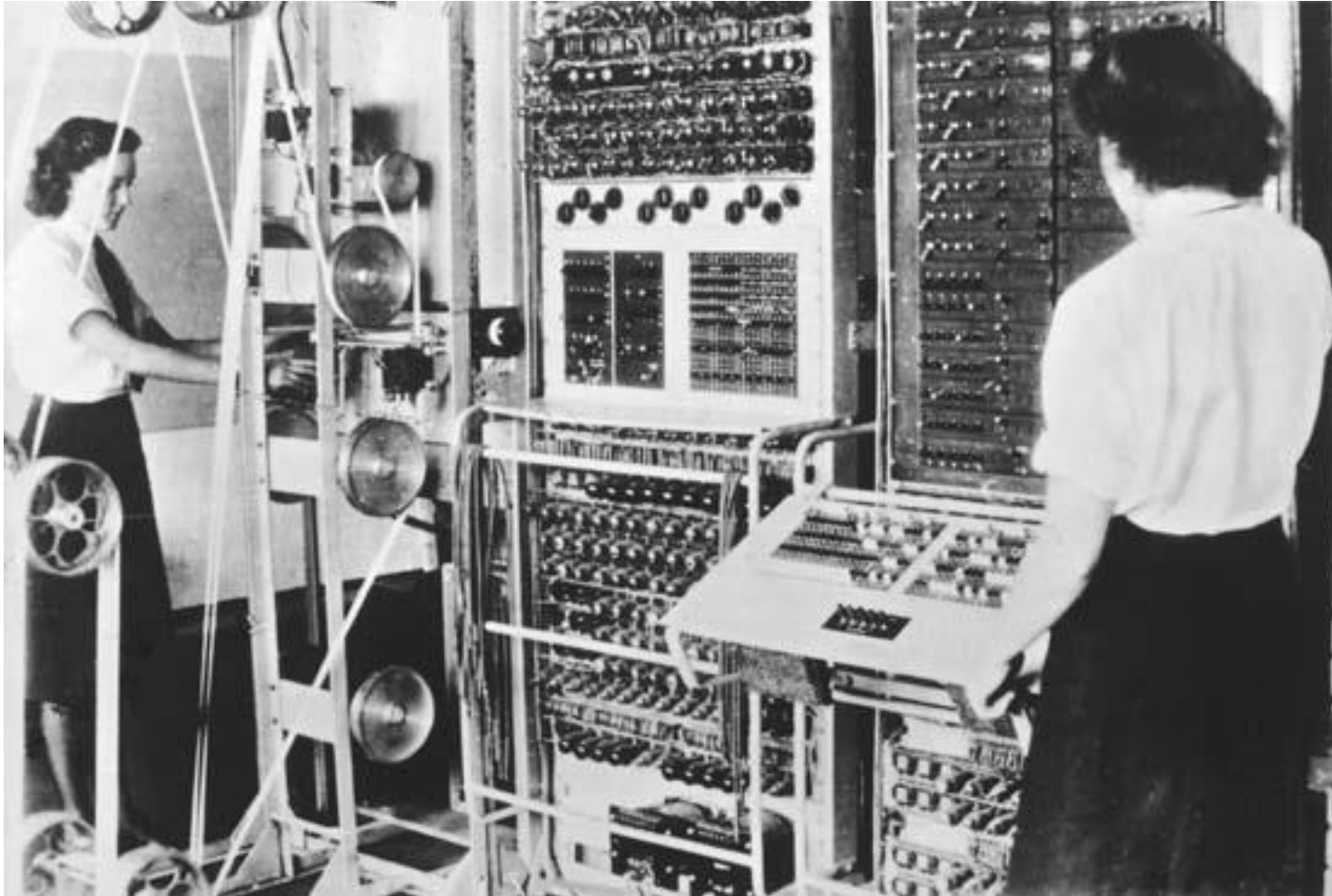


Our interaction with computing devices continues to evolve

Thomas J. Albin, PhD, PE, CPE

Colossus, circa 1944

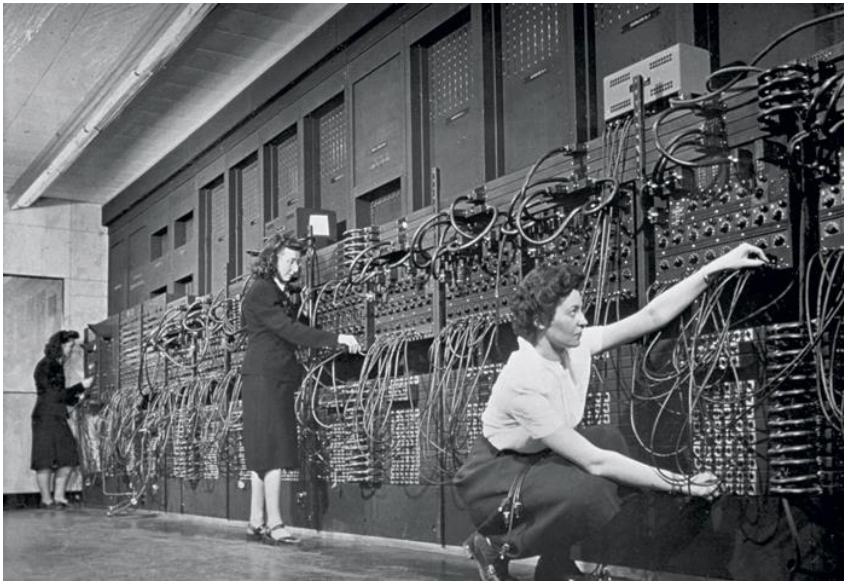


HIGH PLAINS



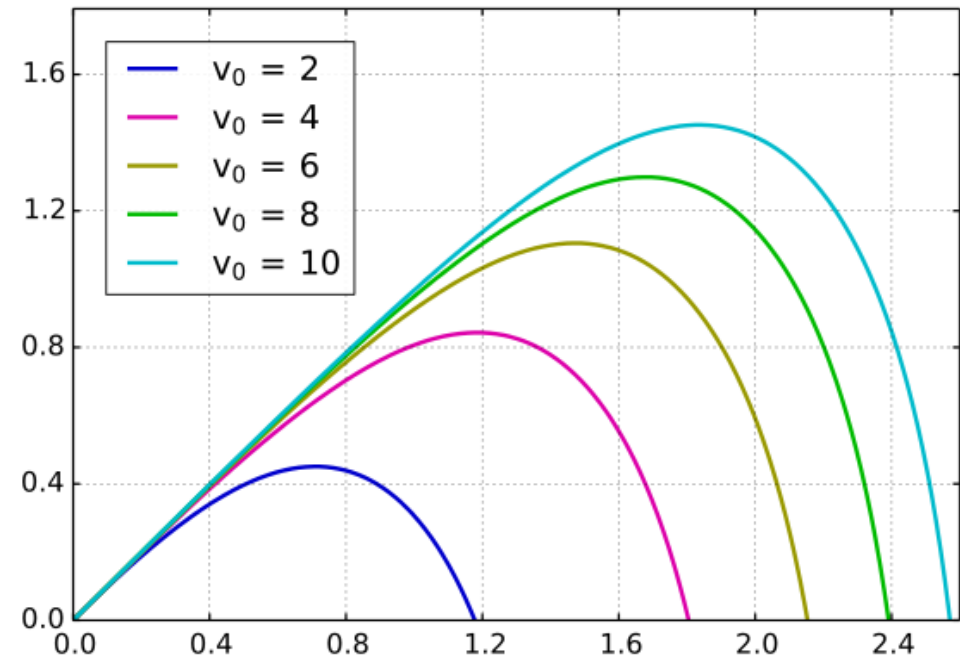
ENGINEERING
SERVICES

ENIAC – ca 1946-1955



It's always been about improving
systems' performance

Eniac Was built to compute artillery trajectories



- A skilled human with a desk calculator required about 20 hours work to calculate a 60 s. trajectory
- ENIAC needed 30 s.

Human-computer systems continue to evolve



60's

— Imagine: tape—data card—tape conversion systems.

- ▶ **MS. EXCEED DATA ENTRY**... these **DUALCIRCS** speedily do the work of four keypunches.
- ▶ **MAX. I/O COMPATIBILITY**... both 3- and 9-track **DUALCIRCS** are compatible with third and fourth generation computers.
- ▶ **ENGLISH LANGUAGE DISPLAY**... data and program numbers are directly readable; equipment operation can be set to intuitive.
- ▶ **DATA INTEGRITY**... advanced IC electronics assure faithful reliability of data during all file handling modes—Program Entry, Program Search, Data Entry, Data Search, etc.—year after year.

For full details on **DUALCIRCS** features and applications, write for our brochures.



anguard™
SINCE 1954

1967 BANNER 47 (P.O. BOX 1200 CHICAGO, ILL. 60604) PHONE: (312) 500-7042

See this computer in the Audio-Visual Program Center, Rooms 5, 6, and 7.

