



Panel Discussion 64: Vitamins to Address Actuarial System Risk

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Vitamins to Address Actuarial System Risk

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February 25, 2016

Small Co – EMC National Life Company

- Only credentialed actuary
- Two support staff
 - Limited actuarial background
 - Not taking exams
- Interns from nearby Drake University, key to doing detailed work to add vitamins
- Generalist!
 - Know enough to be dangerous
- Possible to improve controls at co like this

Small Company Vitamins

- Controls, controls, controls
 - Anything that reduces error rates
 - Screw up less often!
- Two sets of eyes
 - Ingrained in Culture
- Document & automate
 - Inevitably leads to better controls, productivity
- Don't have time to do it, or worse, not do it
- Good ideas for big companies

Step-by-Step.xlsx

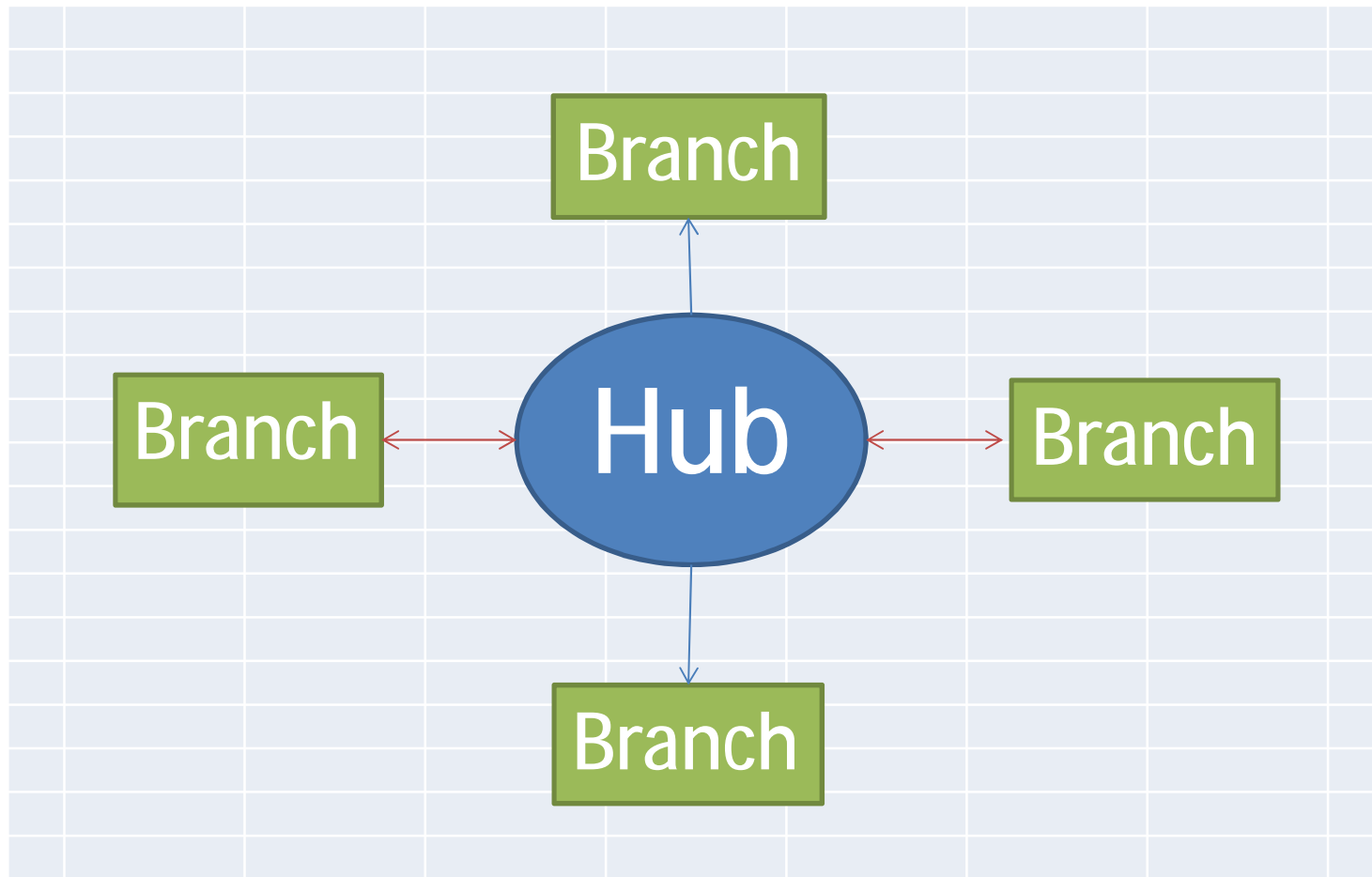
- Spreadsheet that organizes financial reporting
- Excruciatingly detailed instructions
- Two sets of eyes (doer and validator)
- First versions lacking
- Every quarter focus on improving
- After years finally getting there
- Wish we had this for other processes like pricing

