Collaboration: Challenges and Opportunities for Biostatisticians

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Outline

I. Introductory Example

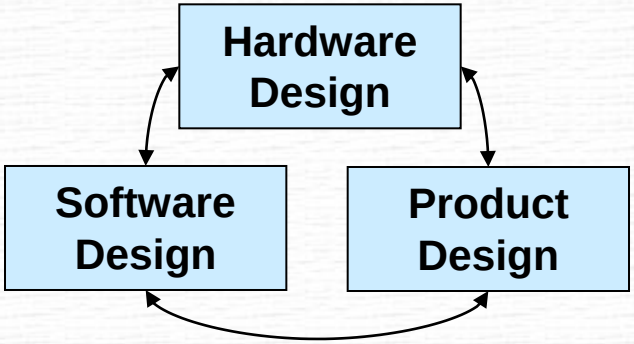
II. Defining Today's Environment

III. Capitalizing on The Wiki Way

IV. Working Towards a Solution

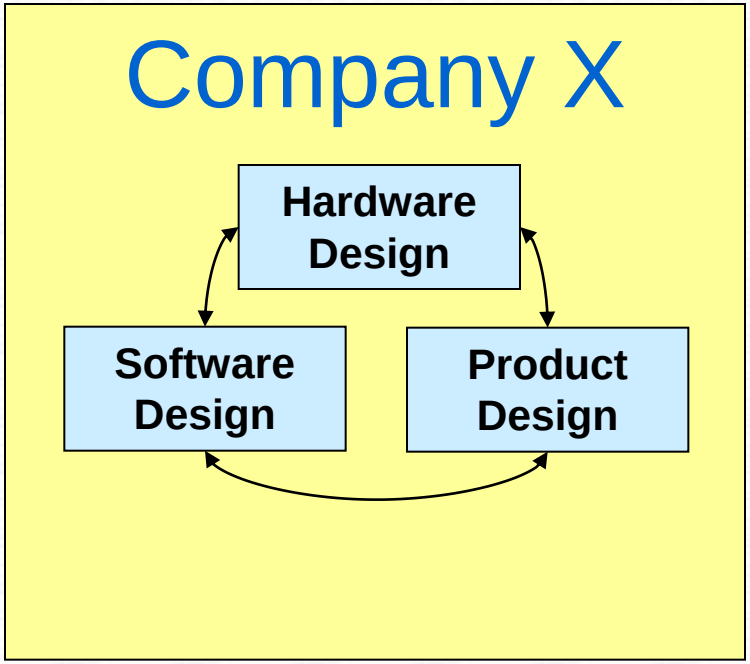
Collaboration: A Tale of Two Companies

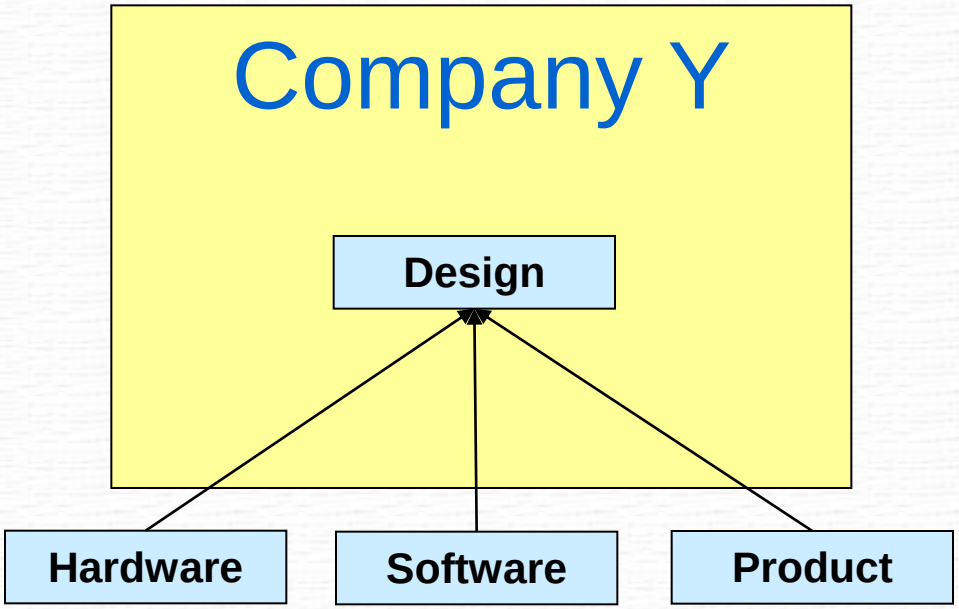
- Goal: Develop a new electronic music device
  - For simplicity, assume 3 components need to be created/developed/modified/refined



