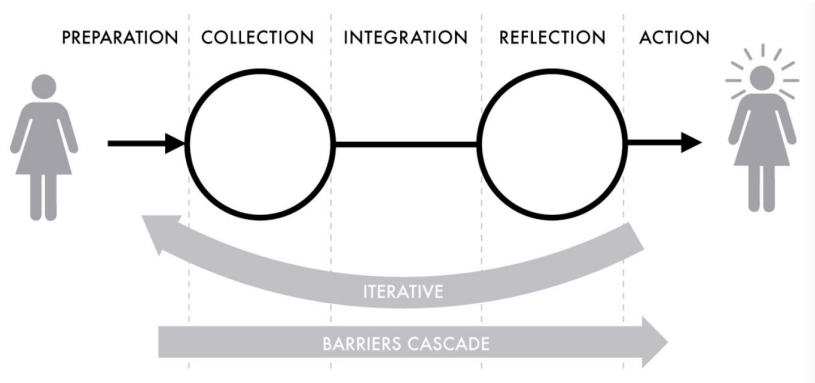# Integration

Discussion Lead: Xi Lu

Integration Stage

Based on Li's stages model of personal informatics, the integration stage is " where the information collected are prepared, combined, and transformed for the user to reflect on. pg 561 [1]"

| Integration Barriers	Example Quote
Transcribing data (10/68)	"It'd be neat if I could graph it straight from the website instead of manually typing in the data to a spreadsheet" P41
Organization (8/68)	"Collecting is simple. Organizing it takes some time." P29
Scattered visualizations (4/68)	"A bit cumbersome going to so many different sites [for visualizations]" P6
Multiple inputs (3/68)	"Difficult to keep organized because sometimes data are kept in separate places" P31

Table 3. Integration barriers.

[Health Mashups: Presenting Statistical Patterns between Wellbeing Data and Context in Natural Language to Promote Behavior Change](#)

This study designed a mobile app by using the natural language to present complex patterns between personal data (weight, sleep, step count, calendar data, location, weather, pain, food intake, and mood) and context over time.

The paper argues that:

- While some commercial services allow user to import data from multiple sensors, they usually don't provide any feedback based on the combination of different personal data.
- Users sometimes have difficulty in interpreting data and getting insights on their own, especially for long-term data. " *Many lack the ability to understand and apply data from graphs.* [2]"
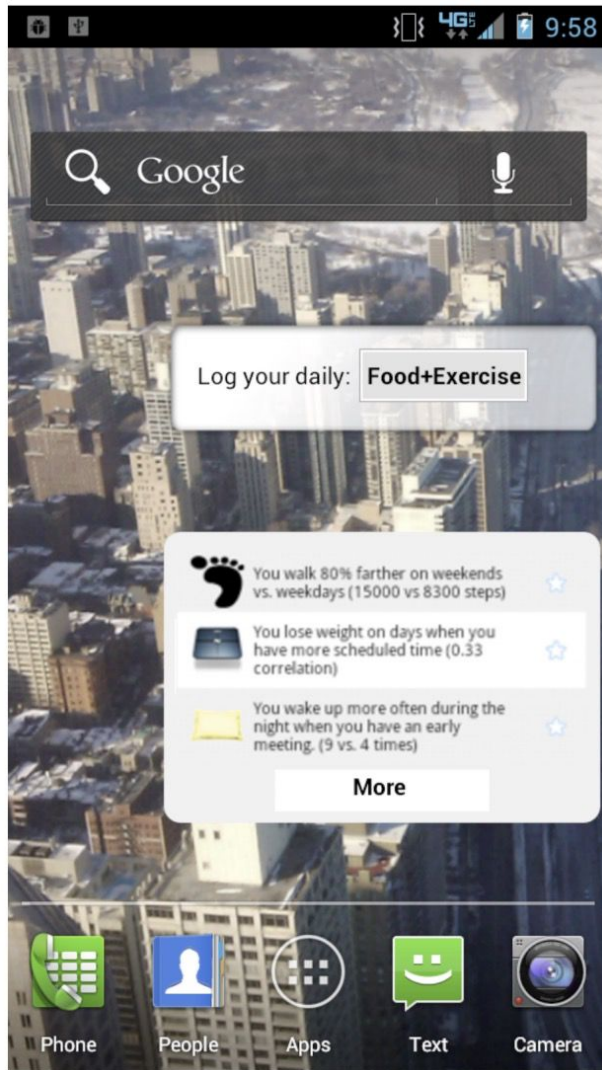
The app presented patterns as a natural language feed to a mobile phone widget
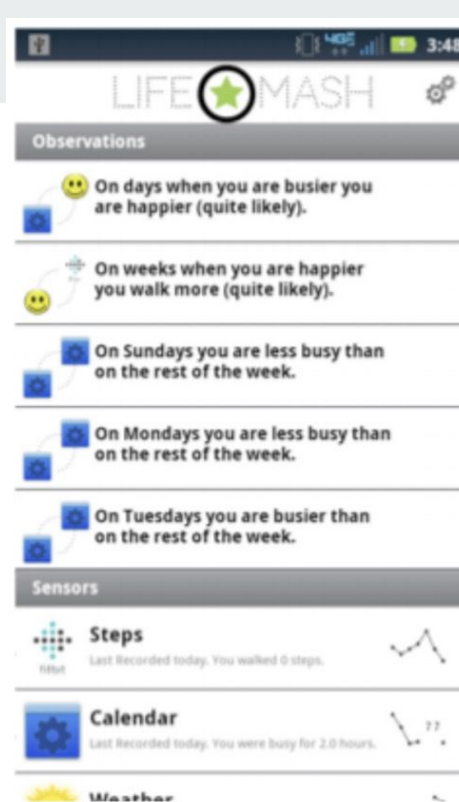
You can see how the mobile app present patterns in a natural language. "On days you are happier it is warmer." (mood & temperature) "On days you are busier you are happier. (mood & step)"

