The Extreme Risk of Generational Turnover

Billy Hollis

Prophet of Doom

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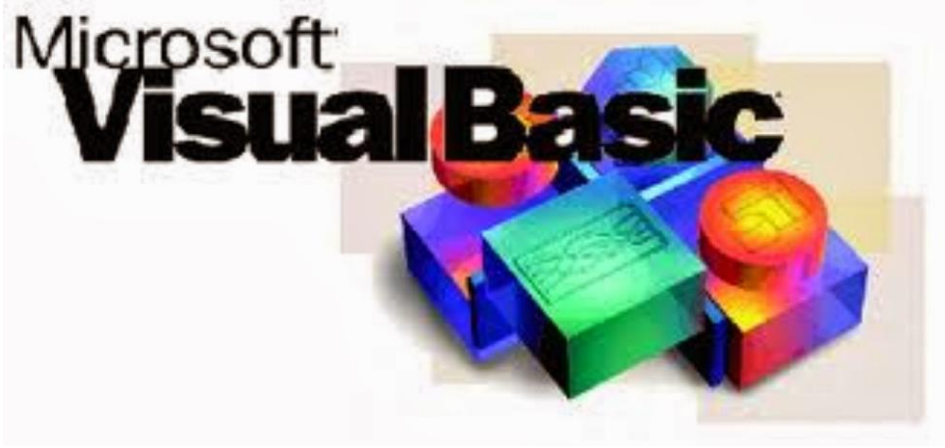
For most businesses, tech is just a tool

Business applications are essential to running most businesses of any size, but…

…most businesses are perfectly happy with “good enough” applications

So many businesses use the same tech for a long time

- “If it ain’t broke…”
- Changing out tech is expensive and risky
- I’m still seeing a few large businesses using 1980s technology with character-based terminals
- I regularly see businesses with their main application running on 1995-2005 technologies
  - Visual Basic classic
  - .NET with Windows Forms
  - ASP.NET, including Web Forms



It’s like stretching a rubber band

- You can stretch it for a while
- But if you stretch it too far…



You know most of the “stretch” factors

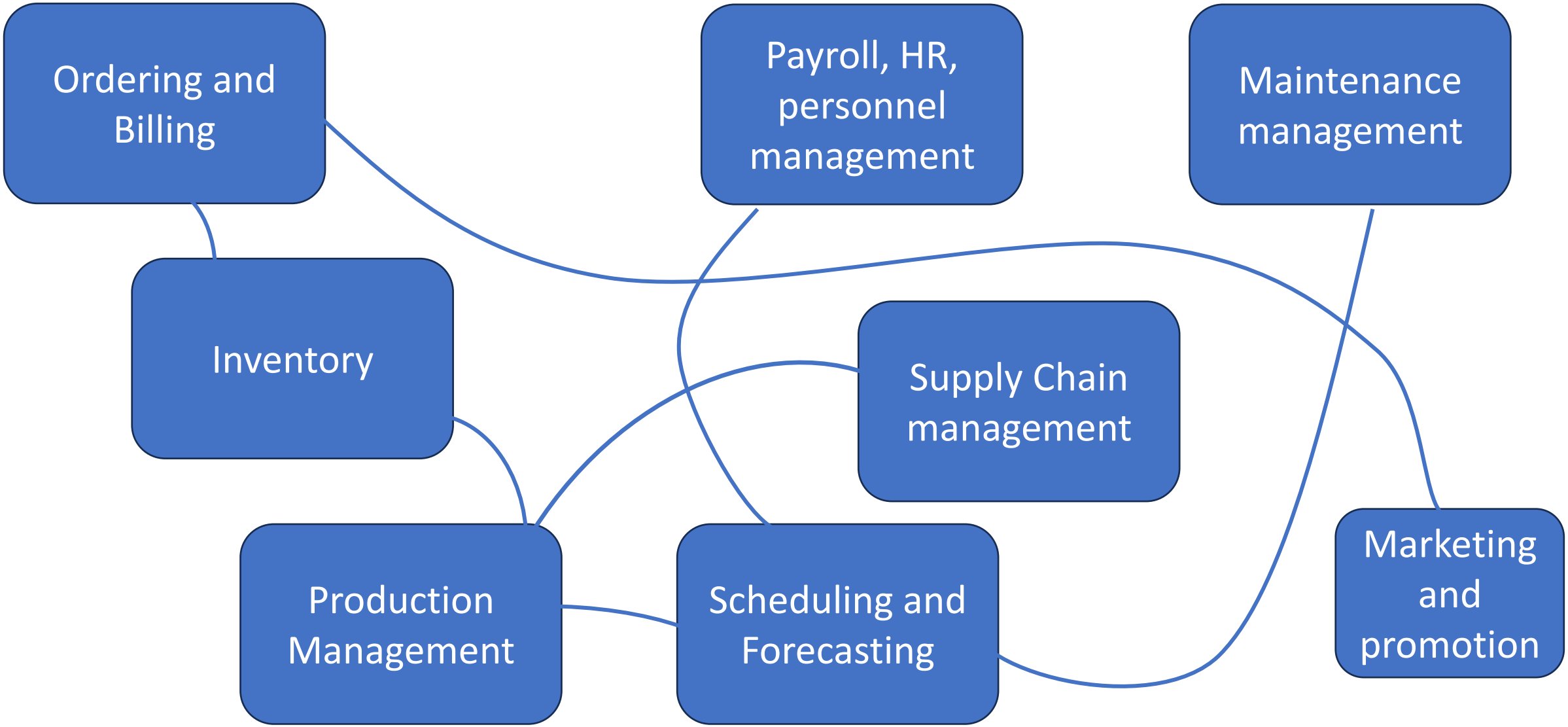
- Obsolete platforms
- Changing business needs
- Business grows and old apps won’t scale
- Business needs to take advantage of new technologies



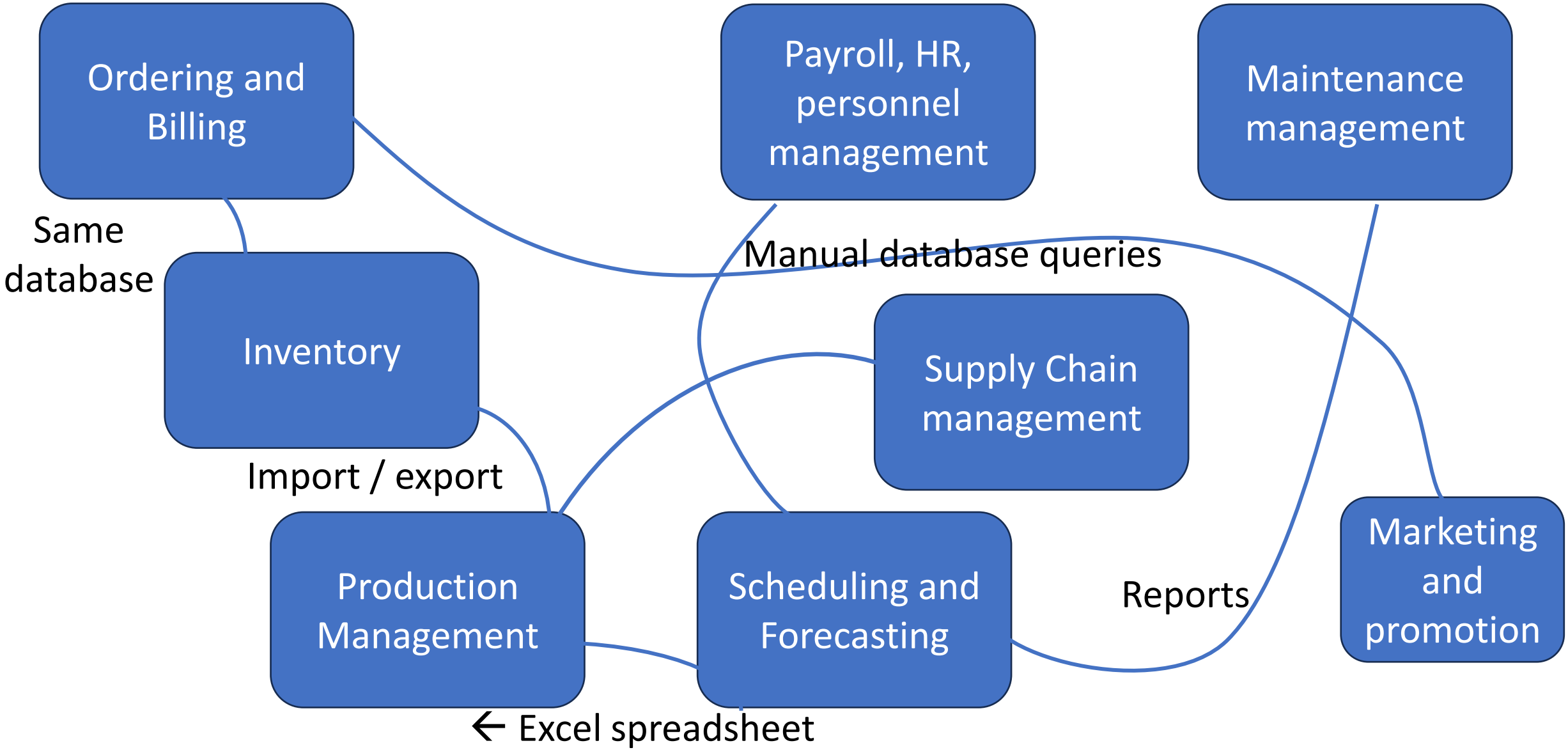
And sometimes the rubber band just gets old

1981	IBM PC introduced
Late 1980s	LANs introduced, dev tools advance (dBase, Foxpro, etc.)
Early 1990s	Client-server, GUI development tools (Visual Basic classic, Access, etc.) Most businesses become dependent on information systems
Late 1990s, early 2000s	Internet era, Java, .NET Almost all surviving businesses of any size are automated

Typical evolution for small/midsize company



Integration between apps often ad hoc



Potential complications

- Some of these might be third party apps
- Apps were granular, often developed completely separately, at different times, by different developers
- Getting information from one to another was varied
  - Same database
  - Different database
    - Import/export via delimited file, spreadsheet, etc.
    - Use multiple APIs
    - Manual transference
    - Format conversion