Re-Engineer Spreadsheets

- Limit access to actuarial files
- Backup files every night
- Version controls
- Keep track of changes, two sets of eyes
- Identify source of data input
- Identify when data changes (typically every quarter)
- Color code – formulas/inputs
- Totals at top
- Don't use Indirect, Lookup, Offset functions

Re-Engineer Databases

- Currently use Microsoft Access
- Hub-to-Branch database structure
 - Hub is central database
 - Stores time sensitive data
 - Closely monitor whether data gets updated
 - All branch databases use same data, from Hub
 - Branch databases link to Hub
 - Small databases dedicated to single task
- Macros for automation
- Support staff good at these tasks
- Migrating to SQL to handle larger data



Controls in financial model

- 2015 – Implemented model governance
 - Two sets of eyes
- Large companies assign different roles to different departments
 - Not practical with 4 person staff!
- Use actuarial modeling software for:
 - Valuation
 - Financial Projections
 - Pricing

Huge Controls Project for Financial Model

- Intern very valuable
- Inventory assumptions
- Defend assumptions
- Audit tables against administrative system
- Catching errors, use model governance procedures to fix errors

Progress in Taking Vitamins

- Financial reporting in July smoothest ever
- Productivity increasing
 - Controls add automation
- Greatest takeaway:
 - Error rate reduced
 - Not screwing up as much!
- A lot more to do
- Move forward or will fall back!
 - Can never be done with these efforts



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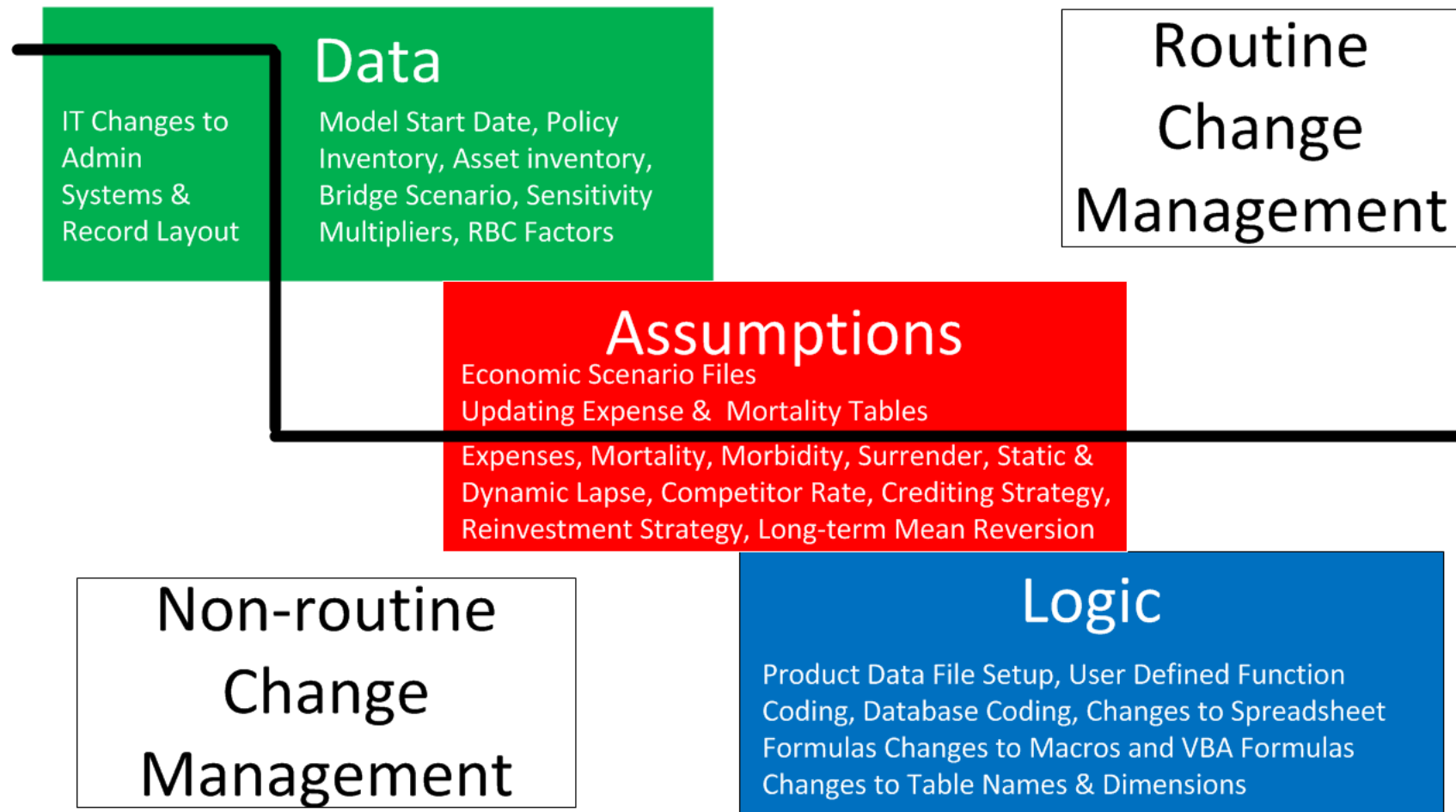
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Vitamins C&M