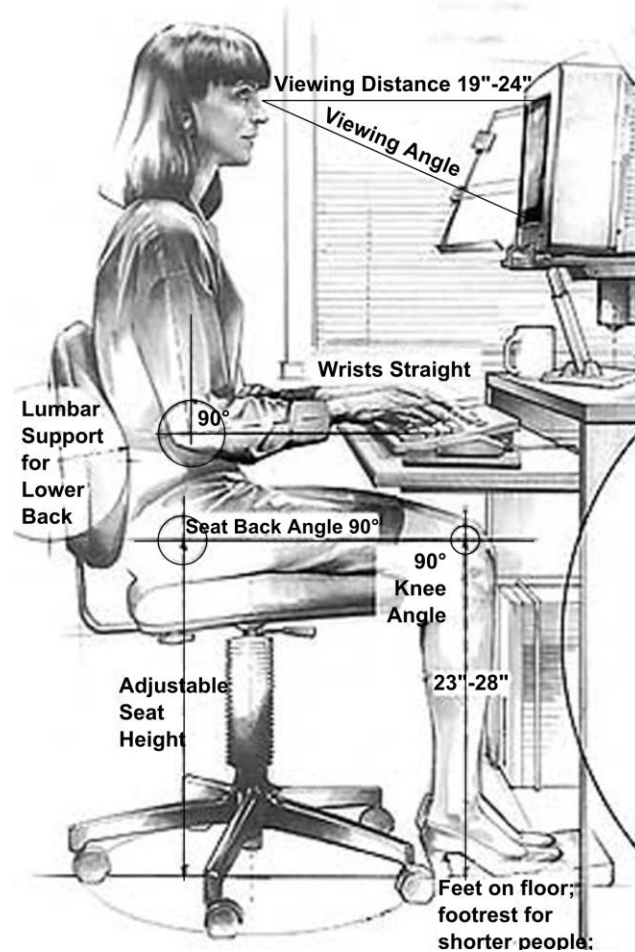
70s – 80s



90's



Desktop workspace specifications well established by 2000



HIGH PLAINS



ENGINEERING
SERVICES

And then



Computers In the home

US Census Bureau report

2010

- 81 % of households had desktop or laptops
- 21 % of households had handhelds

2013

- 79 % of households had desktops or laptops
- 64 % of households had handhelds

How and where do we use
them?

Knowledge workers and computers

Honan, M. (2015) Mobile Work: Ergonomics in a rapidly changing work environment, *Work*, 52(2)

- Surveyed 350 knowledge workers
- Where do we use mobile devices?
- For how long do we use them?
- What tasks do we use them for?

Hours of use per day

Smartphone	2.3 hours
Tablet	0.9 hours
Laptop	1.8 hours
<u>Desktop*</u>	<u>4.5 hours</u>
Total	9.5 hours