Collaboration: A Tale of Two Companies

- Two Companies (X and Y)





Collaboration: A Tale of Two Companies

- What company is likely to be more successful?

Collaboration: A Tale of Two Companies

- Lessons Learned
  - Both companies collaborated
    - Company X used mostly internal resources
    - Company Y relied on external components and designed them for their needs
  - Collaboration was not the only thing, BUT...
    - For complex activities, *effective* collaboration is a necessity for success
    - Collaboration should be *embraced* and given enough resources in order for it to have success
  - Collaboration can have negative consequences

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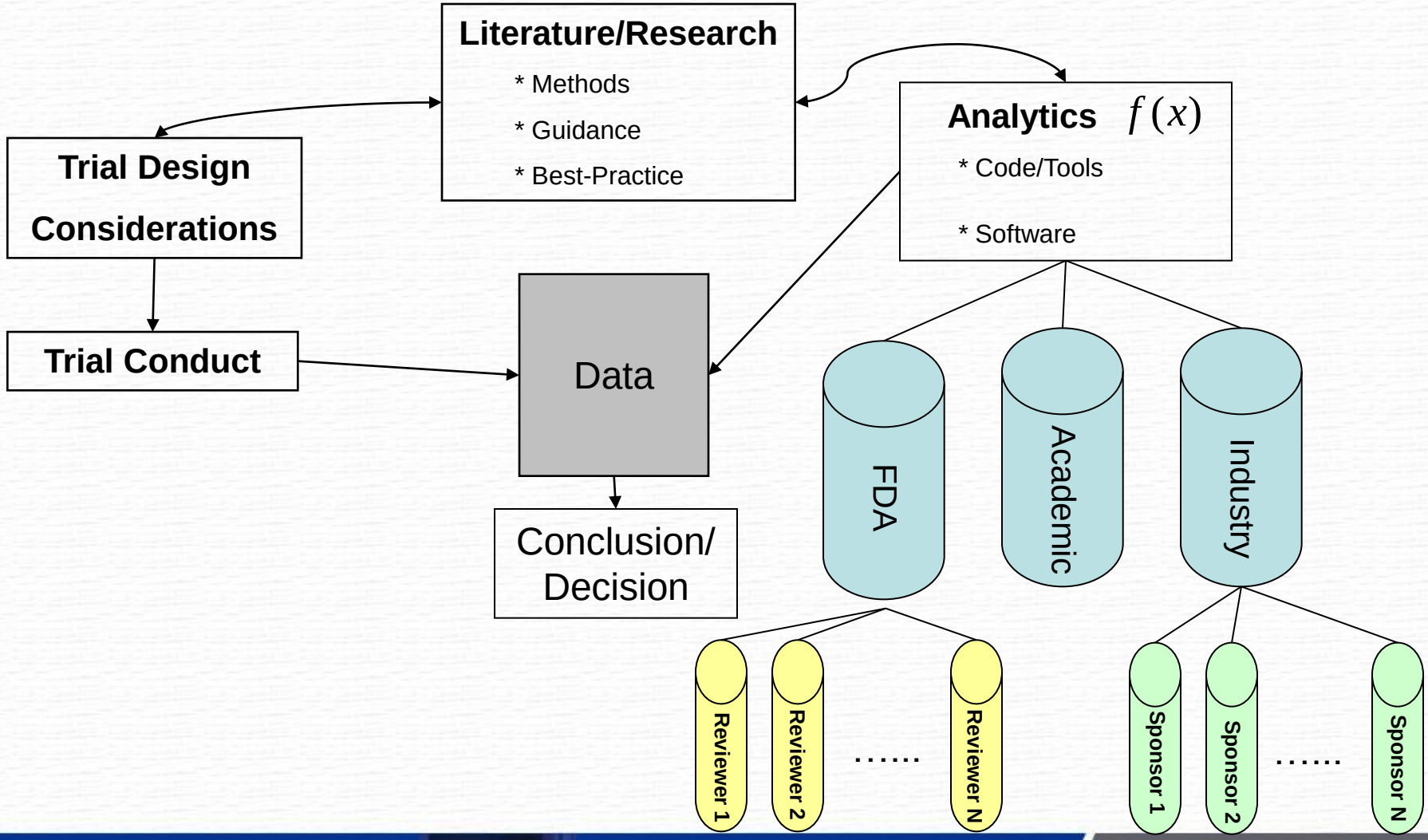
Simplistic yet Realistic Schematic