LIFE ★ MASH

Welcome

Here are your significant observations:

📶 Weight (based on 455 readings): ⬇

Average: 152.9 lbs

Significant differences occur over time on these days of the week:

Sundays	Mondays	Tuesdays	Wednesdays	Thursdays	Fridays	Saturdays
▲ 0.39 lbs	▲ 0.15 lbs	▲ 0.14 lbs	0.22 lbs ▼	0.19 lbs ▼	0.2 lbs ▼	

The past week:

Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Yesterday
2.61 lbs ▼	2.94 lbs ▼	2.61 lbs ▼	1.94 lbs ▼	1.61 lbs ▼	2.61 lbs ▼	3.38 lbs ▼

You weigh more when:

🖥 you are busier

🙂 you are less tired

You weigh less when:

⬆ you walk more

🌞 it is warmer

🙂 Mood (based on 273 readings): ⬇

Average: 65.6 %

Significant differences occur over time on these days of the week:

Sundays	Mondays	Tuesdays	Wednesdays	Thursdays	Fridays	Saturdays
▲ 11.69 %	4.35 % ▼	2.76 % ▼	5.84 % ▼	9.09 % ▼		▲ 11.81 %

You are happier when:

⬆ you walk more

🌞 it is warmer

🙂 you are less tired

Last week you were happier than usual.

On weekdays you are less happy than on weekends.

⎙ Sleep (based on 108 readings): ⬇

Average: 8.3 hours

Significant differences occur over time on these days of the week:

Sundays	Mondays	Tuesdays	Wednesdays	Thursdays	Fridays	Saturdays
▲ 0.21 hours	0.24 hours ▼		0.29 hours ▼		▲ 0.15 hours	▲ 0.16 hours

You sleep longer when:

⬆ you walk more

🙂 you are less tired

A web interface that was shown to users at the end to provide a clearer aggregation of the observations.

Their insights related to integration:

- More logs, more accurate observations
- The observations presented by the app increase participant's self-understanding, enabling them to see how diverse aspects are interrelated
- How to present the observation: present "obvious observation" (You walk less on Tuesdays) vs. "educative observation" (Try to walk more on Tuesdays)?