- “CM” stands for Change Management
- Exists within the Context of SOX Controls
 1. Input Verification Controls (e.g. Reconciliations)
 2. **Change Management** Controls (Routine & Non-routine)
 3. Analysis of Results (e.g. Trend Reports, Greeks)
 4. Output Verification (e.g. Reconciliation, Earnings Analysis)
 5. Other (Security Access, General Computer Controls, etc)
- 1 – 4 are basically the valuation production process
- Check Lists are an Excellent Means of Control

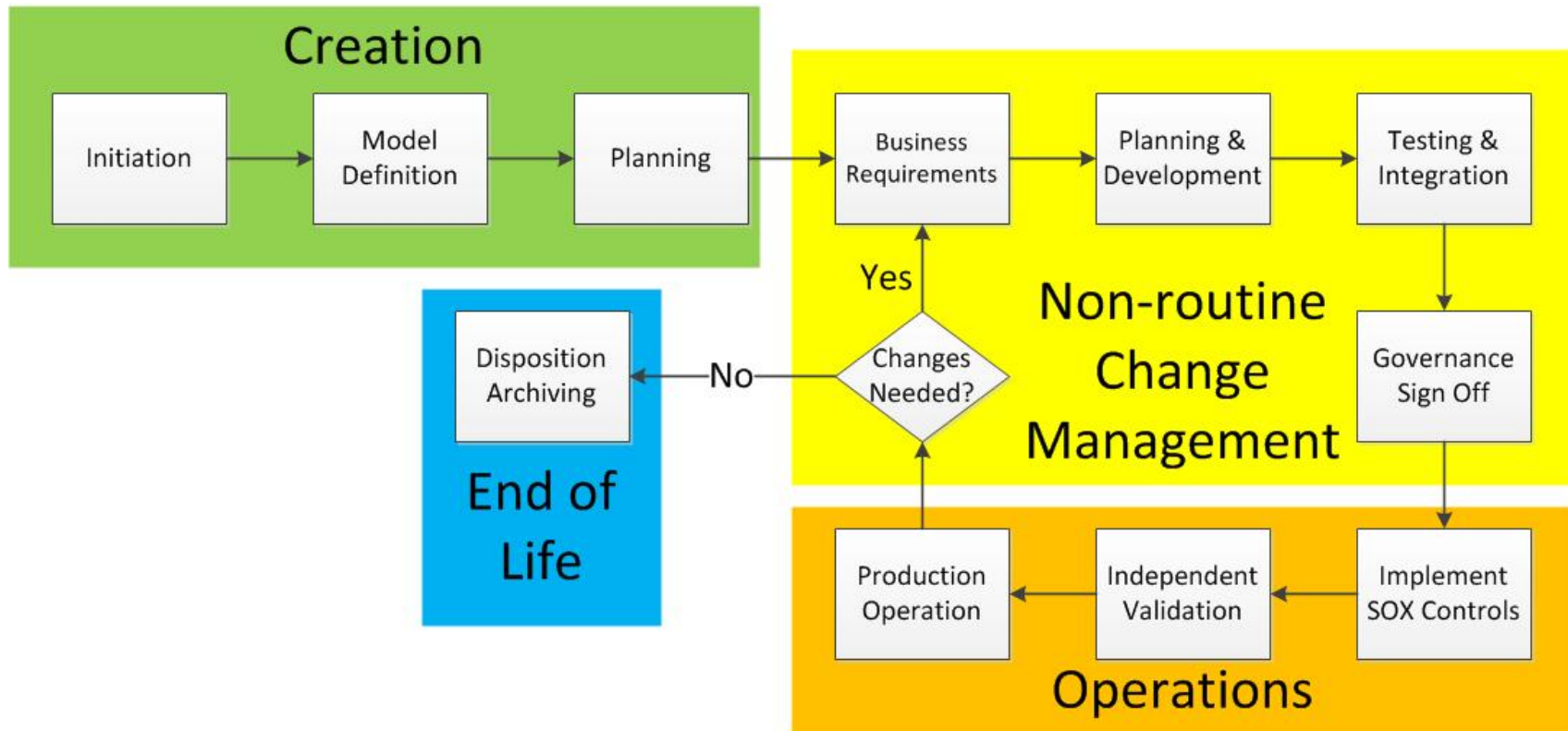
A Model is Data, Assumptions, and Logic



Project vs. Process

- A lot of models are developed/ changed as projects
 - One and Done
 - Copying a similar model from the same product
 - By individuals focused on minimizing development cost; but not maintenance/ operational cost
 - Without recognition that this is a repeatable process
- View it as Software Development Life Cycle (SDLC)

Software Development Life Cycle (SDLC)



This is for all software, not just actuarial models

Change Management Best Practices

- Create Useable Documentation
 - Not a compliance exercise
- Training for consistency across the organization
- Maintain a calendar with enough time to execute all controls through competent project management
- Create written, robust test plans
- Provide expectations and guidance for Peer Review
- Break down Peer Review into manageable bites

Non-routine Change Management Phases

Phase	Task	Documentation	Review
Initiation	Determine Needed Changes	Business Requirements	Actuarial Standards
Development	Coding & Unit Testing	Development Specification	Technical Review
Testing	Create and Execute Tests	UAT Results & Conclusions	Testing Review
Governance	Secure Approval to Implement	Evidence of Approval	Documentation

Peer Review Best Practices

- Don't wait until the end