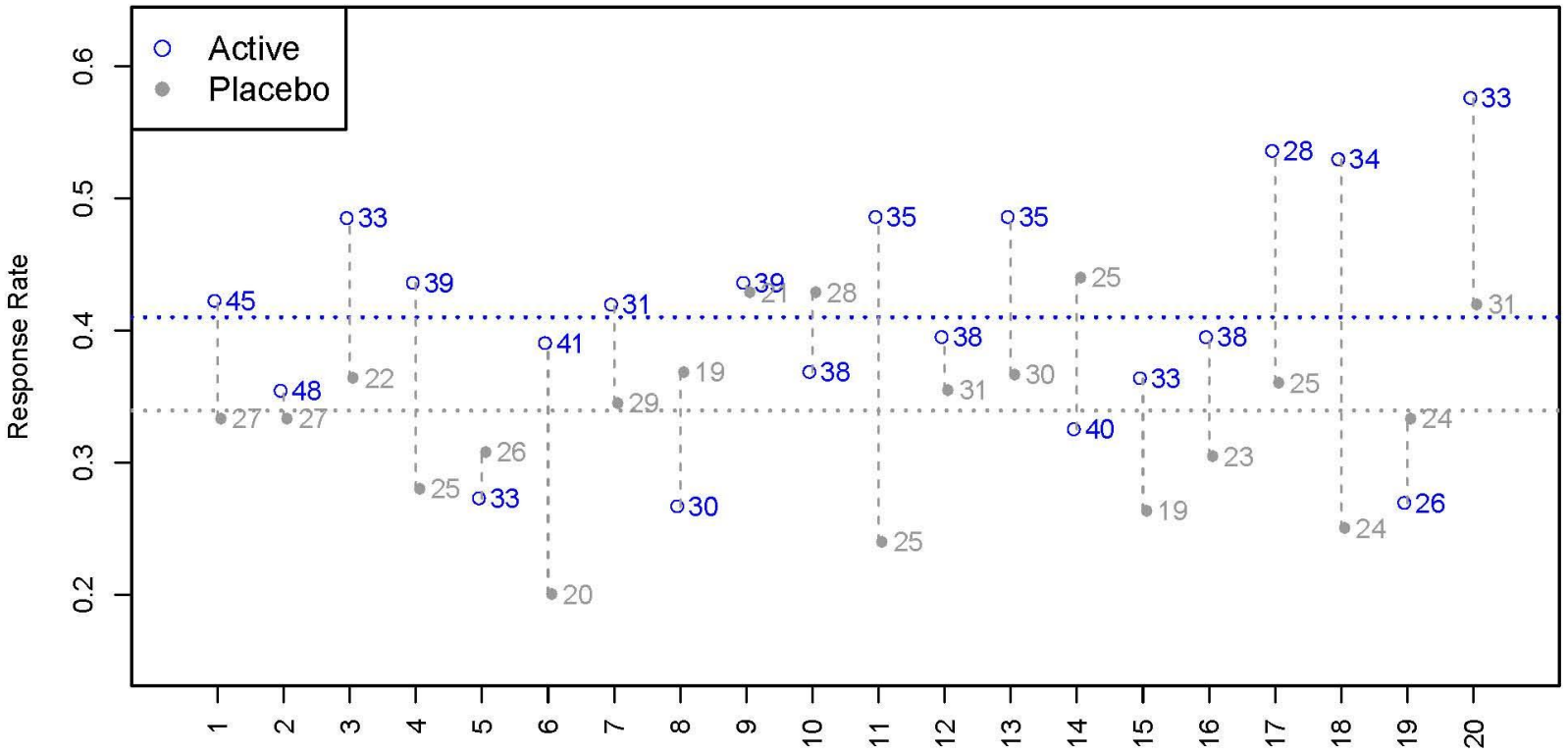
The Problem

Based upon today's current practice, the following limitations may be present:

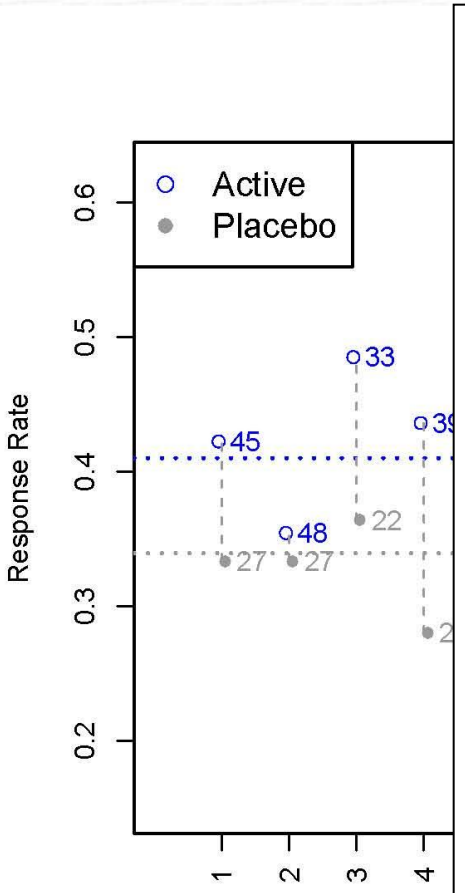
1. Redundancy in analytic development
2. Slow for cross-organization application of literature/guidance/best-practice
3. Quality Control/Validation NOT maximized with limited to no code/open-source sharing
4. Tendency to rely on traditional methods

Illustrative Example: Efficacy by Site

A Graphic….



Illustrative Example: Efficacy by Site



R Code

```
"efficacy.by.site" <-
function(yy, site, trt, type="b", legend=FALSE, ...){
    nms <- names(list(...))
    ss <- summarize(yy, llist(site, trt), mean)
    n <- summarize(yy, llist(site, trt), length)

    sdat <- data.frame(ss, n[,3])
        names(sdat) <- c("Site", "Trt", "Mean", "N")

if(type=="b"){
    nsn <- length(unique(sdat$Site))
    ut <- unique(sdat$Trt)
    rnx <- tabulate(as.factor(sdat$Site))
    sdat$plotx <- rep(1:nsn, rnx[rnx>0])
    # Creation of the figure.
    if("ylab" %in% nms)
    plot(c(.5, nsn+.5), c(min(sdat$Mean)-.05, max(sdat$Mean)+.05),
            type="n", axes=FALSE, ...)
    else plot(c(.5, nsn+.5), c(min(sdat$Mean)-.05, max(sdat$Mean)+.05),