Open mHealth Architecture: An Engine for Health Care Innovation

mHealth: "mobile health, a term used for the practice of medicine and public health supported by mobile devices [4]"

The paper argues that:

- " traditional "stovepipe" approach limits data-sharing with other apps and with electronic and personal health records (EHRs and PHRs) [3]" => open architecture built around shared data standards and the global communication network

mHealth Architecture

Stovepipe — Open. Figure: components of the open hourglass will include at least...
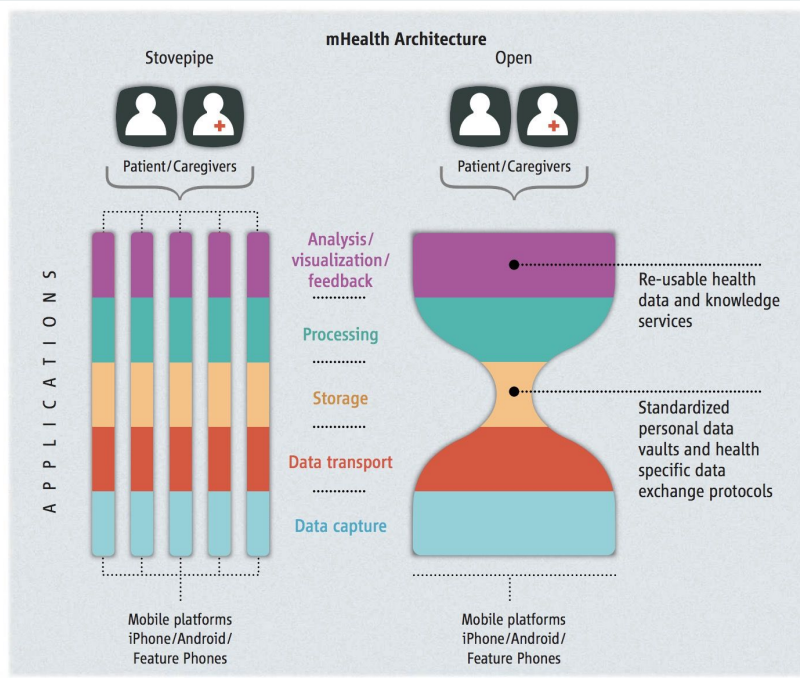
" The narrow waist of the open hourglass will include at least health-specific syntactic and semantic data standards; patient identity standards; core data processing functions such as feature extraction and analytics; and data stores that allow for selective, patient-controlled sharing. **Standards should be common with broader health IT standards whenever possible**.[3]"

Insights related to integration:

" Shared standards and reusable components may enable rapid authoring, **integration**, and evaluation of personal data capture for clinical care and research. [3]"

