Quantifying the Meaning of Interactions on Different Communication Media

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Motivation and Overview

- **There are known differences (and similarities) in the meaning of an interaction on different media**
  [2, 7, 8, 6, 4, 3, 9]
- **Effects:**
  - Event data $\rightarrow$ Social Tie
  - Tie Strength/Meaning
- **How can we move in a principle way from qualitative findings to quantities of use to network analysis?**
- **Today**
  - Exploratory Analysis
  - A three step process from "media bias" to metric: **Observe, Generalize, Quantify**

CASOS

Data Description

- Survey data from the Pew Internet and American Life Project report on "Social isolation and new technology" [5] [1]

- Their question: **Are new technologies shrinking the size of our core discussion networks?**

- Core tie: "especially significant" or "with whom we discuss important matters"

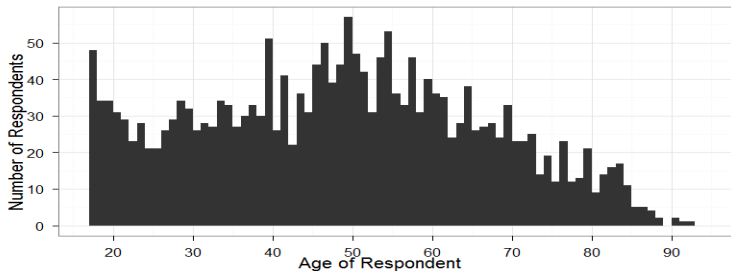- Phone interviews (7/08) of 2,512 adults in households in the continental US

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[1]Disclaimer: This work is not affiliated with Pew

Survey Demographics

- 47% Male, 53% Female
- 76.1% white, 10.2% black, 5.3% Hispanic or Latino

Part I Used

Each respondent names all core ties.
For each tie:

- Features of the relationship
  - type, duration and physical distance
- Frequency of communication via:
  - Face to Face, Email, Text Messaging, Landline, Cell phone, Mail, Instant messaging, Message through a SNS
  - Only have value if person is able to access media
- Demographics
  - age, race and gender

Core Tie Generators

From time to time, most people discuss important matters with other people. Looking back over the last six months — who are the people with whom you discussed matters that are important to you? If you could, just tell me their first name or even the initials of their first AND last names. [RECORD UP TO 5 NAMES] [PROBE: "Anyone Else?"]

Now let's think about people you know in another way. Looking back over the last six months, who are the people especially significant in your life? [IF NECESSARY: By significant, I mean just those who are MOST important to you.] If you could, just tell me their first name or even the initials of their first AND last names. These may be some of the same people you just mentioned or it may be other people. [RECORD UP TO 5 NEW NAMES] [PROBE: "Anyone Else?"]

Relationship Type Generator

People can have many different connections to others. For example, a woman can be your co-worker and also be your neighbor. Or a man could be your brother and also a member of your church. Now, I would like to go through the names you just gave me. Please list all the ways that person is connected to you. How is [INSERT NAME FROM Q10Q17LIST in ORDER] connected to you? [PROBE: What other ways?] [PRECODED OPEN-END; DO NOT READ CATEGORIES; RECORD UP TO FIVE RESPONSES][9]

Friend
Child
Spouse/Partner
Other Family member/Family relationship
Brother/Sister/Sibling
Parent
Co-worker
Member of Group: Church, community association, volunteer group
Neighbor
Advisor
Internet/Online Friend/Acquaintance
Other

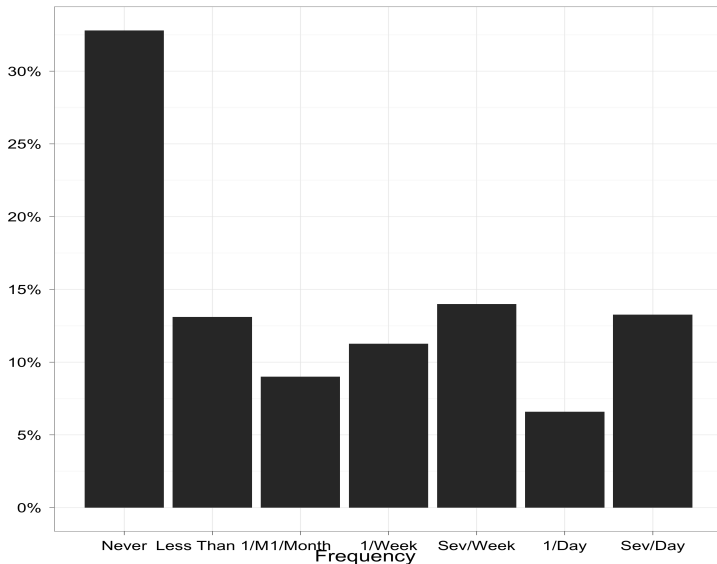# Frequency of Communication Generator

Still thinking about [INSERT ANSWER FROM Q10Q17LIST]... About how often do you usually [INSERT ITEM IN ORDER]... several times a day, once a day, several times a week, once a week, once a month, less often or never?