*includes docked laptop

Most common (top 3) locations where mobile devices are used

Smart phones

- Everywhere

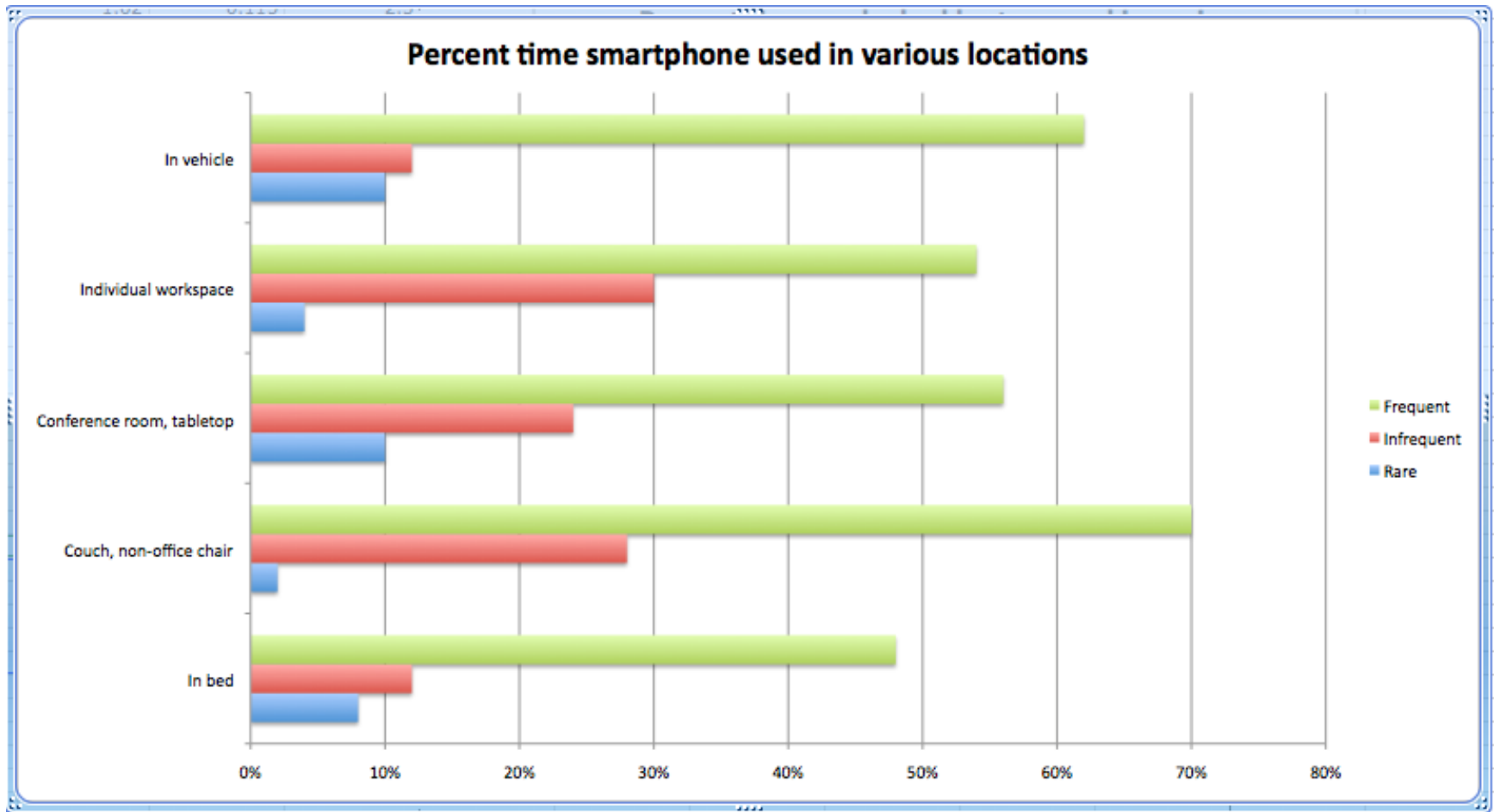
Laptops

- Conference room
- Non-office seating
- Individual workplace