- Qualifications
 1. Independent from the work
 2. Independent from person who did the work
 3. Subject matter expertise on product, platform, language
 4. Sufficient capacity to perform the work on schedule
- Formally document how and why you got comfortable with the results; how do you know they are reasonable?

Testing Best Practices: Types of Tests

- Development Testing
 - Unit testing
 - one policy-type calcs
 - System Testing
 - Whole runs
 - Integration testing
 - Fits with other systems?
 - Performance Testing
 - Regression Testing
 - No changes elsewhere
 - User Acceptance Tests
 - Total impact at minimum
- Other Tests
 - Sensitivities
 - Mortality, lapse, interest
 - Stochastic convergence & stability of output
 - Data Compression methods are appropriate
 - Stress Testing
 - Negative interest rates
 - Negative Mortality
 - Issue dates in the future
 - Ages of 0 or 118

Additional Thoughts on Controls

- Efficiency and Resiliency are mutually exclusive
- One must strike a balance
- Engineers deal with this and their #1 priority is safety, not cost.
- Financial integrity is our ultimate concern
- Controls are engineered inefficiency
- They're intended to be that way because they have to in order to prevent catastrophe



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System Vitamins

Fix bad calculations - When you see them



System Vitamins

Document the system scope (think ASOP 41)



System Vitamins

Name variables consistently



System Vitamins

Prototype:

- Design prototype
- Build system from new parts
- Danger: *Don't use prototype for production*



System Vitamins

Write a user's guide

- Make it task-oriented



System Vitamins

Implement version control

- Separate developers from users
- Keep a central file
- Maintain a tab of changes (name, date, comment)