a. Talk to (him/her) in-person

b. Talk to (him/her) using your cell phone

c. Talk to (him/her) on your landline phone at home

d. Send (him/her) a card or letter via the mail

e. Send (him/her) an email

f. Send (him/her) a text message

g. Send (him/her) an instant message

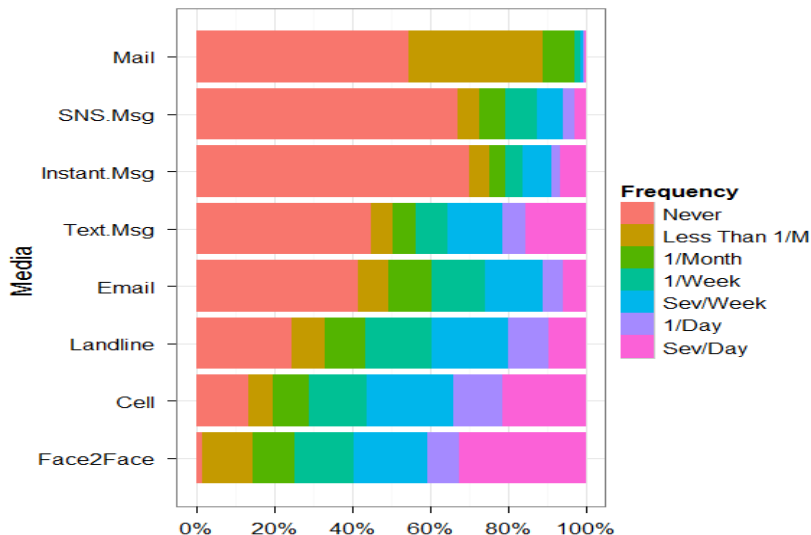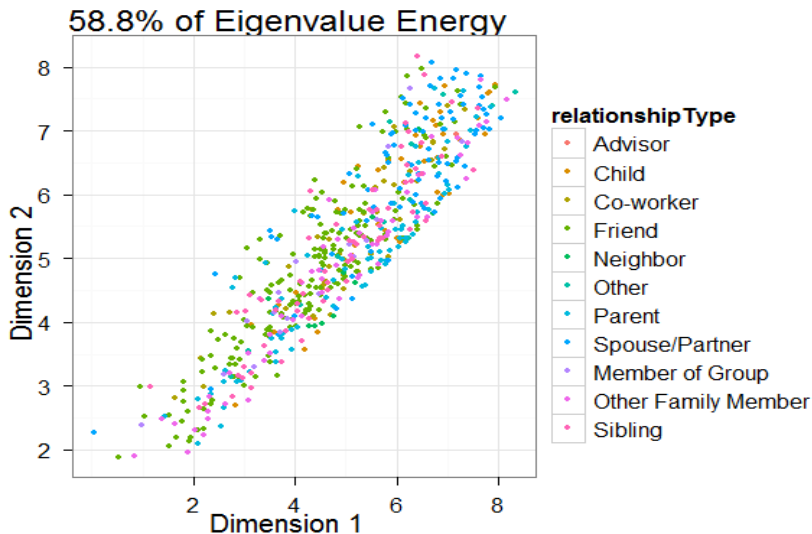h. Send (him/her) a message thru a Social Networking site
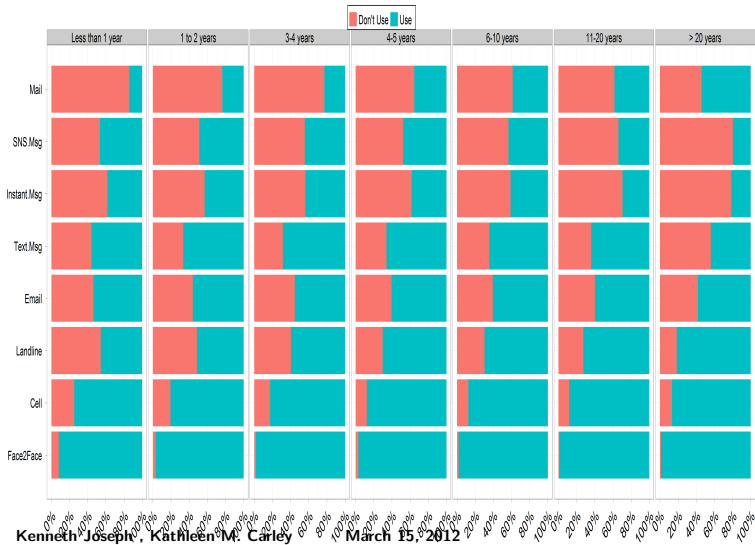
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Something is a Bit Off...