To make this work at all, people plugged the gaps

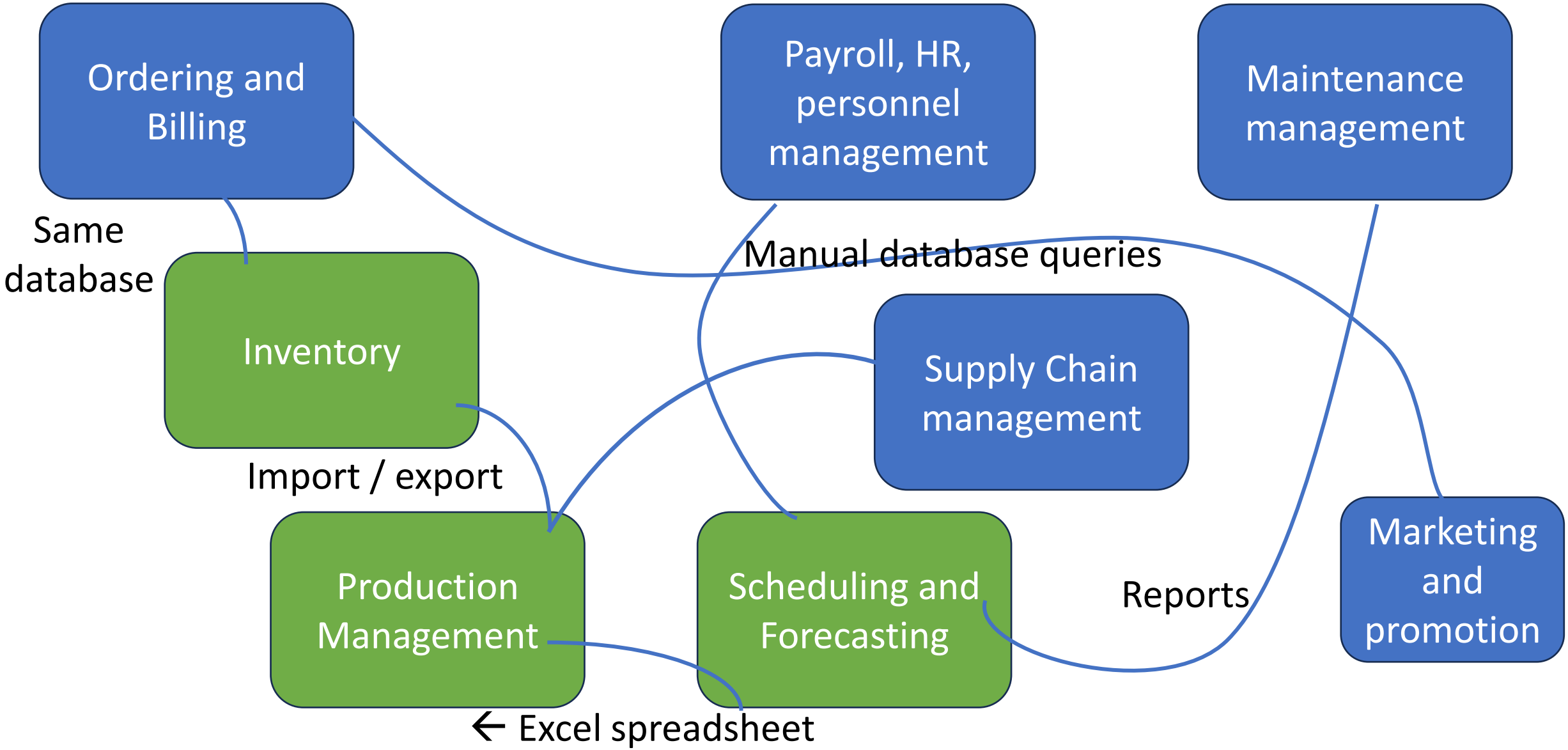
- Often clunky, unintuitive UI, but early users figured it out
  - Hey, it was easier that doing it all on paper
- Managing flow from app to app required business domain knowledge plus specialty knowledge of apps

The business grew to depend on these people smoothing out the way apps were used

(Consider “Doreen” as an example)



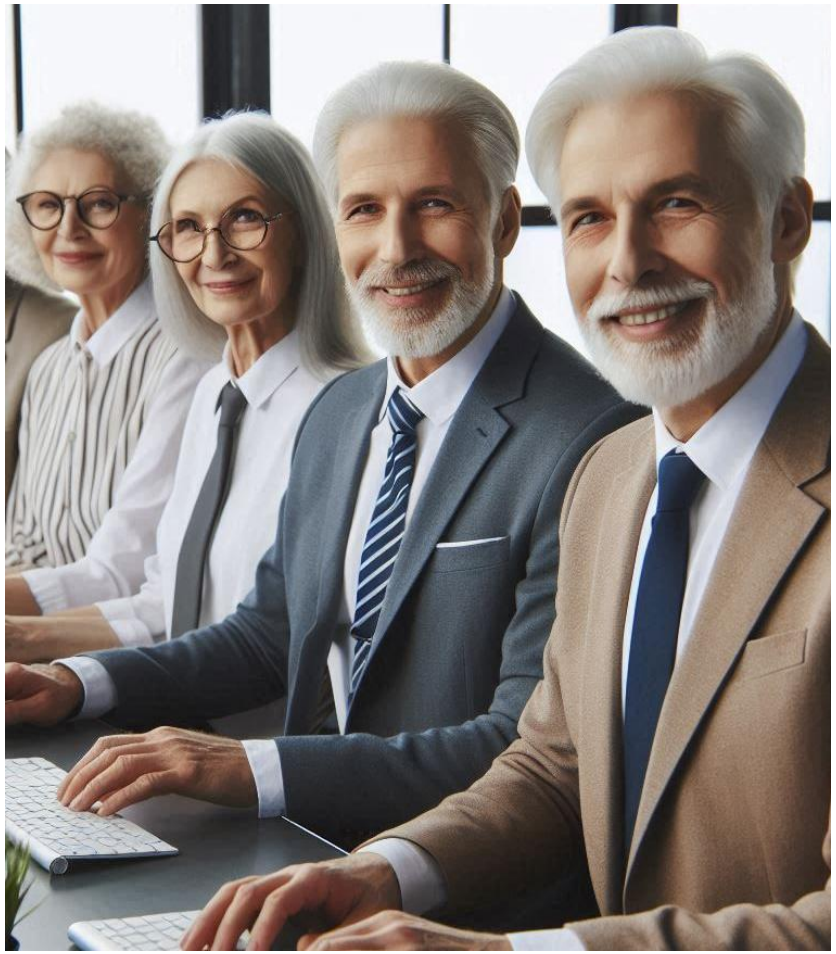
Doreen might be the go-to person for this



Let’s do the math on Doreen and her colleagues

- Assume main automation complete 1995
- Assume key users were around 30 at that time
- Those users are now all approaching retirement

- What if several retire in a short time?



I call this generational turnover (type A)

- I’ve consulted with five companies going through some variation
- They consider the problem an *existential risk*
- I’ve observed companies that failed because of it
  - **Too many things going wrong in too short a time drove off the customer base**

“Well, just train some new people!”

- Not that simple
- Took years to build the expertise
- Will those newly trained stay for ten to thirty years?
- Will younger employees put up with obsolete technology?
- Will younger employees have the patience to learn the quirks and details?



Whizbang Business App Circa 1995

Name	Sherlock Holmes	Master Header	1B-2B-3
Street	221B Baker St.	Override Auth	1-1A-2B
City, State, Zip	New London, CT 13161	Diff Splint	Stage 9
Region	Northeast	Fustamont	Bucksnort
Discount	7%	Oblate Diad	108.291702
Master Code	NCC-1701	Frenulum	Keep Left
Credit Limit	$100,000	Chiro Fistula	Thiotimiline
Debit Limit	$50,000	Overt Crang	Foramen Magnum
Account Type	Annual	Blastokink	Mitochondria
Overage Fee	$39.50	Parody Fee	$17.50
Sales Rep	Watson, J	Chaotic Orb	Hanal Nathrac
Prof Category	Charlatan	They Just	M41/M46
Route Output	Max donuts	Keep Cramming	Energy Sword
Histoform	Patella 2	More Data	Incineration Projector
Frengle Type	PinkFrengle	Into This	Spiker
Rampancy Slot	Sloane	Dense Form	BR85

Demographics | Fissure Table | Dingleplops | Raster possums

StopType	Arrived	StopETA	ArrivalTime	StopDesc
Warehouse	☑	8/22/2018 3:25:00 PM	8/22/2018 3:25:00 PM	Nashville
Office	☑	8/22/2018 5:40:00 PM	8/22/2018 5:40:00 PM	Tulsa ware
Residence	☐	8/23/2018 3:25:00 PM	8/22/2018 3:25:00 PM	Houston D
Office	☑	8/25/2018 3:25:00 PM	8/23/2018 3:25:00 PM	Los Angel
	☐			

Indicators



Oh My Goodness	Scorpion
They're Still	Warthog
Cramming More	Hornet
Stuff in Here	Mongoose
Nobody needs	Pelican
Any of This	Wasp

