**Old & new research interests**

- What a user wants
- What a user does
- What a user understands
- How a system/service/application supports this

But also:
- The user experience (what a user feels, thinks, motives, etc.)
- The user context (social, physical, etc.)
- The dynamics between experience, context and earlier research interests

**Challenges in usage & usability studies**

- More to study (scope & results), with limited resources
  - More complex and larger applications, services
  - Multiple devices used
  - Multiple target groups
  - Multiple research interests
  - Data or study management
- Different data gathering requirements
  - Over longer periods of time
  - In real life situations (in situ, in context without explicit task description)
  - Qualitative & subjective as well as quantitative & objective (or combinations of these)
  - Larger number of participants
  - Unobtrusive
  - Keeping control over data gathering (focused, statistically valid)
  - Capture dynamic or changing variables (from multiple sources)
  - Capture data at different abstraction levels
- Different data analysis requirements
  - Complex data transformation for analysis (different sources & different data levels, over multiple participants)
  - Large and more complex cause and effect relations (qualitative as well as quantitative and combinations of these)
- Different data reporting requirements
  - Visualizations of analysis and results

**Framework** (more info/results will be made available soon on www.usage.nl)

<table>
<thead>
<tr>
<th>Difficulties</th>
<th>Solutions</th>
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<tbody>
<tr>
<td>Logging: capturing critical events is hard because they are sparse &amp; difficult to sense. Critical incident capturing is needed in situ, unobtrusive with large number of participants (Monkoff &amp; Carter, stages 1, 2 and 6)</td>
<td>Participant does capturing; Manual sensing; No interruptions, high feedback; Participants in context (Monkoff &amp; Carter, stages 1, 2 and 6)</td>
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<tr>
<td>Interpretations of logs (mixed events, missing system response to user actions, reducing data volume, techniques for summarizing and analysis &amp; bug reporting mechanisms) (Hartman, stages 5, 6 &amp; 7)</td>
<td>Use usability engineering methodology to plan all design cycles and implement logging and further analysis (e.g. interviews, observation) based on that (Schwarz, stages 1, 2, 3, 4, 5, 6 &amp; 7)</td>
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<td>In situ measurements, capture qualitative information (privacy concerns), easy and effective annotation of browsing, longitudinal evaluation, data analysis and visualization (Hawkey, stages 5, 6 &amp; 7)</td>
<td>Useability engineering methodology to plan all design cycles and implement logging and further analysis (e.g. interviews, observation) based on that (Schwarz, stages 1, 2, 3, 4, 5, 6 &amp; 7)</td>
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<td>Observations are too time consuming and not detailed enough, analyze usage in context, gather qualitative data like habitual patterns (Hawken, stages 5, 6 &amp; 7)</td>
<td>Electronic task diary, task categorization tool, logging page visits (Kellar &amp; Watters, stages 5, 6 &amp; 7)</td>
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<td>Multiple contexts, in situ measurements, multiple user groups, mobile usage (Thurmer, stages 5, 6 &amp; 7)</td>
<td>Combining qualitative &amp; quantitative methods throughout the design cycle (Schwarz, stages 1, 2, 3, 4, 5, 6 &amp; 7)</td>
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<td>Combining mobile activity logging with questionnaires, interviews and screen capturing (Thurmer, stages 5 &amp; 6)</td>
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<td>In situ measurements, Experience Sampling Method, application(s) usage logging &amp; physiological measurement (e.g. heart-rate variability) via an integrated platform (Van Esch, stages 5 &amp; 6)</td>
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<td>Combining activity logging with screenshots &amp; follow-up interview, (Rodden, stages 5 &amp; 6)</td>
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<td>Measurements in multiple contexts, questionnaires, client side logging, electronic diary (for privacy annotation), semi-automated classifications, multiple viewpoint visualization &amp; analysis tools (Hawkey, stages 5 &amp; 6)</td>
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<td>Log at architectural boundaries (defined by Snarf), capture all commands &amp; register changes in application, combine logging with triggered audio/video recordings (Hartman, stages 5 &amp; 6)</td>
<td>Automatic identification of related events, multiple linked visualizations, multiple file support (simultaneous users, observer notes, screen/video capturing), automatic identification of event groups &amp; eye tracking (Hartman, stages 5 &amp; 6)</td>
</tr>
</tbody>
</table>

**Increased system, application & service complexity**

- Increased interconnectness
- Increased and easier information exchange between applications and services (distributed services, service bundles)
- Increased functionality support

**Usage analysis: Combining logging and Qualitative Methods**