MyLifeBits: A Personal Database for Everything

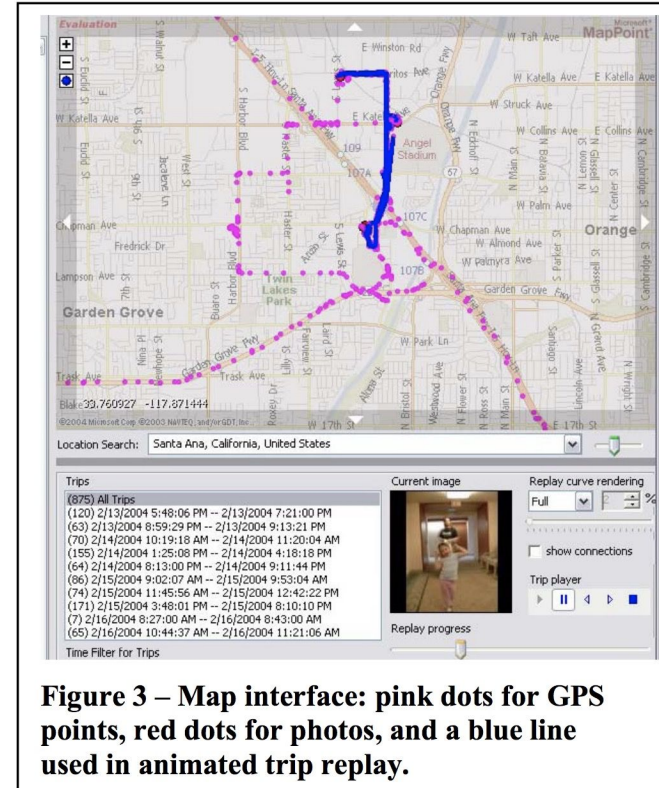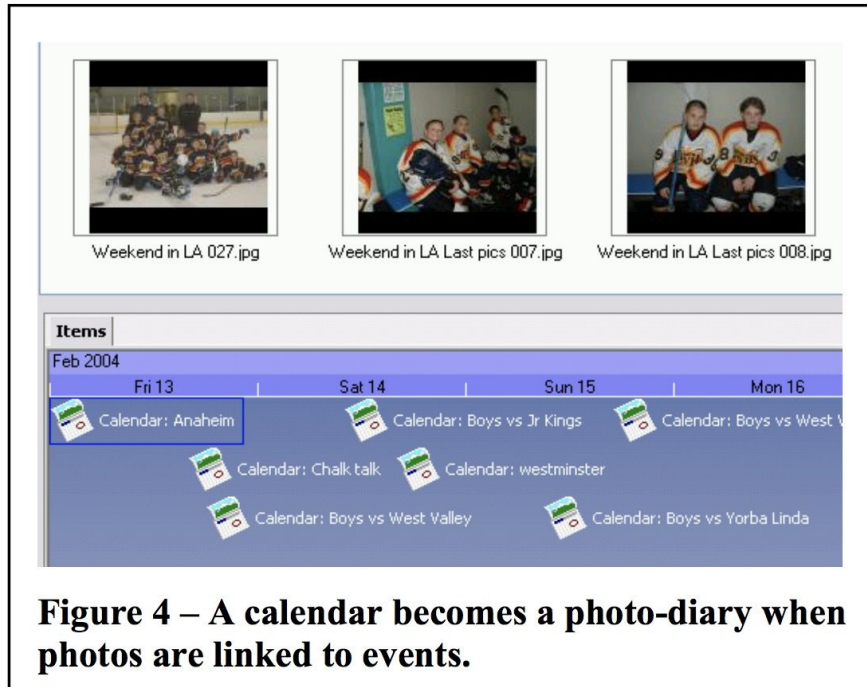This paper introduces a system, MyLifeBits, that intends to store everything that could be captured.

Two parts of MyLifeBits [6]:

1. **The experiment**: Gordon Bell has captured a lifetime's worth of articles, books, cards, CDs, letters, memos, papers, photos, pictures, presentations, home movies, videotaped lectures, and voice recordings and stored them digitally.
2. **The software research**: Jim Gemmell and Roger Lueder have developed the MyLifeBits software, which leverages SQL server to support: hyperlinks, annotations, reports, saved queries, pivoting, clustering, and fast search.

For MyLifeBits: since numerous data are captured and stored, it's important to think about how to present information

Reporting tools with **appropriate visualization** [5]:

Figure 4 – A calendar becomes a photo-diary when photos are linked to events.