System Vitamins

Don't Repeat Yourself

“Every piece of knowledge must have a single, unambiguous, authoritative representation within a system.” Hunt & Thomas

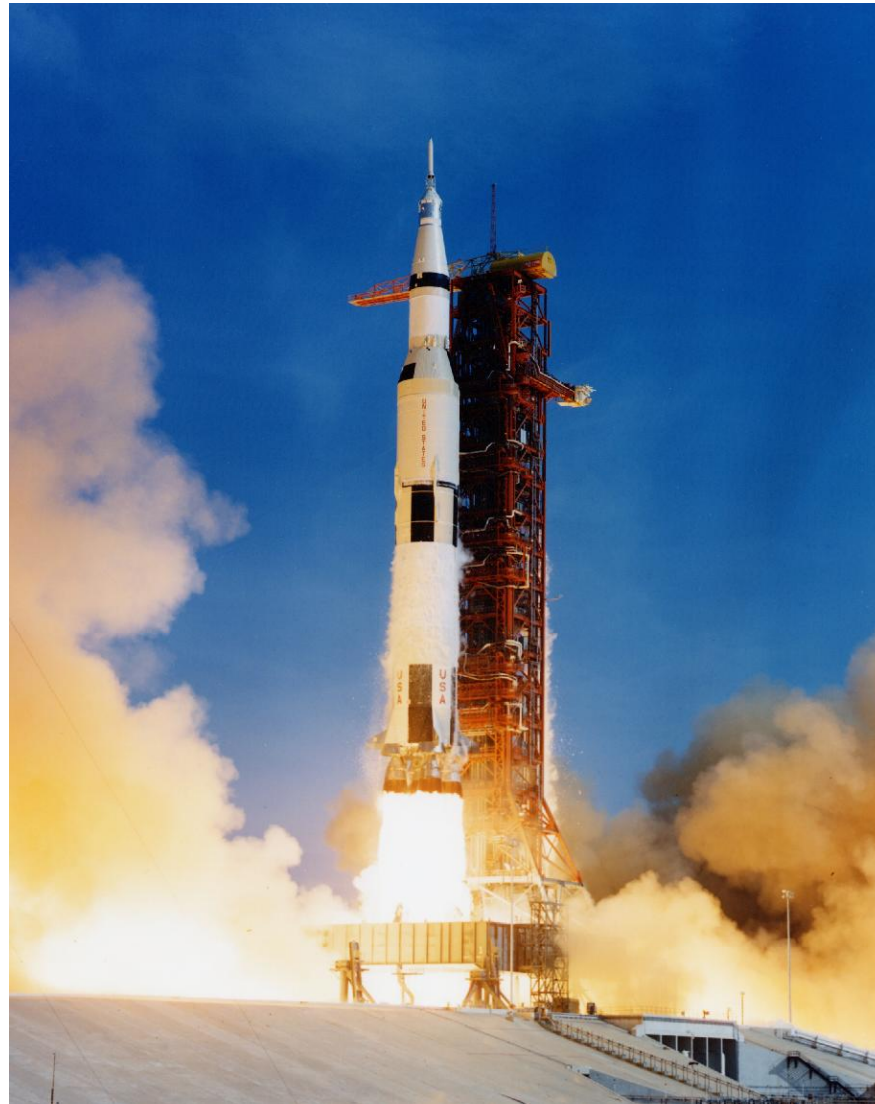


System Vitamins

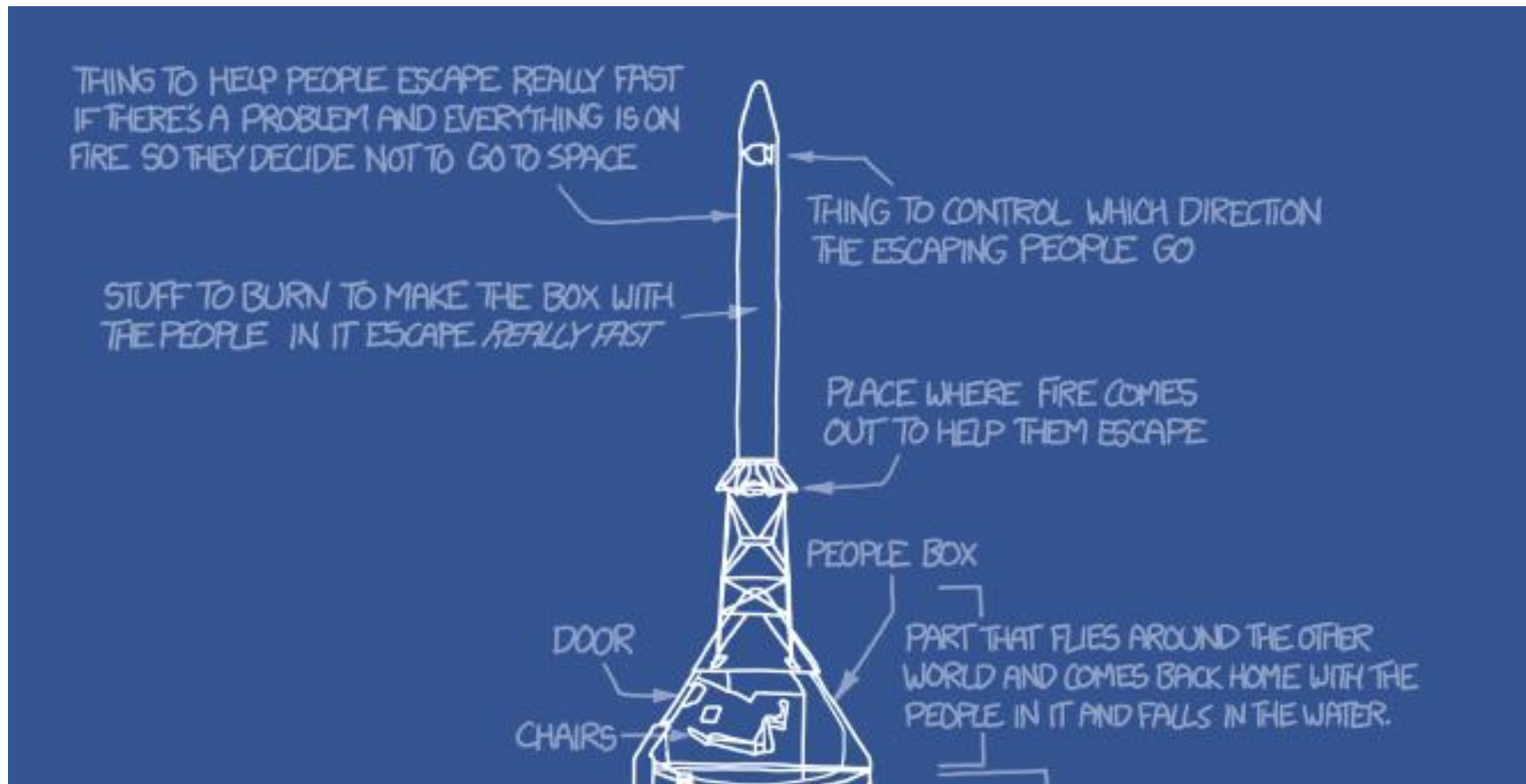
Use plain text



What is this?



Randall Munroe: Up Goer Five



Excel Vitamins

A1 or R1C1?



Excel Vitamins

Name everything!

- Name scalars
- Make data tables
- Name data tables



Excel Vitamins

Keep the formulas simple



Excel Vitamins

Limit VBA

- X** Data
- X** Calculations
- ✓** Repeated tasks



Excel Vitamins

Master lookups



Is Excel your best tool?

- Controls are difficult
- Challenges with multiple users
- Auditors don't like it

Example A

Policy-level calculations

- 100 calculations and lookups
- 250,000 policies



Example A

- Takes too long to run
- Crashes the system



Example B

Data analysis

- Review aggregate results from valuation system
- Check for *reasonableness* (year-to-year consistency, expected changes, comparing groups, ...)



Example B

- Excel is good for analysis
- Filtering data and maintaining charts
- Slicing data for reports



"Keep everything as simple as possible but not simpler." Einstein

Example C

Royalty Calculations

- Complex set of rules
- Quarter-to-quarter roll forward



Example C

- Rules were easier to follow in a database
- Warehouse stores quarterly data for trending



Non-Excel Vitamins

Microsoft Access

- Easy to use
- Database
- Integrates with Excel
- On your computer?
- **Overly simplistic?**
- **Multiple users**
- **File size limit**
- **Not robust**



Non-Excel Vitamins

Microsoft SQL Server

- Sophisticated
- Scales well
- Robust
- Multiple users
- Requires a server
- Learning curve
- Database expertise