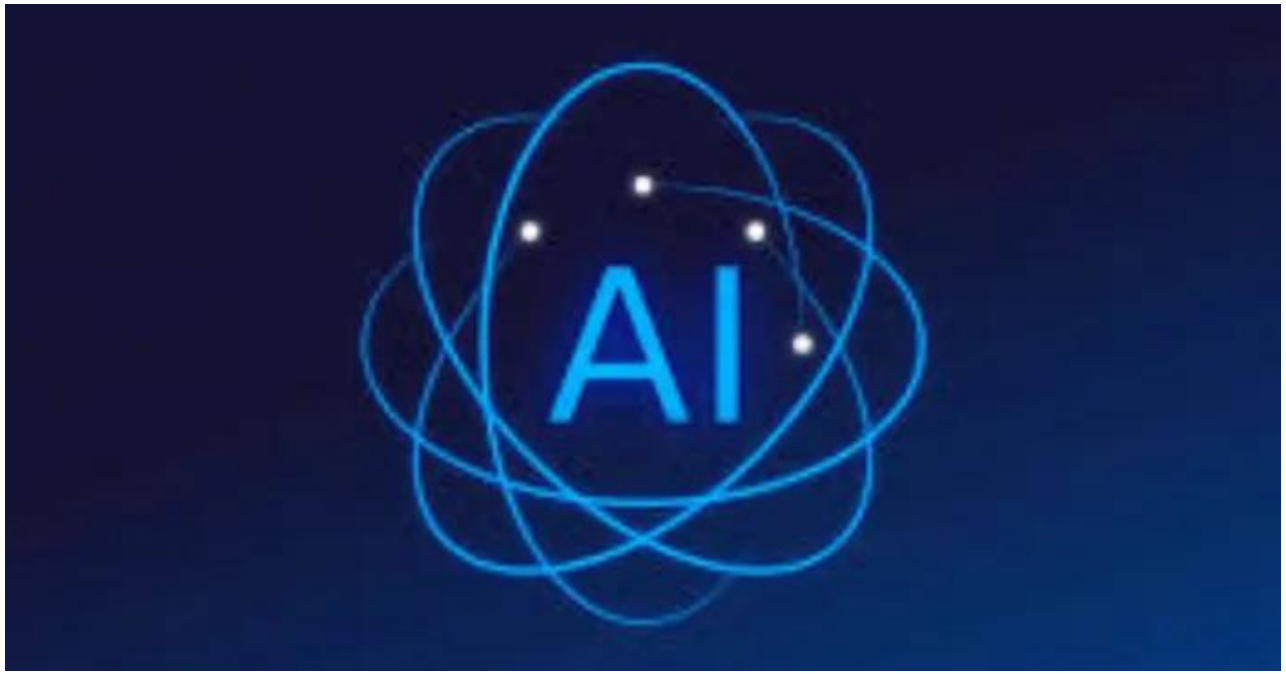
Route #	Customer	Shipper	Stops	ETA	Cond	G/L Ref	Issues	Condition
Z47202905	Giant Goofy Gadgets	Crazy Chris Trucking	4	7/27/2019 5:37:22 PM	5	QX-307181	0	5
Z47200284	Last Mile Fuel	Last Mile Trucking	5	7/28/2019 5:37:22 PM	8	QX-306740	0	8
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Z47202306	Instant Teleportation, Inc.	Hollis Worldwide	4	7/25/2019 5:37:22 PM	8	QX-306312	3	8
Z47202337	Instant Teleportation, Inc.	Hill Valley Transportation	5	7/23/2019 5:37:22 PM	2	QX-305717	0	2
Z47206046	Yosimite Sam Liquors	Across the Ocean Blue	4	7/24/2019 5:37:22 PM	4	QX-305860	0	4
Z47207193	Everywhere Transportation	Speedy Transit	5	7/28/2019 5:37:22 PM	4	QX-308276	0	4
Z47203833	Mistrel Auditorium	Instant Teleportation, Inc.	5	7/25/2019 5:37:22 PM	5	QX-306117	0	5
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Z47202415	Hollis Enterprises	Last Mile Trucking	4	7/26/2019 5:37:22 PM	4	QX-309330	0	4
Z47205391	Hollywood Hotels	Bugs Bunny Expediters	5	7/28/2019 5:37:22 PM	3	QX-302140	0	3
Z47205847	Marvelous Marv	Everywhere Transportation	5	7/28/2019 5:37:22 PM	5	QX-307329	0	5
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Remember, this problem stacks on all the others

- Obsolete technology
- Technical debt
- Business evolution
- Need to adopt new technologies to be competitive – which right now means…

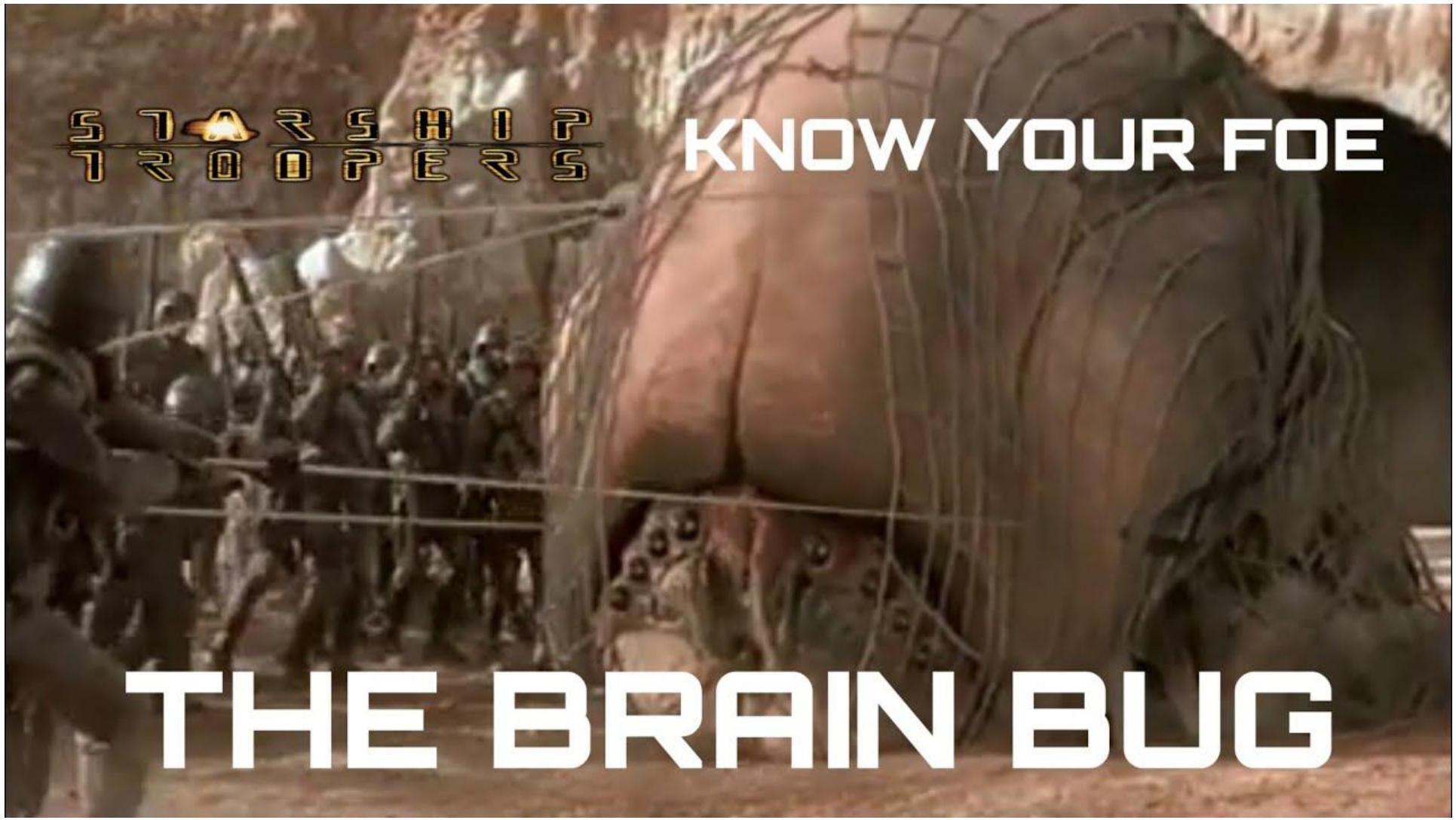


Critical to address the issues before the rubber band snaps

- Especially before hard deadlines introduce big problems
  - Retirement of key users
  - Deprecation of platforms, leading to security problems and lack of support

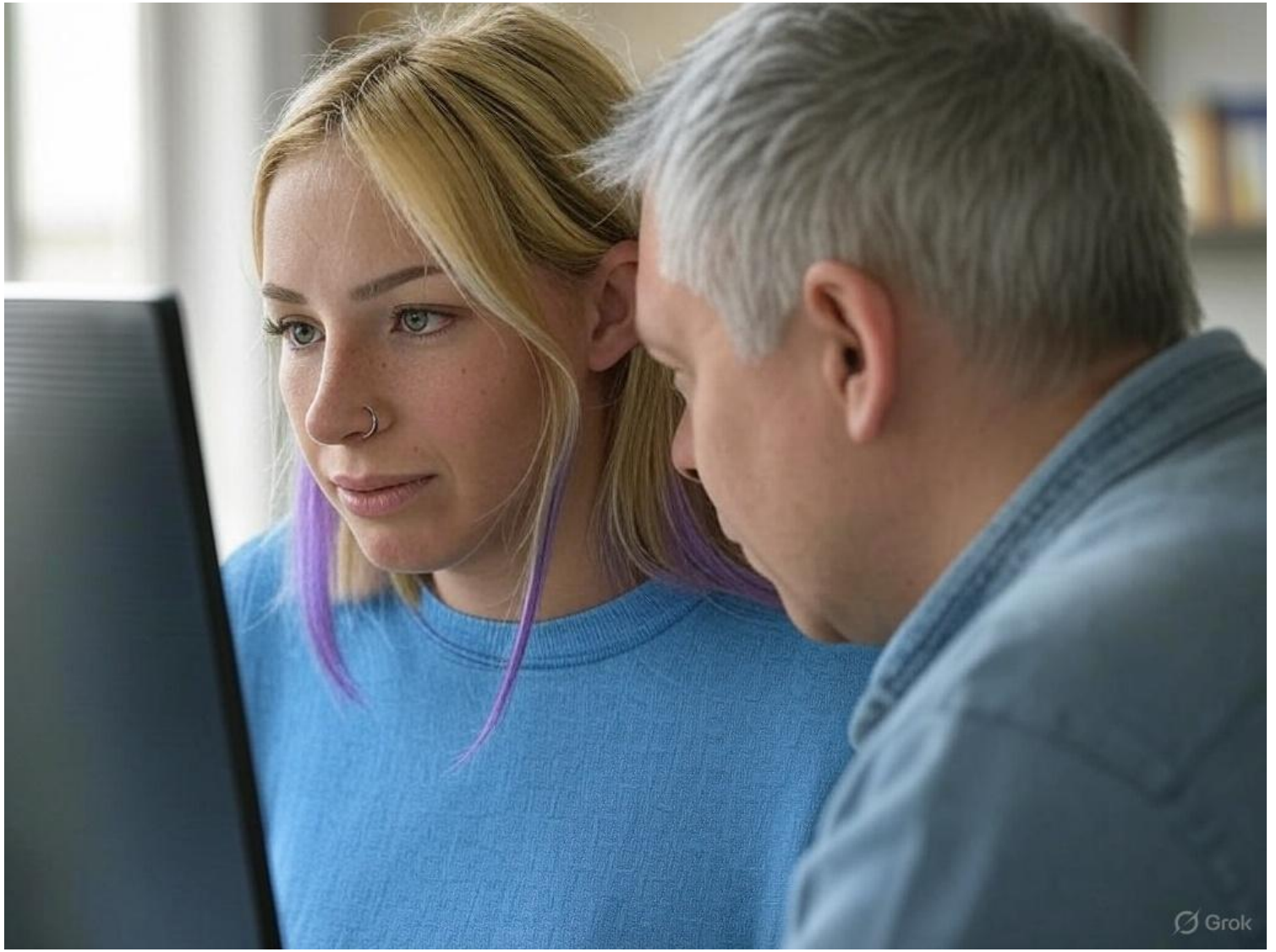
Naïve manager: “We’ll use AI to generate a replacement”