            type="n", ylab=paste(deparse(substitute(yy))), axes=FALSE)
    axis(1, at=1:nsn, labels=as.character(unique(sdat$Site)), cex.axis=.75, las=3)
    axis(2)
    box()
    if(length(ut)==2) sdat$plotx <- sdat$plotx + rep(c(-.05,.05), length(sdat[,1])/2)
    if(length(ut)==3) sdat$plotx <- sdat$plotx + rep(c(-.1,0,.1), length(sdat[,1])/3)
    if(length(ut)==4) sdat$plotx <- sdat$plotx + rep(c(-.15,-.05,.05,.15), length(sdat[,1])/4)
    for(k in 1:length(ut)){
        subdat <- subset(sdat, sdat$Trt==ut[k])
        points(subdat$plotx, subdat$Mean,
               pch=trellis.par.get("superpose.symbol")$pch[k],
               col=trellis.par.get("superpose.symbol")$col[k])
        for(j in 1:length(subdat$N)){
                text(subdat$plotx[j]+.3, subdat$Mean[j], labels=subdat$N[j],
                     col=trellis.par.get("superpose.symbol")$col[k], cex=.7)
        }
    }
    for(i in 1:nsn){
        subdat <- subset(sdat, sdat$Site==unique(sdat$Site)[i])
        lines(c(i,i), c(min(subdat$Mean), max(subdat$Mean)), lty=2, col='gray60')
    }
}
if(type=="nonly"){
    nsn <- length(unique(sdat$Site))
    ut <- unique(sdat$Trt)
    rnx <- tabulate(as.factor(sdat$Site))
```