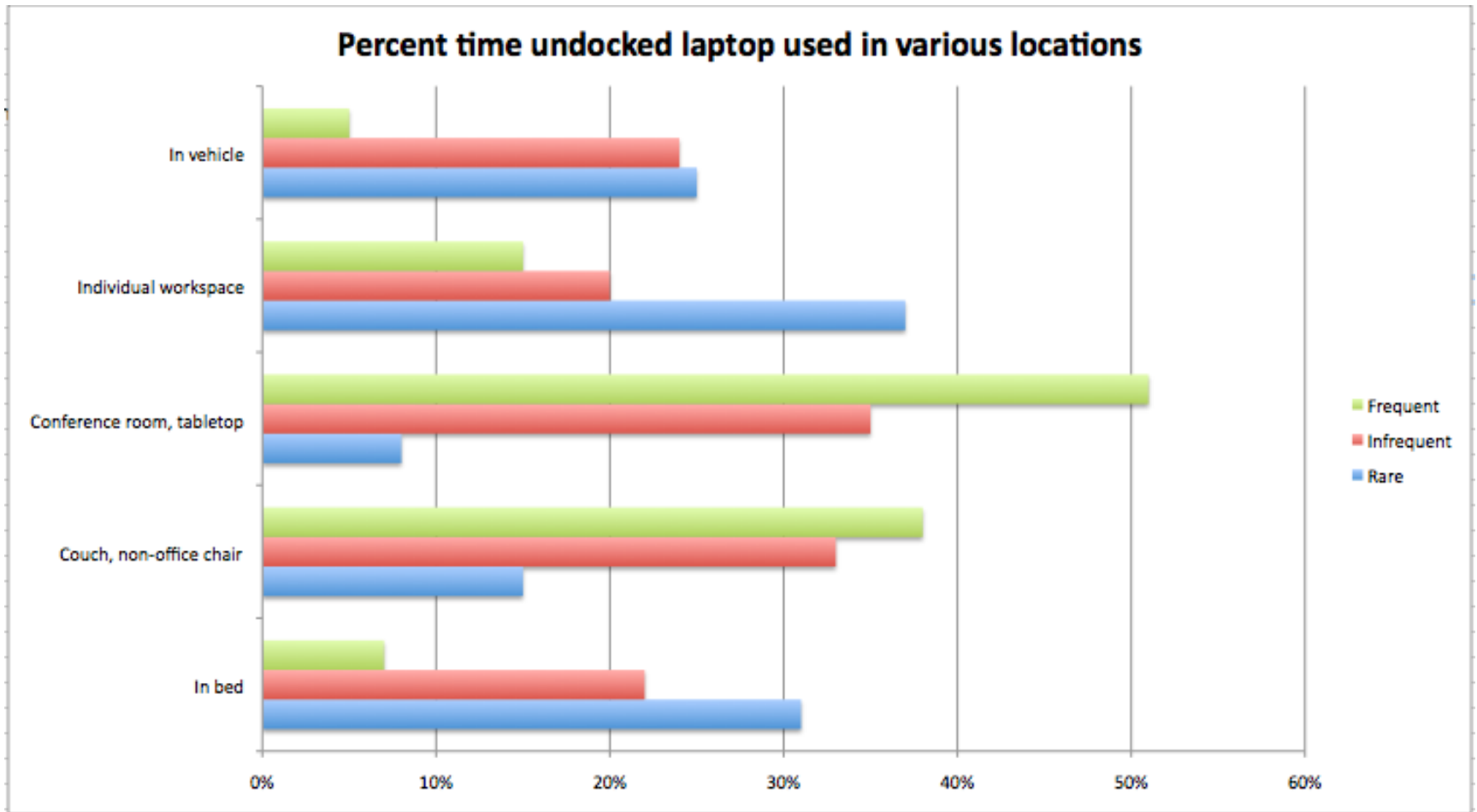
Tablets

- Non-office seating
- In bed
- Vehicles/conference room/Individual workplace

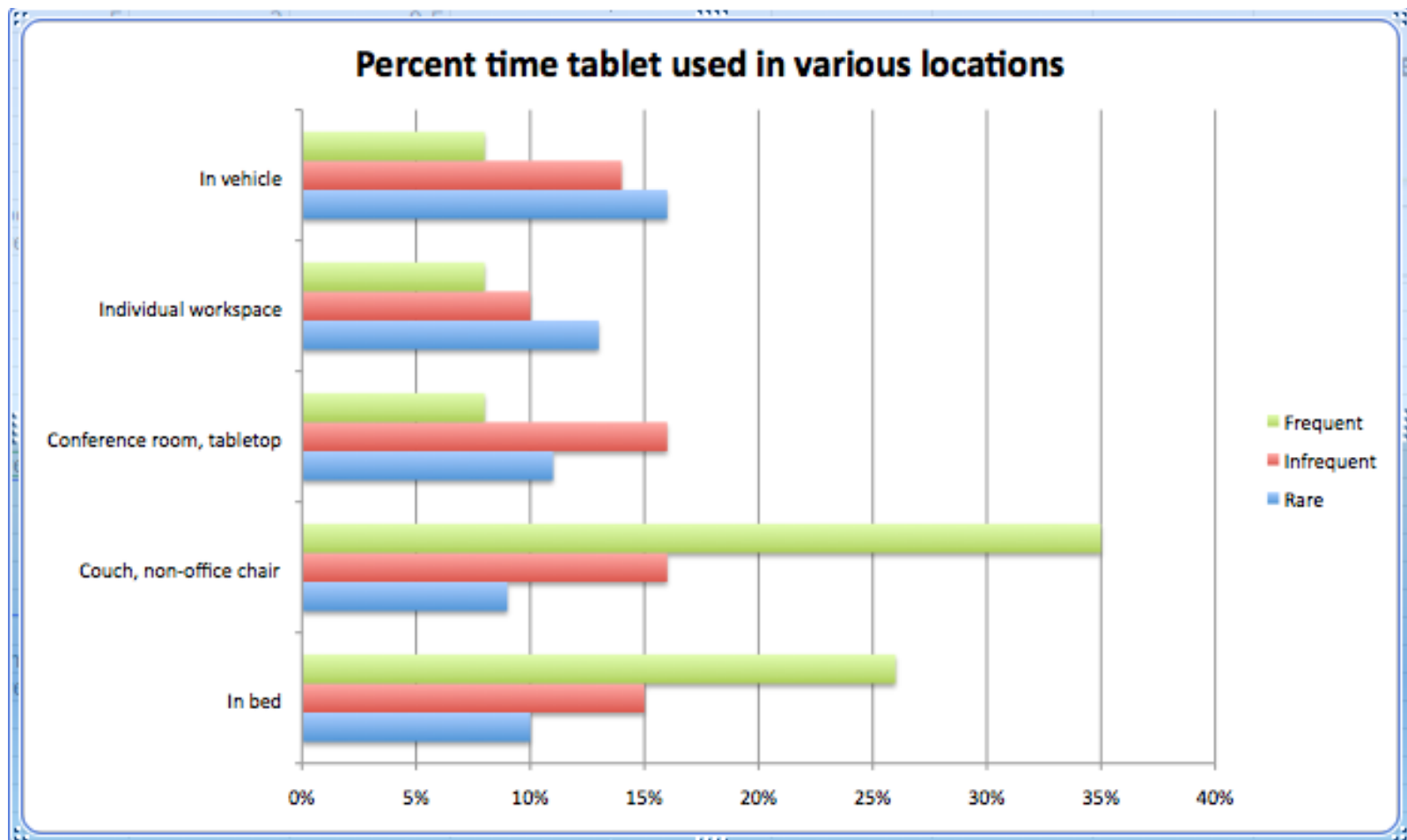
Where are smart phones used (~2.3 hrs/day)?