But… if the expertise is in people’s heads and they leave before you get it out, how will a dev team know what to tell the AI?


STARSHIP TROOPERS
KNOW YOUR FOE
THE BRAIN BUG

Stopgap

- Training program to replace the most critical users



Eventually, you'll have to choose

- Use what you have as a base
- Buy off the shelf
- Replace with enterprise software
  - SAP, JD Edwards, SalesForce, etc.
- Rewrite some or all of the apps

All of these have their own risks, and all the risks are significant

Different companies are in different places

- I find teams have generally put more investment in their back ends than their front ends
- If your back end is generally in good shape and has the flexibility to support changes going forward, you're in better shape to deal with generational turnover
- Even so, don't neglect the potential need to embrace new front end platforms, wider range of devices, and modern UI designs.

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Master Code	NCC-1701	Frenulum	Keep Left
Credit Limit	$100,000	Chiro Fistula	Thiotimiline
Debit Limit	$50,000	Overt Crang	Foramen Magnum
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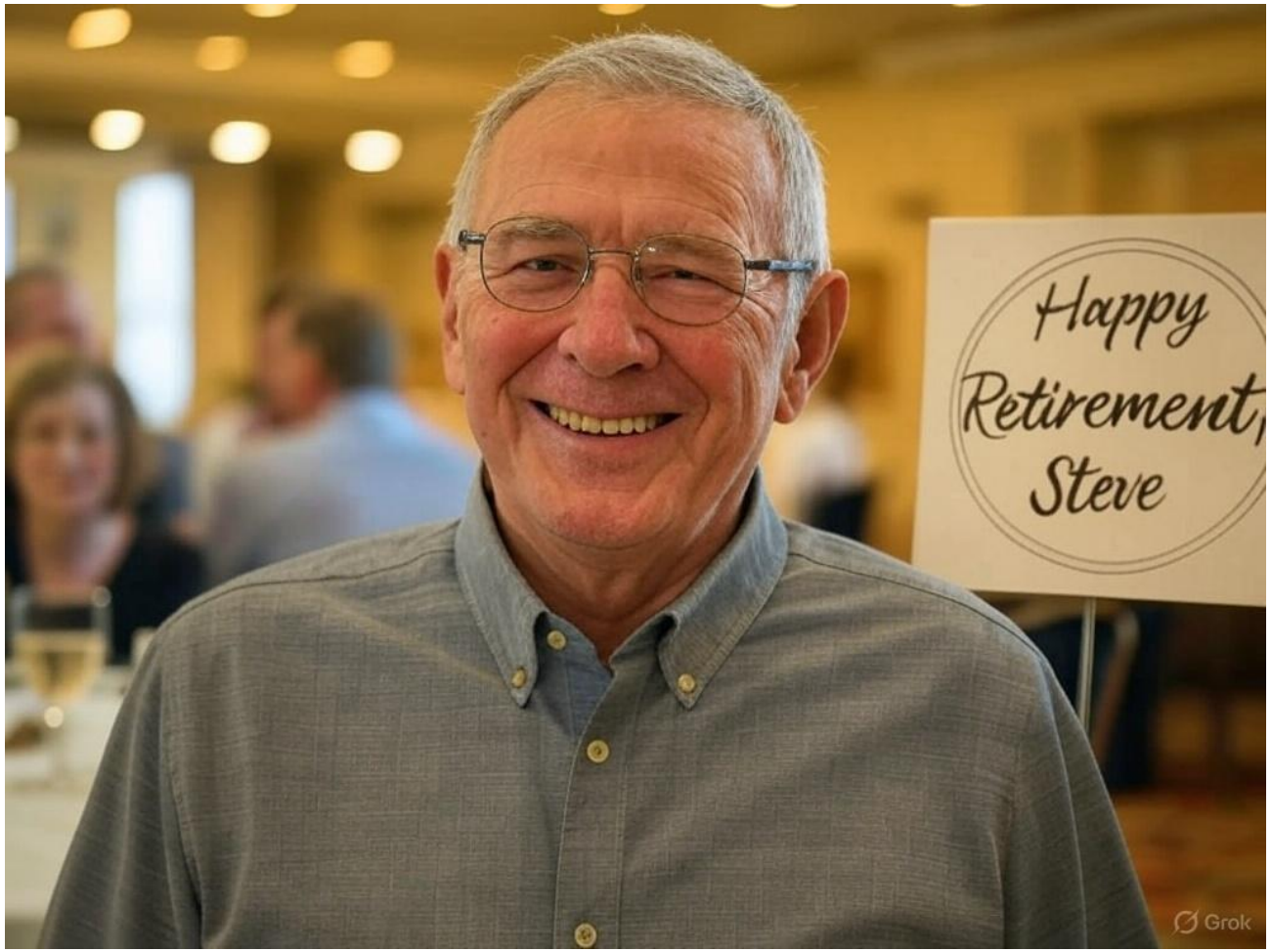
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Research before the decision

- Just how much trouble is the business in?
- What are the hard deadlines?

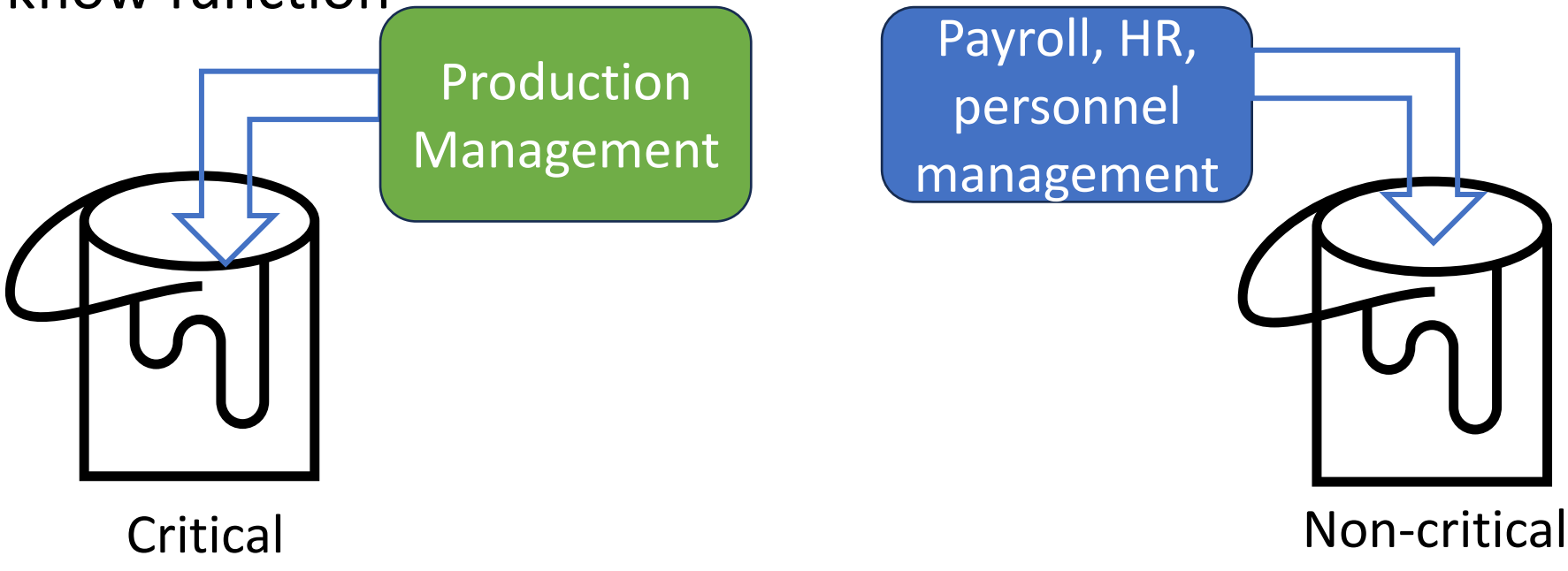


What are the major systems in business operations?

- How do they connect to one another?
  - Automated
  - Export / import
  - App-based, such as spreadsheet
  - Manual entry from one to another
- Who are the key users of each system from a business domain perspective?

What systems are in the mission critical workflow?

- For each system, would unavailability lead to shutdown of major part of the business?
- Map out the mission critical workflow, including the systems, the connections between them, and the key people who make the workflow function



How is each system aging? What risks do they present?