Illustrative Example: Efficacy by Site

- Is the approach publicly available or does the public know about it?
  - Potentially, it's been presented at several professional meetings.
- How to reproduce this visual representation?
  - Write your own code; ask the author.
- What if there are ways to improve the representations?
  - Publish/present at public meetings
- What if you have written sleek code, can you share it?
  - Not really; potentially with the author
- What if the code is written in a language my closed system does not run?
  - Rewrite it!

What We Know

1. Current environment can be improved upon
2. There is a large pool of talented and experienced researchers/biostatisticians that can be utilized
3. Collaboration among FDA, academia, and industry has *the potential* to alleviate/solve some of the current problems.

But ***HOW*** do we solve it?

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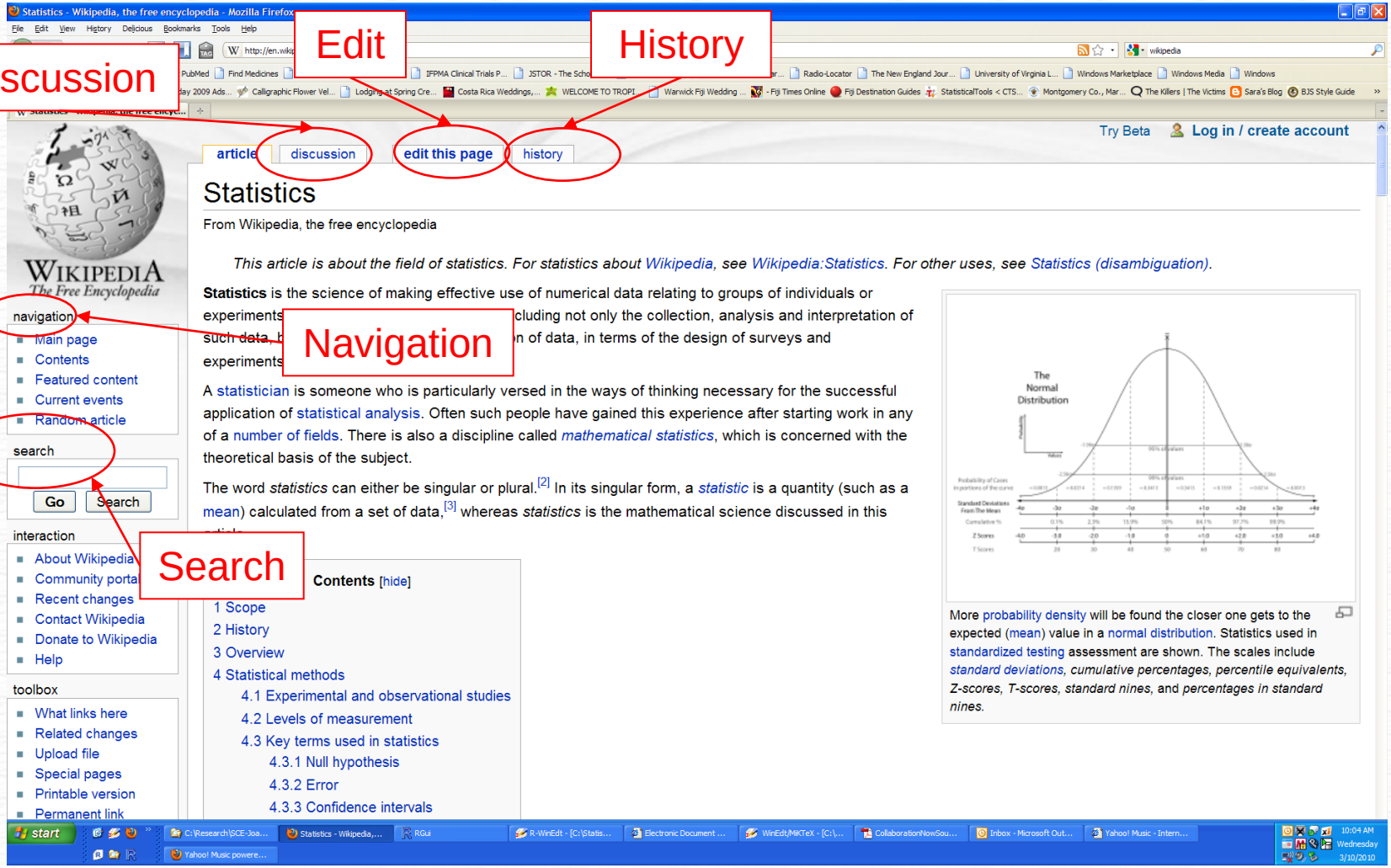
The Wiki Way