Where are undocked laptops used (~1.8 hrs/day)?



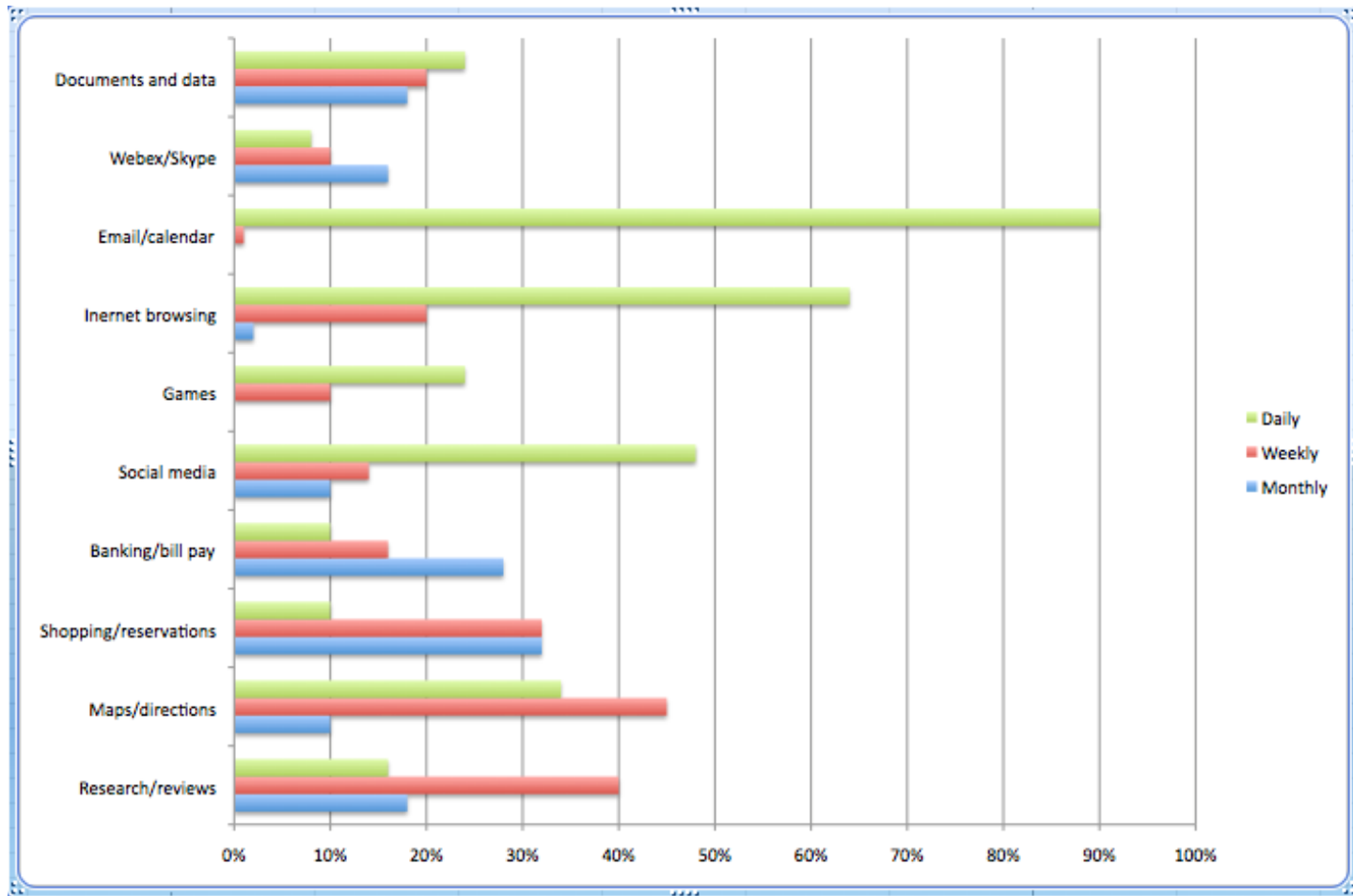
Where are tablets used (~0.9 hrs/day)?