- Obsolete dependencies
- Platform support issues
- Projected “must replace” date
- Current organization plans for change
  - New features
  - Rewrite
  - Replacement
  - Migration to new platform

Distill to major systems plus their users

System / Application	Major / critical users	Risk factors (e.g. platform support ending)
Production Management	Clark Kent Ralph Kramden Holly Golightly	
Supply Chain Management	Irene Adler Clark Kent Elizabeth Bennett	MyDataStuff 12.2 database reaches end of life 10/25/2027
Sales Forecasting	Holly Golightly Liza Doolittle	
Scheduling	Ralph Kramden Hazel Nutt Chris P. Bacon	Uses third party calendar service, company probably going out of business

Pivot to note critical users

- These are the ones who possess expertise critical to the business, entirely in their heads

Interview critical users

- What risks do they see?
- Are their major flaws in the apps that expose the business?
- Do they need something to do their job better?
- How hard would it be for someone to learn their job?
  - What backup do they have? “Suppose you had a heart attack next week…”
  - Be extra careful not to suggest they might be replaced



Generational Turnover – Type B

- Many businesses use various technologies that
  - Are essential to their operations, usually because a critical app uses them
  - Are no longer being maintained or improved
  - Require specialized knowledge to integrate



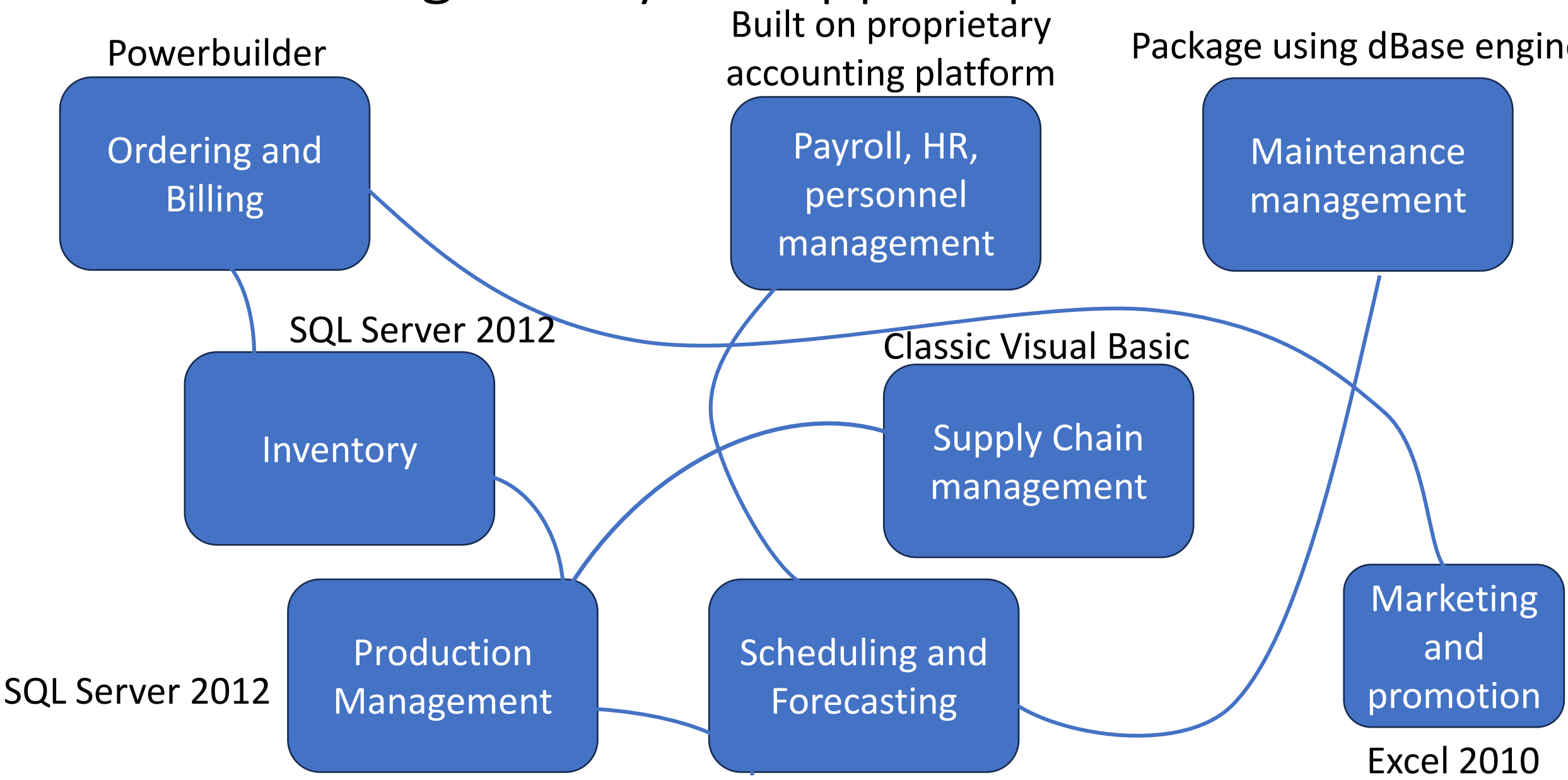
This time, the retirements are in technology staff rather than business app users

- Every year, fewer people understand this aging technology
- Replacing it is difficult and expensive
  - Otherwise that would already have been done
- It’s hard to find anyone to learn it – no good career path
- This problem tends to afflict larger companies
  - Banks, for example, are particularly vulnerable

Risk analysis for Generational Turnover Type B is in your area of responsibility

- Many of the same considerations apply
  - Who are the key people who keep obsolete technology running?
  - How much longer will you have them?
- Your overall plan for dealing with Generational Turnover must combine potential problems from Type A and Type B

Add technologies to your app map



As with users, analyze to find key people and their retirement trajectory

- The ones supporting the oldest, most obsolete technologies are usually the priority
  - The older the tech, the harder it is to find someone qualified and willing to work with it
- Might negotiate an on-demand arrangement after retirement
  - But don’t abuse it!

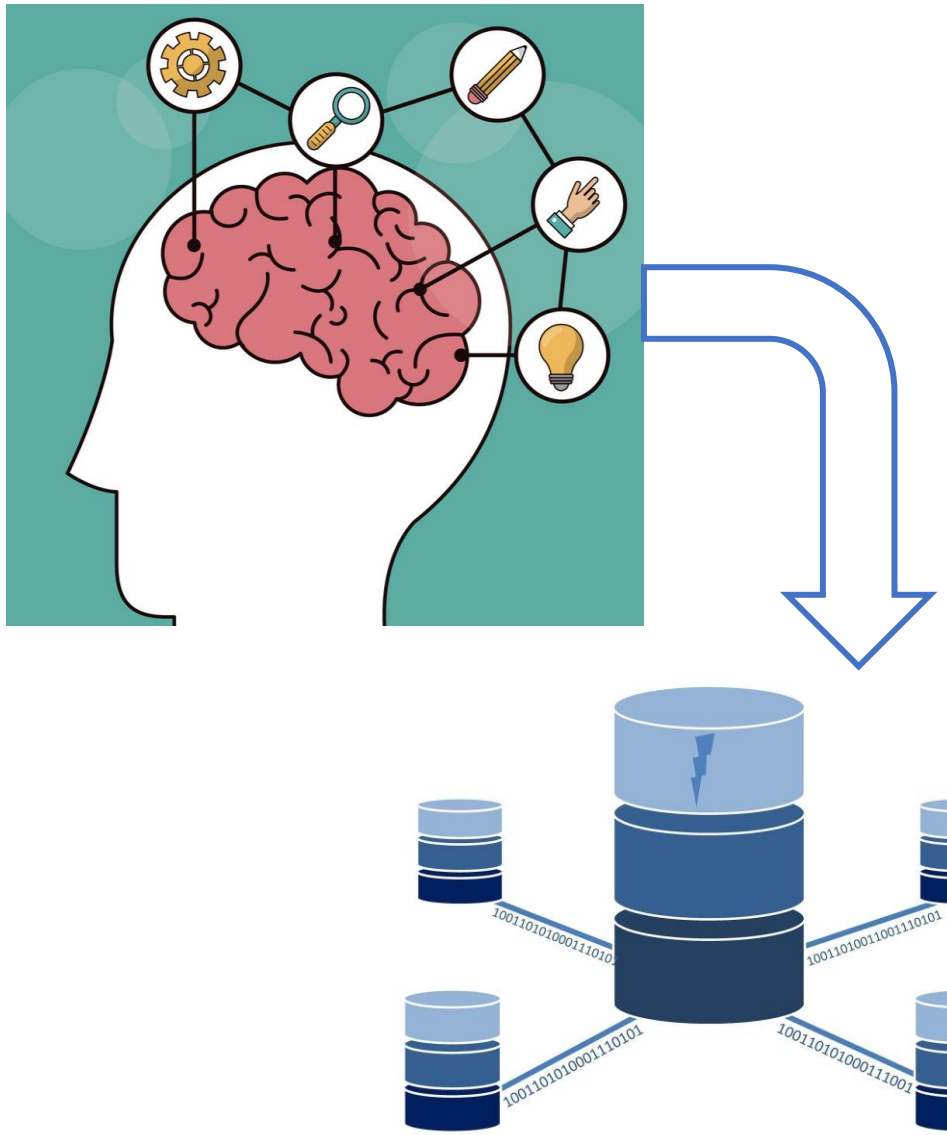
What's to be done?