- Most popular and HIGHLY successful Wiki: Wikipedia
- **Definition**: A wiki is a website that uses wiki software, allowing the easy creation and editing of any number of interlinked Web pages, using a simplified markup language [source: Wikipedia].
- Creation/Editing is done via the web browser - no fancy software is required.
- **Community** of users add/edit content → pages/website is not static but ALIVE!
- *Invokes* user participation to create or collaborate.
- Subject to GNU-GPL regulations making them free software programs.

Wikipedia Screenshot



Wiki Strengths and Weaknesses

- **Bad content** may appear from time to time
  - 50% of mass deletions were modified in less than 3 minutes (Wikipedia, CHI 2004)
- **Lack** of contributions to important topic areas
- Topics which are emerging can **evolve quickly**
- **Rewards** contributor to know their efforts are being utilized by others
- **Lack** of citation/recognition for wiki contributions
  - Recently; more acknowledgement for such contributions
- **Development** in topics not otherwise planned by originators

What We Learned

1. Wikis provide open access to information which is provided by a community of users
2. The technology is straight-forward and can be easy to use
3. The technology is dynamic and offers advantages to static websites
4. A wiki *can be* highly successful as a medium for others to collaborate

But ***HOW*** do we apply it to our problem?

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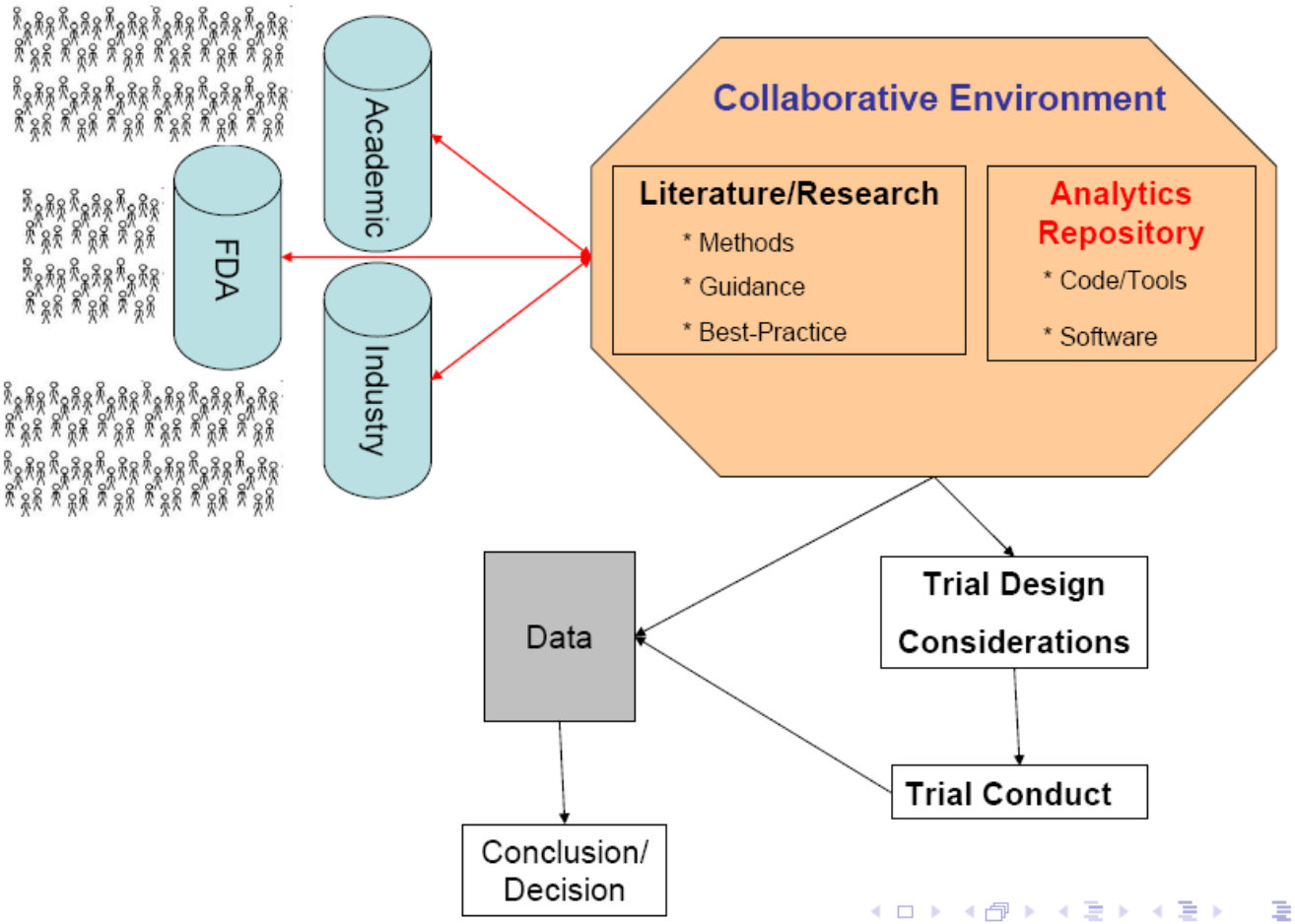
Collaborative Schematic