Figure 3 – Map interface: pink dots for GPS points, red dots for photos, and a blue line used in animated trip replay.
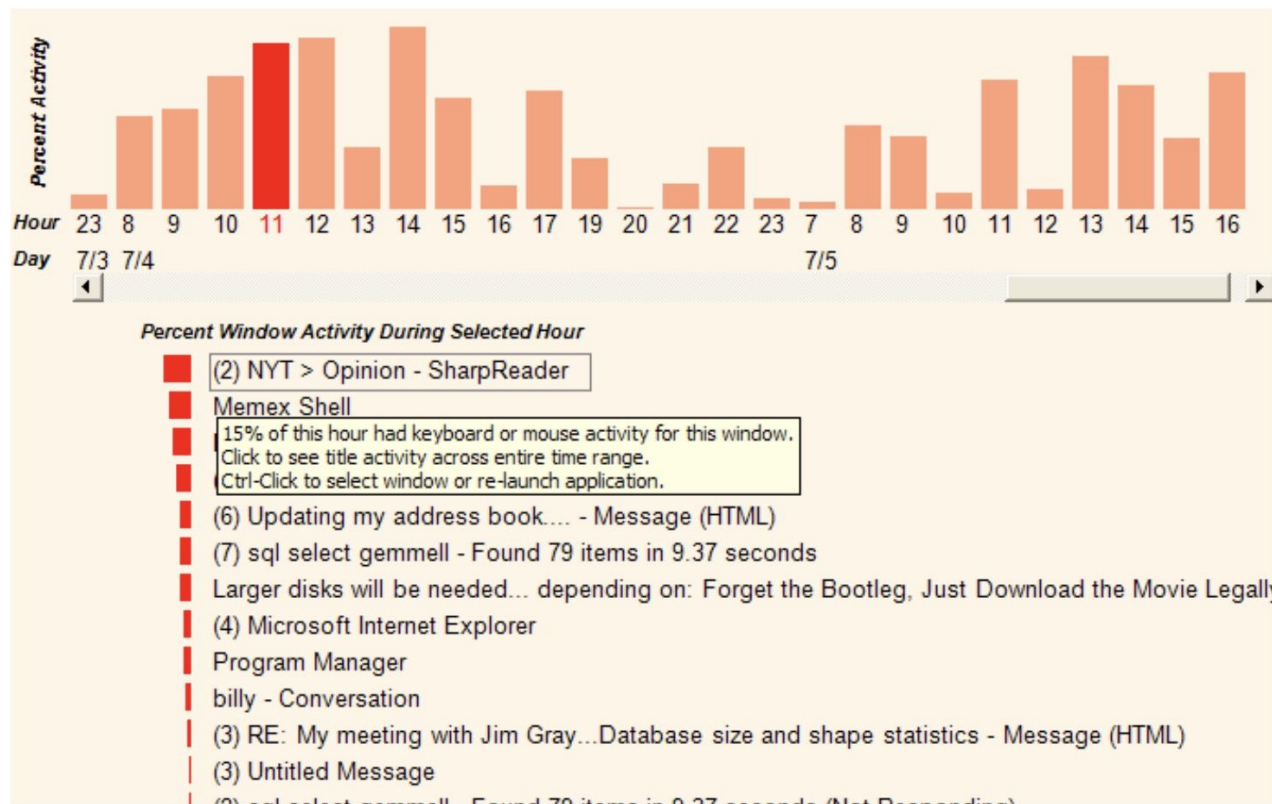
Figure 5 – GUI Activity log on an hourly or daily basis from the PersonalVibe GUI log

mouse and keyboard activities on a hourly and daily basis for each active screen taken from the PersonalVibe GUI log

My takeaway....

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Table 3. Integration barriers.

Going back to this table [1], these three papers all face an integration challenge:

When collecting various personal data, how to find and present patterns between data for users to recognize their behaviors, especially for some activities that they themselves haven't realized before?

- Good visualization
- Explanation/language
- Shared data standard

Reference:

[1] Li, Ian, Anind Dey, and Jodi Forlizzi. "A stage-based model of personal informatics systems." In Proceedings of the SIGCHI conference on human factors in computing systems, pp. 557-566. 2010.

[2] Bentley, Frank, Konrad Tollmar, Peter Stephenson, Laura Levy, Brian Jones, Scott Robertson, Ed Price, Richard Catrambone, and Jeff Wilson. "Health Mashups: Presenting statistical patterns between wellbeing data and context in natural language to promote behavior change." ACM Transactions on Computer-Human Interaction (TOCHI) 20, no. 5 (2013): 1-27.

[3] Estrin, Deborah, and Ida Sim. "Open mHealth architecture: an engine for health care innovation." Science 330, no. 6005 (2010): 759-760.

[4] https://en.wikipedia.org/wiki/MHealth

[5] Gemmell, Jim, Gordon Bell, and Roger Lueder. "MyLifeBits: a personal database for everything." Communications of the ACM 49, no. 1 (2006): 88-95.

[6] https://www.microsoft.com/en-us/research/project/mylifebits/?from=http%3A%2F%2Fresearch.microsoft.com%2Fen-us%2Fprojects%2Fmylifebits%2Fdefault.aspx