- Every company will choose a different combination of strategies to deal with Generational Turnover

- An optimal strategy will depend on
  - Size of company
  - Business domain
  - Time to impact of Generational Turnover
  - Talent available in your organization
  - Availability of outside assistance, and budget to use it

Embracing rules-based applications

- Generational Turnover often involves lots of business domain knowledge in people's heads
- When people have to know too much, this is a huge risk factor for many reasons
- A long term solution usually moves that expertise into the application set (the applications running the business become smarter)
- This usually involves rules-based workflow, which I'll get to shortly

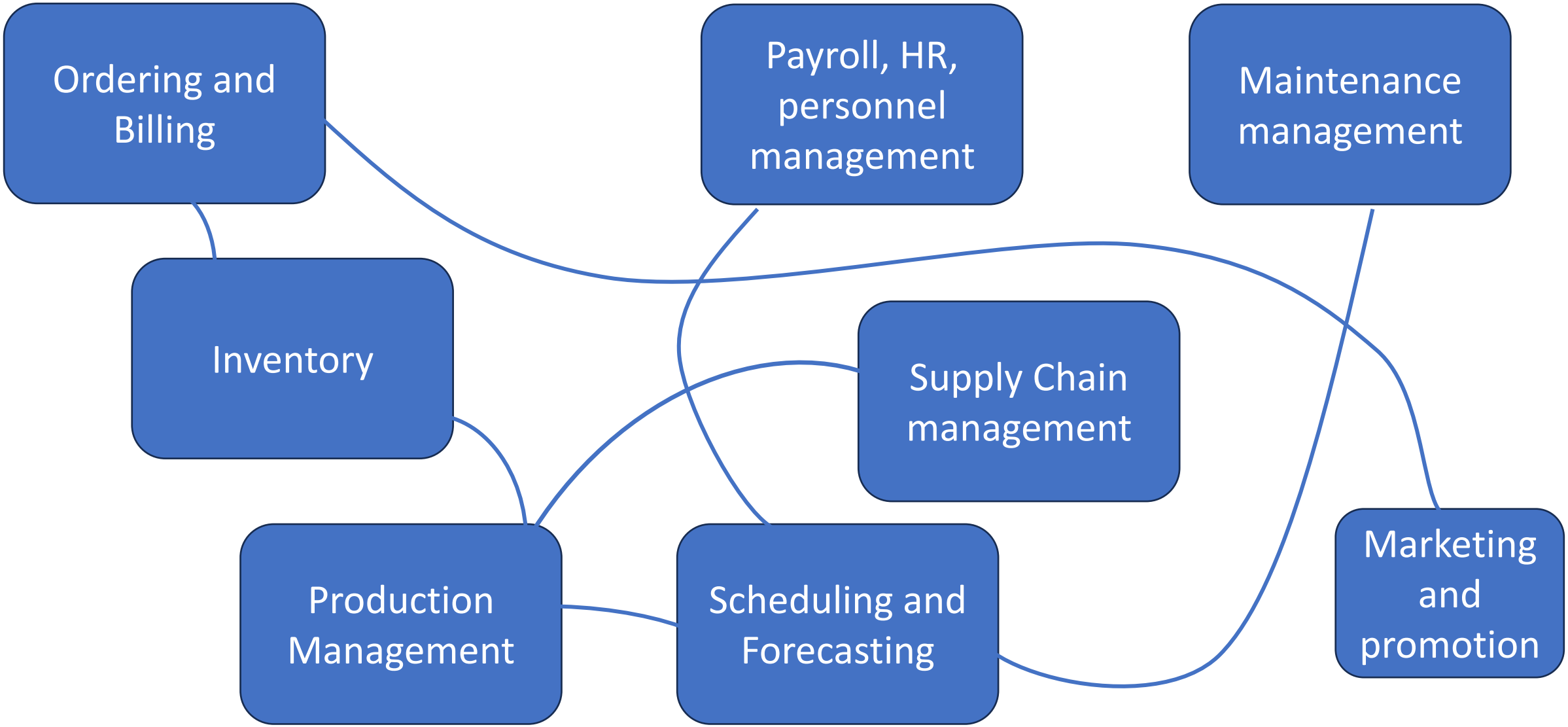


Major options

- Target worst parts of legacy apps and improve them
  - Focusing on reducing expertise needed to use them
- Replace with commercial packages targeted at your business type
- Replace with enterprise software, configured for the business
  - SAP, JD Edwards, SalesForce, etc.
- Rewrite some or all of the apps

- All of these have their own risks, and all the risks are significant

May use different strategies on different apps



Replacing with a commercial package

- Depends on availability of a commercial package that is sufficiently congruent with your business

- **For most of you in here, such a match isn't available**
  - The larger you are, the less likely you'll find one

- Offloads tech expense and responsibility
- But also introduces an external dependency
  - Your business now depends on survival of that business



Enterprise (ERP) option

- Expensive
- Usually does typical business processes well (ordering, accounting, marketing, vanilla supply chain)
- Needs customization, sometimes heavy, to the business
  - That can be very expensive
  - For a unique business, may still not fit well
- Running costs for development normally reduced







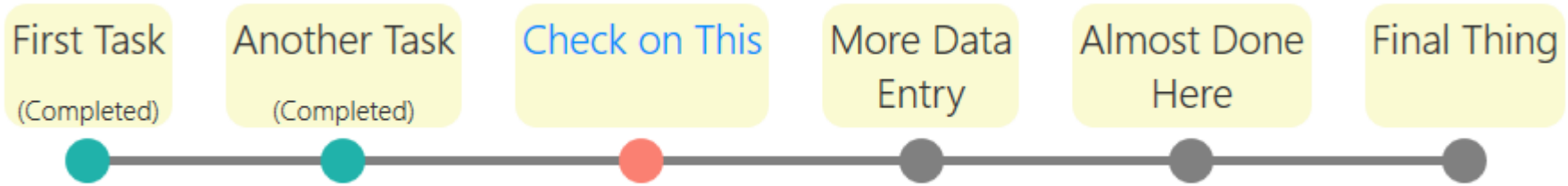
Rewrite – two general approaches

- Replicate current functionality with some improvements
  - Can solve the platform obsolescence problem
  - Usually doesn't completely solve the "user has to know too much" problem
  - Do you stick with old UI or try to modernize?

- Business process reengineering
  - Go back to the white board and decide how the business ought to work today, taking new business needs and modern technology into account
  - Expensive, and you probably need outside help, but can be the best long term option

Big opportunity for business process re-engineering is to automate workflow

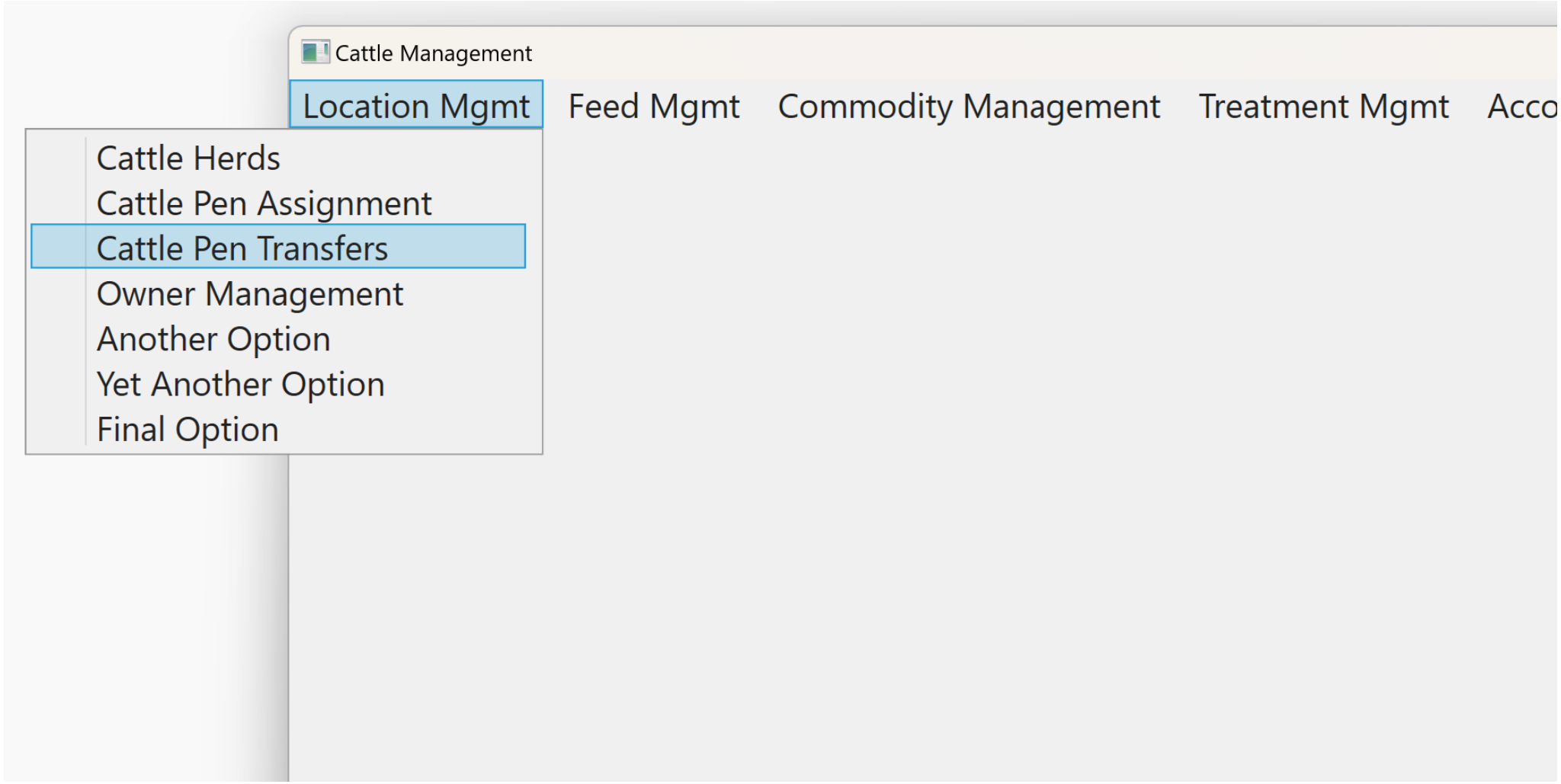
- Workflow is everywhere, but often not explicitly supported
- Workflow allows a lot of app logic to be in rules that are easily changed
- We've seen cases where well-architected and well-implemented workflow cut unit labor by 50%