Observe: Frequency of Use Differs for Core Ties
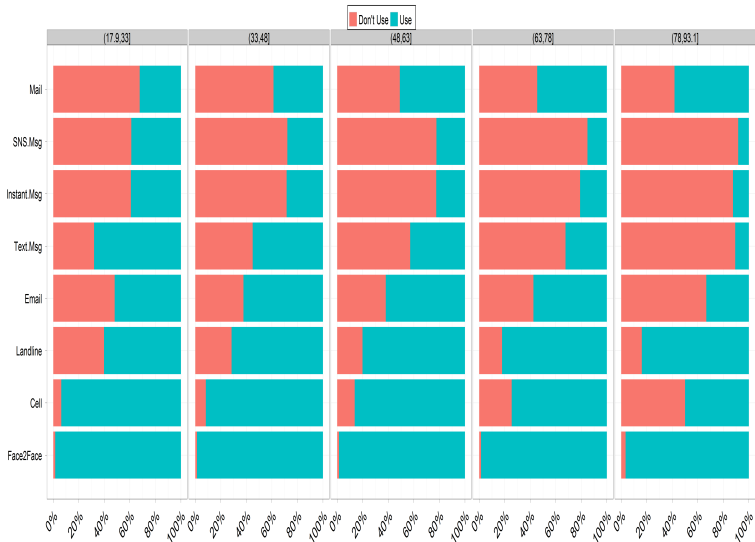
Generalize: Relationship Type (SVD)

58.8% of Eigenvalue Energy

relationshipType
- Advisor
- Child
- Co-worker
- Friend
- Neighbor
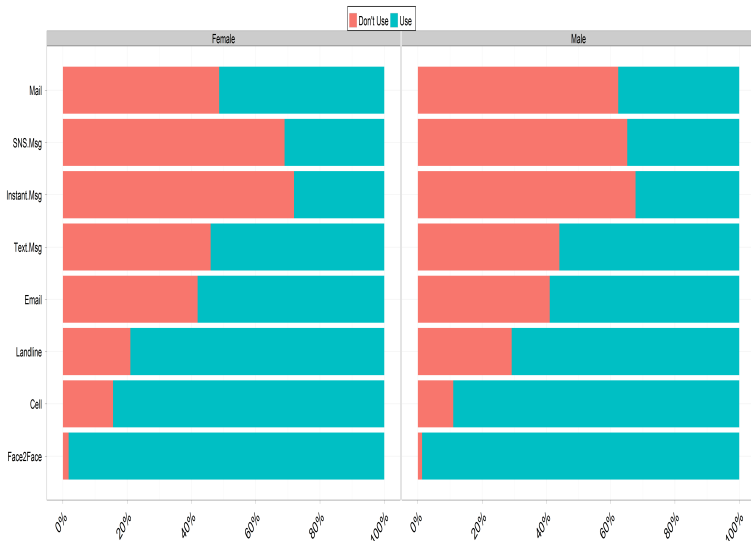- Other
- Parent
- Spouse/Partner
- Member of Group
- Other Family Member
- Sibling

Generalize: Relationship Duration **Chi-sq p-val significant

Generalize: Age **Chi-sq p-val significant

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Generalize: Gender **Chi-sq p-val significant

Quantify: Proposed Quantification

- **Value:** Likelihood that a single observed interaction on a medium is with a member of the core discussion network, $P(IC)$
- **Use:** Which social ties can we label as "core" from event data?

Quantify: Equation

- Average Communication Per Day with a Core Member

$$(APD_C) = \sum_{ov}^{OrdinalValues} Avg.PerDay_{ov} * ProbOfAnswer_{ov}$$

- Average Communication Per Day (APD) across all ties - a (deliberately) conservative estimate

- Avg.NumCoreTies = 3.2 (from survey)

$$P(IC) = \frac{Avg.Num.CoreTies * APD_C}{APD}$$

- **Note:** On the aggregate, but we could do this on a per user basis

Quantify: Result

Media	APD_C	Avg. Number of Core	APD	**P(IC)**
F2F	1.17	3.2	10	**.370**
Cell	.9	3.2	10	**.283**
Mail	.03	3.2	.25	**.282**
Landline	.52	3.2	10	**.162**
TXT	.60	3.2	15	**.127**
SNS Msg	.16	3.2	5	**.103**
Email	.33	3.2	10	**.068**
IM	.26	3.2	15	**.056**

- Mail is a good indicator - birthday cards
- SNS Msg higher than Email - dependence on (currently) arbitrary APD
- Otherwise, order matches intuition, previous work, data

Conclusion

- Chief Limitations:
  - Survey data [1]
  - "Averaging over circumstance" [6]
  - Current metrics rough
  - Missing data
- Chief Contribution: Observe, Generalize, Quantify
- **Uses:**
  - Move with principle from event data to network data
  - For large scale analyses of anonymized data, quantification of this kind is practical
  - If we can choose a subset of mediums to observe, which should we choose?

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