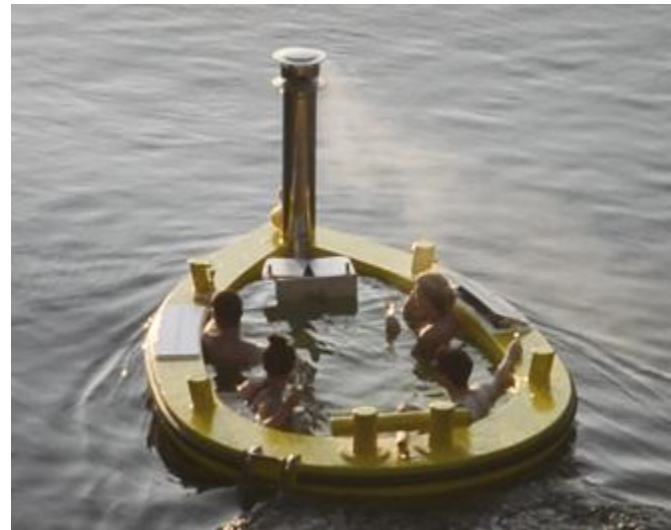
Learning Vitamins



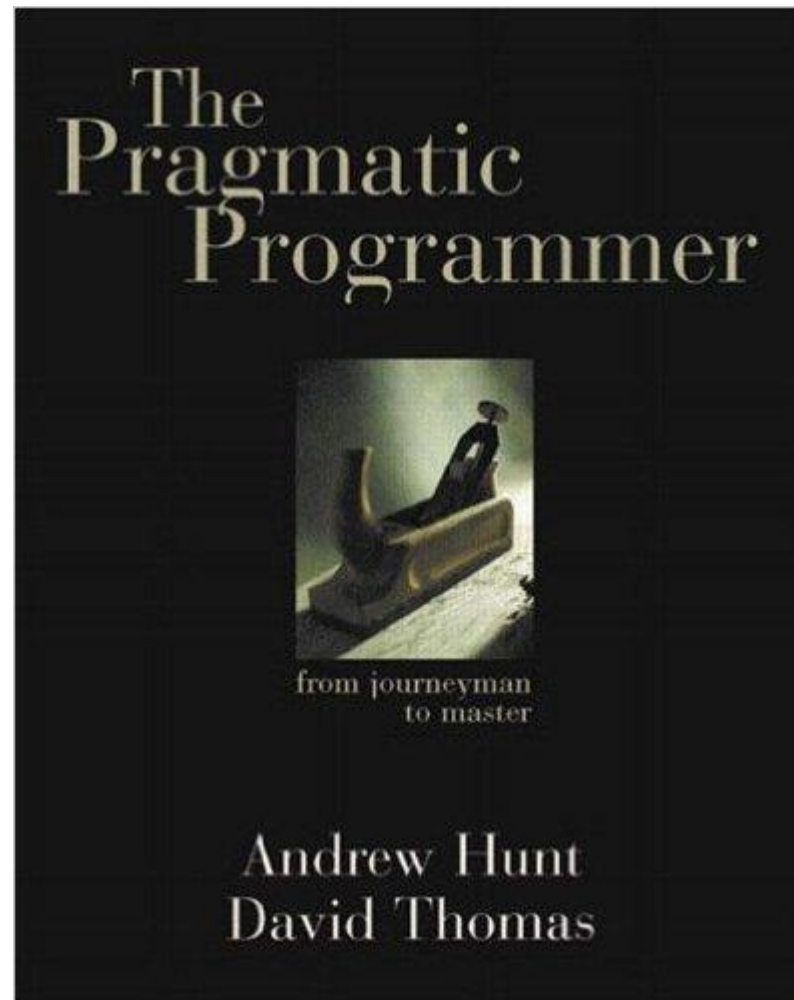
Learning Vitamins



OR



Learning Vitamins



Learning Vitamins

The CompAct



Learning Vitamins

Eddie Smith's blog *Practically Efficient*



Learning Vitamins



- Data Scientist's Toolbox
- Machine Learning
- Negotiation
- Matlab, R
- Algorithms
- And more...

Learning Vitamins



- TED
- Talks at Google
- Computerphile, Numberphile
- CGP Grey
- Veritasium
- Smarter Every Day