - MDs value clinical applications that they are most familiar with
  - MDs find mobile devices valuable and useful
  - Positive predictor for CDSS acceptance

<table>
<thead>
<tr>
<th>Application</th>
<th>V&amp;U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browsing medical websites</td>
<td>5.97</td>
</tr>
<tr>
<td>Searching online repositories</td>
<td>4.22</td>
</tr>
<tr>
<td>Creating/ modifying documents</td>
<td>5.69</td>
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<tr>
<td>Creating/ modifying spreadsheets</td>
<td>4.1</td>
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<td>Sending and receiving email</td>
<td>6.94</td>
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<tr>
<td>Viewing images on PACS</td>
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<tr>
<td>Using clinical repositories/EHRs</td>
<td>6.03</td>
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<td>Research databases/statistics s/w</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Tablet functions</th>
<th>V&amp;U</th>
</tr>
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<tbody>
<tr>
<td>Digital pen</td>
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<tr>
<td>Data entry</td>
<td>4.7</td>
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<tr>
<td>Access to EHR</td>
<td>4.73</td>
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<tr>
<td>Use at bedside</td>
<td>4.94</td>
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</table>
**IMI: Effort**

- **Mean Score of 3.2 (1)**
  - Overall the device was relatively easy to use
  - Easiest feature to use was the digital pen
  - Most difficult was data entry and accessing EHR

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<tr>
<td>Digital pen</td>
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<tr>
<td>Data entry</td>
<td>3.3</td>
</tr>
<tr>
<td>Access to EHR</td>
<td>3.26</td>
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<tr>
<td>Use at bedside</td>
<td>3.06</td>
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</table>
IMI: Perceived competence

- Mean IMI score of 4.26 (7)
  - Second lowest score
  - Considered themselves somewhat more competent than their peers - 4.5 (7)
  - Relatively low prior exposure to computer-based support - 3.83 (7)
  - Negative predictor for CDSS acceptance

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<tbody>
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<td>Browsing medical websites</td>
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<td>Searching online repositories</td>
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<tr>
<td>Creating/modify documents</td>
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<td>Creating/modify spreadsheets</td>
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<td>Sending and receiving email</td>
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<td>Using clinical repositories/EHRs</td>
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<td>Research databases/statistics s/w</td>
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</table>
IMI: Pressure and tension

- Mean score of 6.33 (1)
  - Lowest score recorded in the study
  - MDs feel significant pressure and tension using computer based support
  - Negative predictor for the acceptance of CDSS
## IMI: Overall

<table>
<thead>
<tr>
<th>IMI Subscale</th>
<th>Mean IMI Score (Ideal Score)</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest and enjoyment (I&amp;E)</td>
<td>5.58 (7)</td>
<td>1.13</td>
</tr>
<tr>
<td>Value and usefulness (V&amp;U)</td>
<td>5.22 (7)</td>
<td>1.34</td>
</tr>
<tr>
<td>Effort (E)</td>
<td>3.2 (1)</td>
<td>1.4</td>
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<tr>
<td>Perceived competence (PC)</td>
<td>4.26 (7)</td>
<td>1.23</td>
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<tr>
<td>Pressure and tension (P&amp;T)</td>
<td>6.33 (1)</td>
<td>1.9</td>
</tr>
</tbody>
</table>

Mean scores across all IMI subscales
Case study limitations

- One centre
- One CDSS
- One type of mobile device
- One clinical group
- No control group
- No observational study (infeasible to implement)
Conclusions

- Positive predictors for CDSS acceptance
  - MDs perceive computer-based support to be interesting, enjoyable, valuable, and useful
  - Mobile devices are, in general not considered obstacles

- Negative predictors for CDSS acceptance
  - Pressure and tension when asked to use technology at point-of-care
  - Pressure emanates from limited prior experience with computer-based support in practice

- Implications for practice
  - Invest in training MDs with the underlying technology of computer-based support and not just specific CDSSs
Recommendations

- Expand usability analysis of CDSS to assess subjective factors that intrinsically motivate MDs to use computer-based support
  - IMI or similar tools

- Good practice in CDSS design
  - “Examine clinicians’ intrinsic motivation to use a system before commencing design and implementation of CDSSs”
Thank you.
Please visit MET research at:
http://www.mobiledss.uottawa.ca/site/