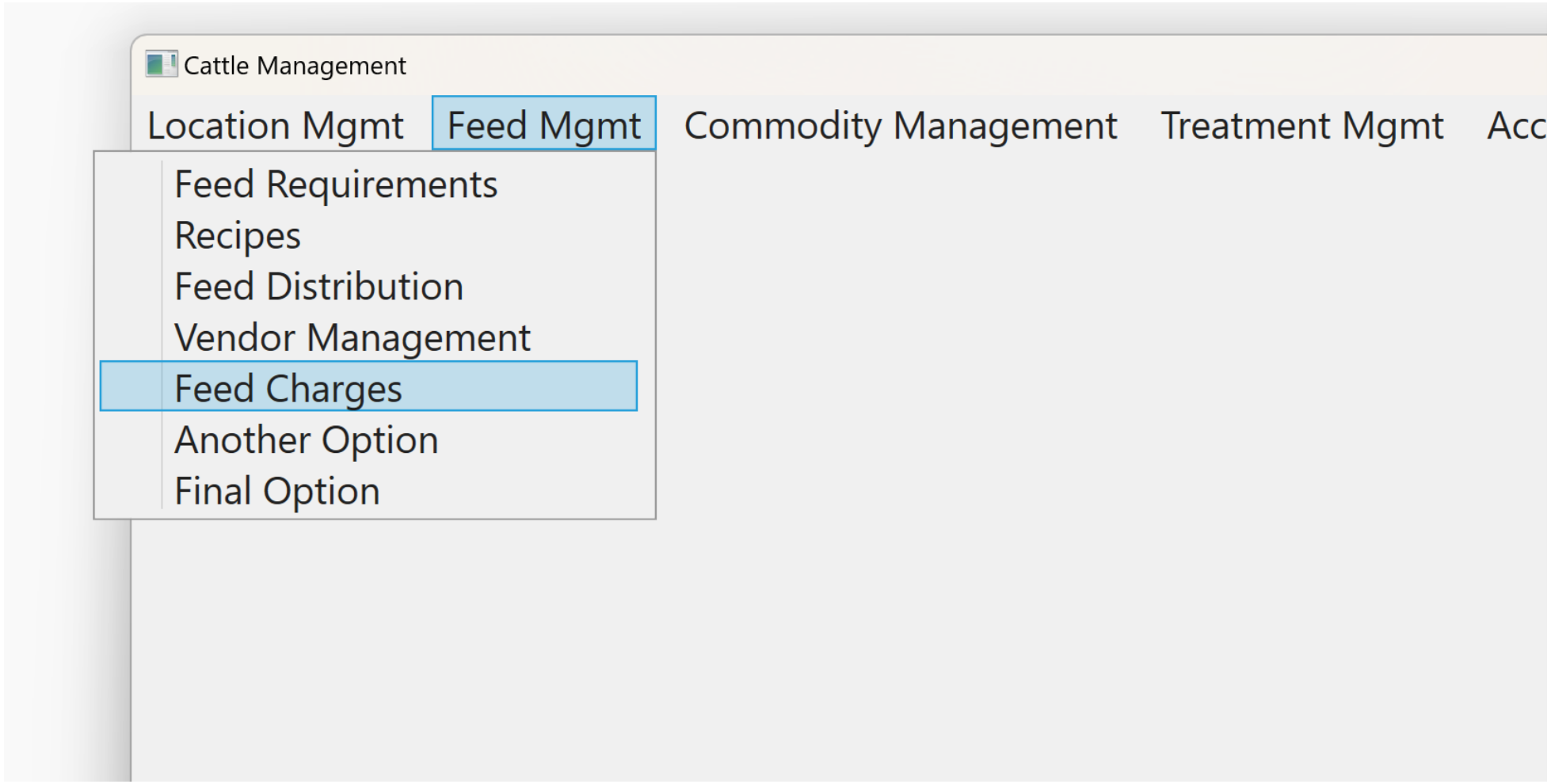


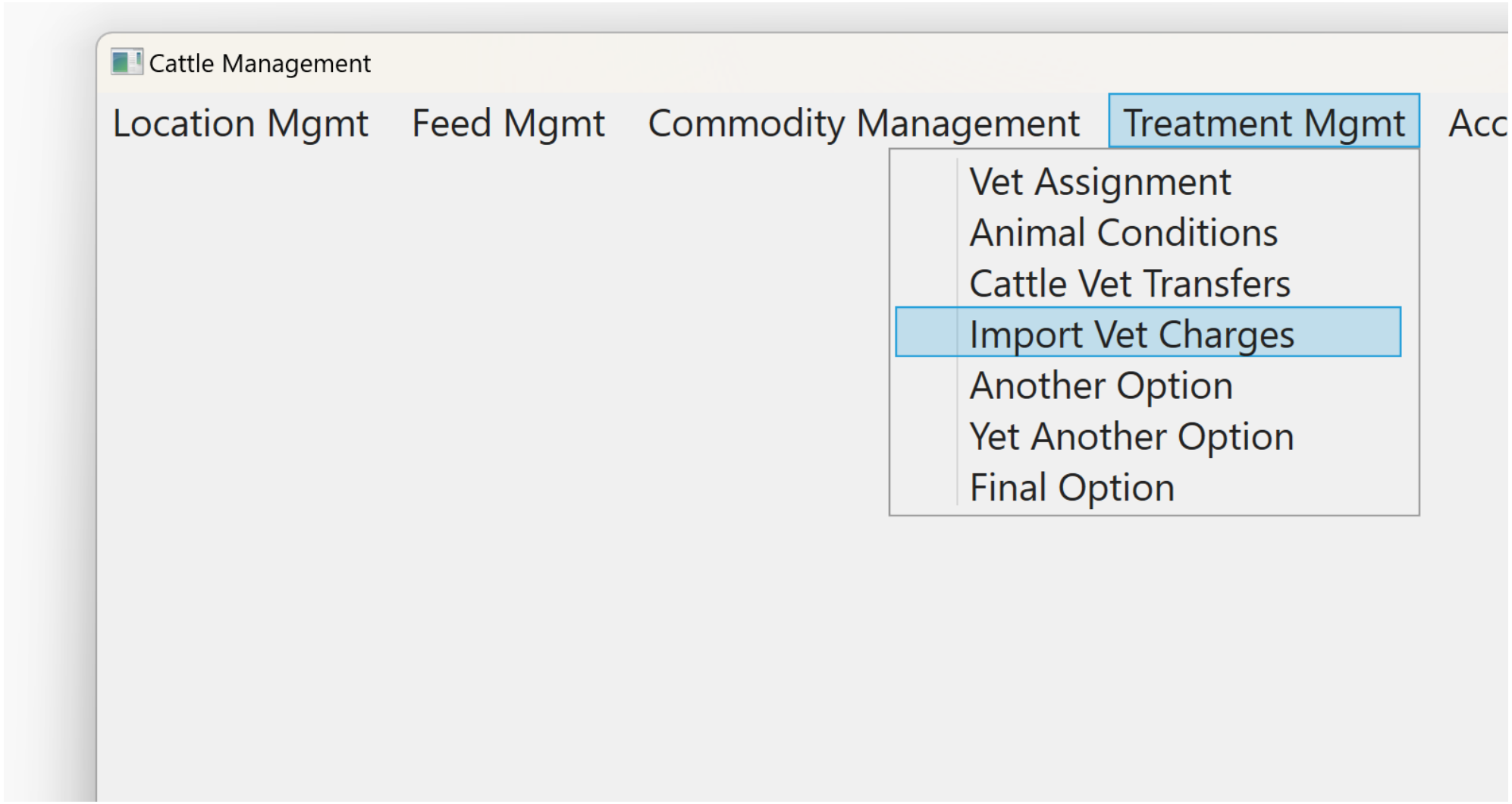
Why workflow is important - human limitations

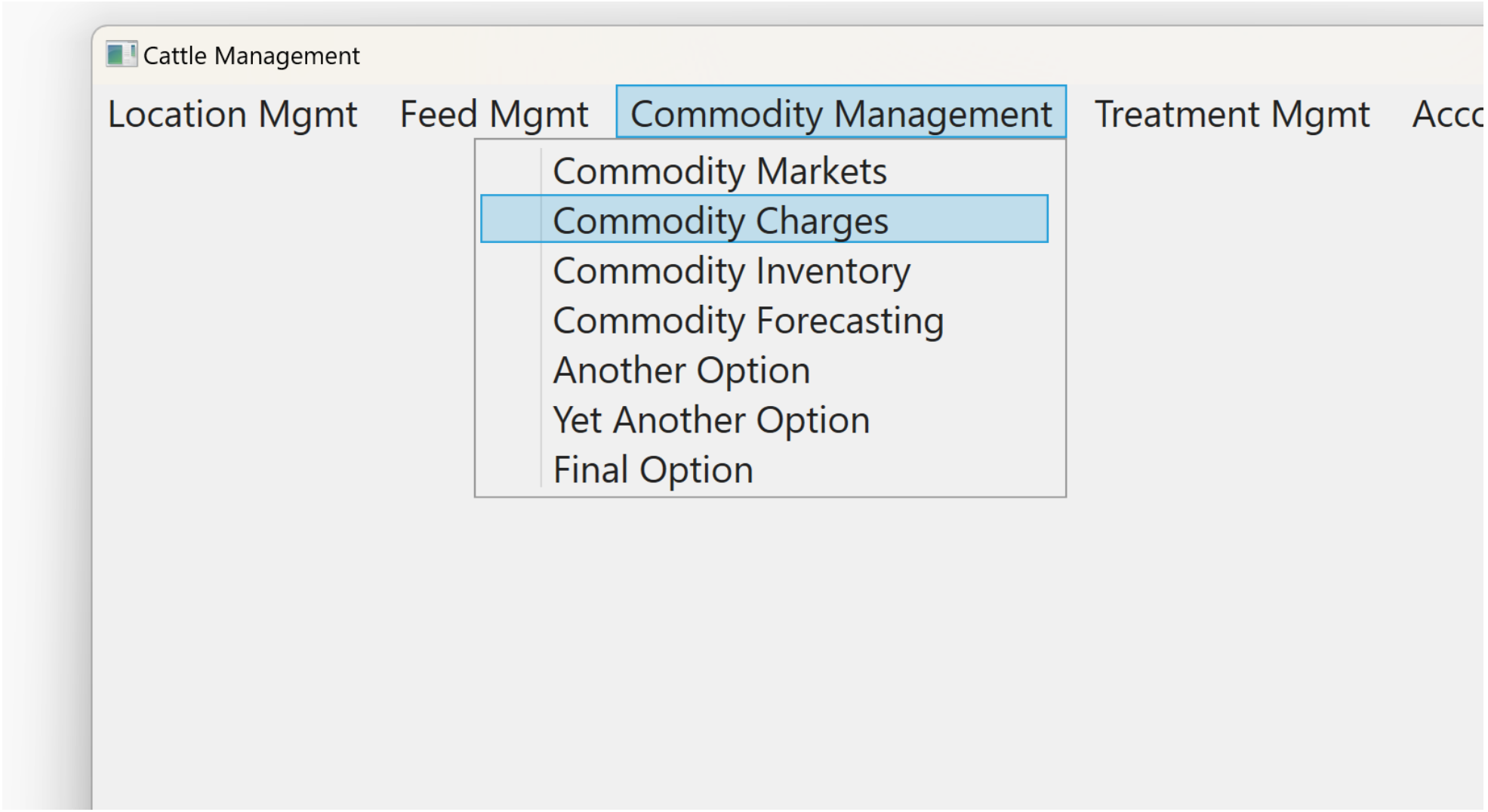
- Attention is a very scarce resource
- Short term memory has limited capacity