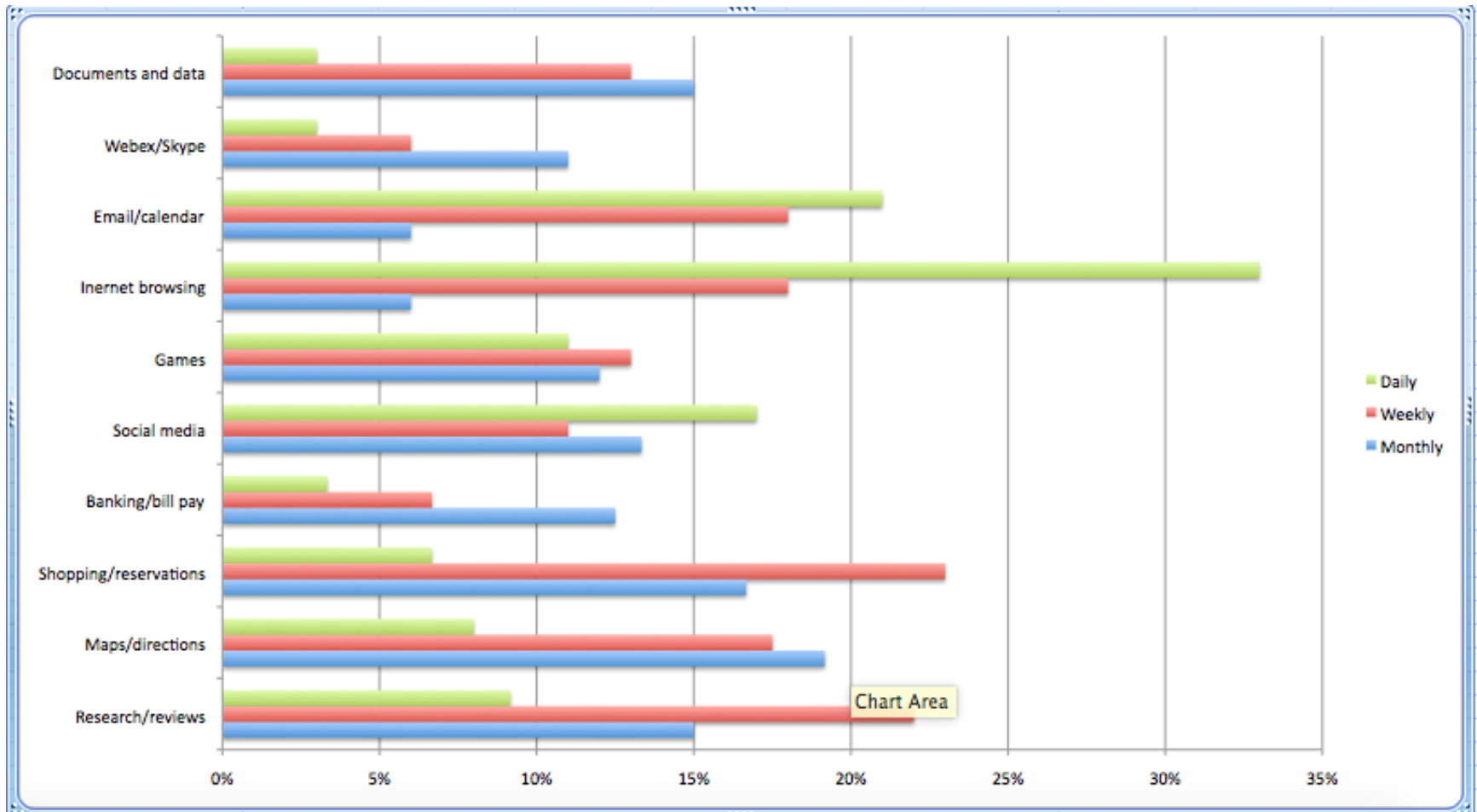
Top three uses for mobile devices

- Email/calendar
- Web browsing
- Social media

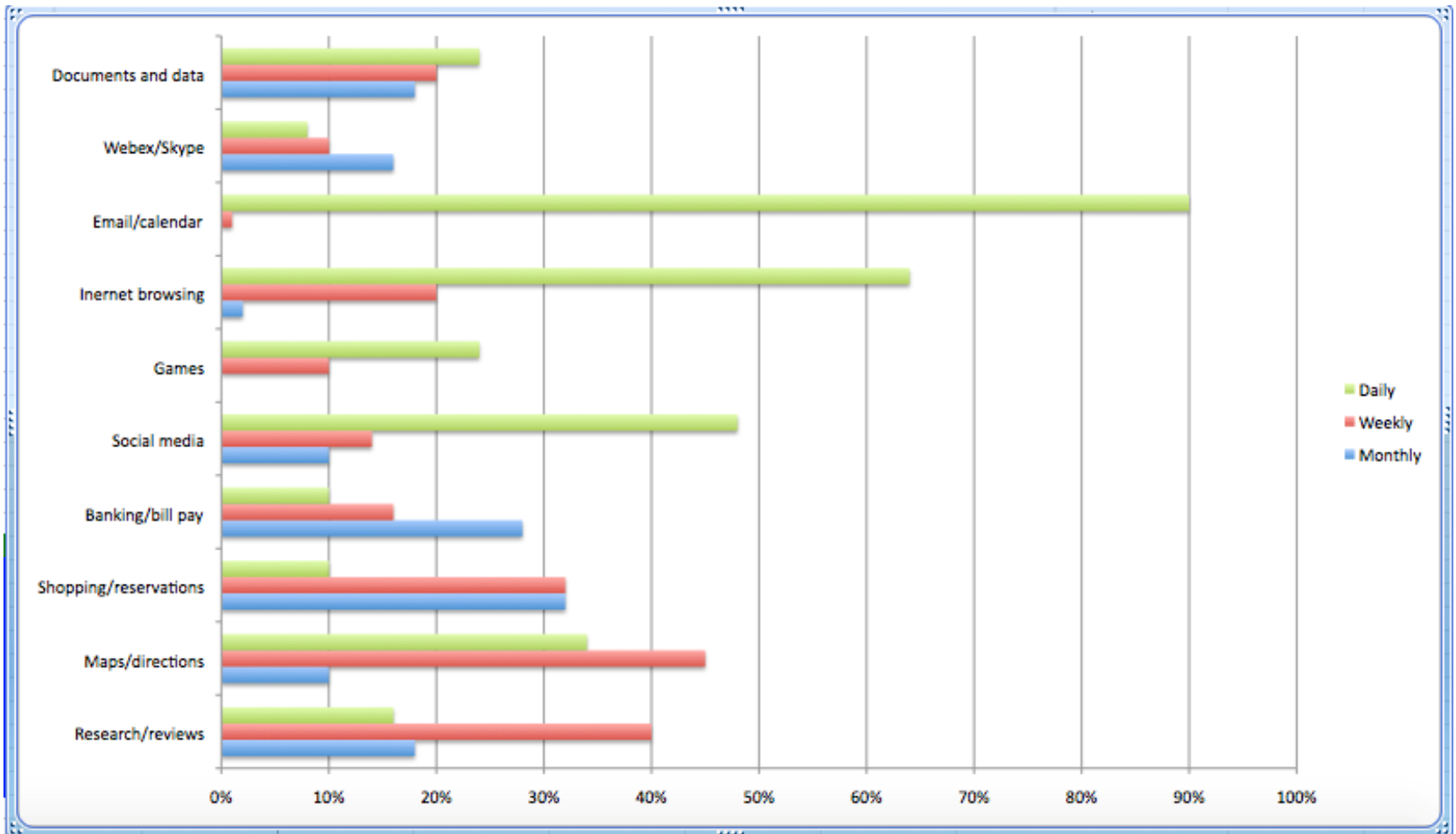
How are smart phones used* (~2.3 hrs/day)?



How are undocked laptops used (1.8 hrs/day)?



How are tablets used (0.9 hrs/day)?



Observations

- Desktop time and portable devices used about 4 hours per day
- Epidemiologic studies suggest that > 4 hrs/day or > 20 hours/week computer use is threshold for MSDs
- We cannot disregard fixed (desktop) workspaces
- We need to evolve our understanding and ability to deal with mobile-device related issues

Some examples of potential mobile device concerns

Neck flexion while viewing tablets

- Young et al
- Albin and McLoone

Thumb pain when using handhelds

- Berolo et al

Arm supports for mobile device use

- van Veen et al

So what is the point?

1. Computers, and the manner in which we use them, will continue to evolve
2. Our ability to measure the impact of Human Factors/Ergonomics on system performance for these new ways of working must also evolve