Relying on a Community

- **Advantages**
  - Transparency
  - Increase in the talent pool
  - Current; documents/materials/code can evolve
  - Efficient; evolution towards improvement (not reproduction)
  - Addresses needs of participants; tailored towards them

- **Disadvantages**
  - Trustworthiness?
  - Lack of authority?
  - Content is driven by willingness of the community to share
  - Too much information?

Keys to Success

- Identify **KEY** stakeholders
- Develop an environment that meets the needs of **ALL** potential contributors/consumers
  - Site organization/structure
  - Ease of use
- **Publicity** of the environment
- Provide **incentives** to contribute
- Provide **metrics** on environment usage
- Ensure **quality** of contributions (rating system)
- Environment **monitoring**

Challenges

- Identifying the **KEY** stakeholders
- Identifying **resources**
  - Hosting the environment (*financial*)
  - Building the environment (*financial and human*)
  - Monitoring the environment (*human*)
- **Culture change**
  - Move from *internal sharing* towards one where non-proprietary information is *shared publicly*
  - *Acceptance* of open/public information
  - *Adoption* of a collaborative culture from **ALL** parties

Stay Tuned….

- Any questions or willingness to participate please email me:
  - Mat.Soukup@fda.hhs.gov

- Any move towards a community-driven collaborative environment can only be as successful as the willingness of the ***community*** to participate!

Special Thanks

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