- Well designed workflow can address these limitations
  - Might not be a replacement for how they accomplish work today
  - A supplement to speed them up and reduce errors


Cattle Management
Location Mgmt
Feed Mgmt
Commodity Management
Treatment Mgmt
Acco
Cattle Herds
Cattle Pen Assignment
Cattle Pen Transfers
Owner Management
Another Option
Yet Another Option
Final Option


Cattle Management
Location Mgmt
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Commodity Management
Treatment Mgmt
Acc
Feed Requirements
Recipes
Feed Distribution
Vendor Management
Feed Charges
Another Option
Final Option

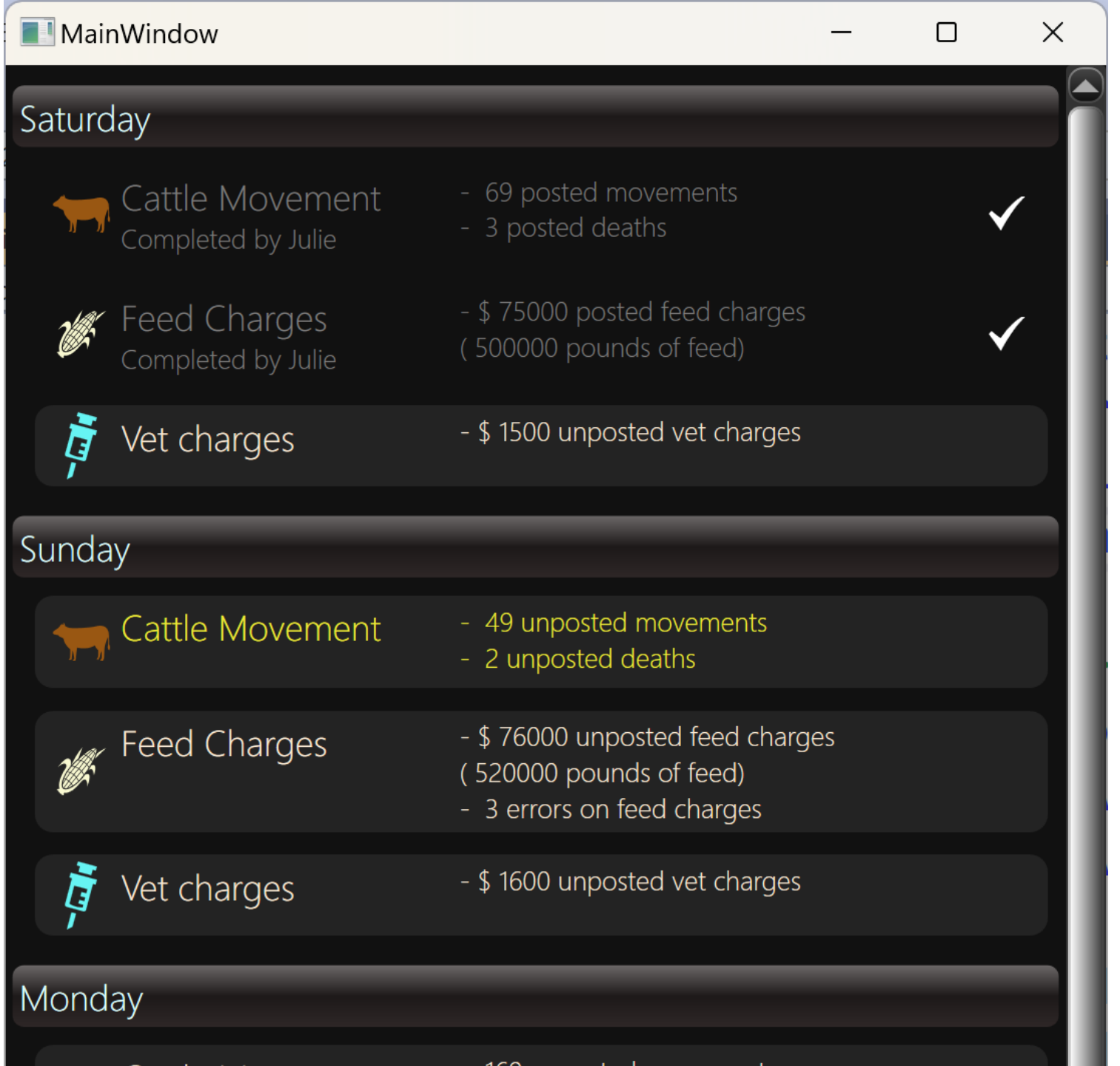

Cattle Management
Location Mgmt
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Vet Assignment
Animal Conditions
Cattle Vet Transfers
Import Vet Charges
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Commodity Management
Treatment Mgmt
Acc
Commodity Markets
Commodity Charges
Commodity Inventory
Commodity Forecasting
Another Option
Yet Another Option
Final Option

Problems for users

- Attention is split between actual work and navigation of the system
- Short term memory is strained
  - User must track the tasks they must complete, and where they are in the workflow


MainWindow
Saturday
Cattle Movement
Completed by Julie
- 69 posted movements
- 3 posted deaths
Feed Charges
Completed by Julie
- $ 75000 posted feed charges
(500000 pounds of feed)
Vet charges
- $ 1500 unposted vet charges
Sunday
Cattle Movement
- 49 unposted movements
- 2 unposted deaths
Feed Charges
- $ 76000 unposted feed charges
(520000 pounds of feed)
- 3 errors on feed charges
Vet charges
- $ 1600 unposted vet charges
Monday
Cattle Movement
- 169 unposted movements
- 5 unposted deaths
Feed Charges
- $ 72000 unposted feed charges
(480000 pounds of feed)
- 0 errors on feed charges
Vet charges
- $ 1400 unposted vet charges
Generated Charges
Generate Charges
Review Generated Charges

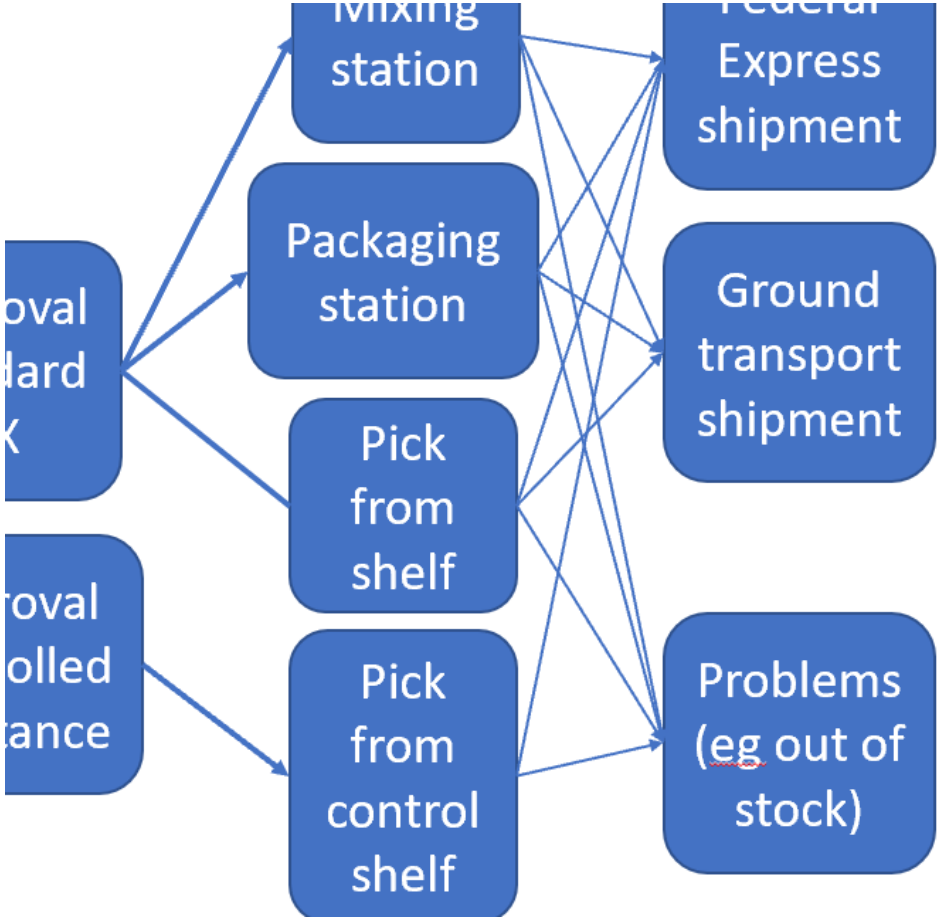

MainWindow
Saturday
Cattle Movement
Completed by Julie
- 69 posted movements
- 3 posted deaths
Feed Charges
Completed by Julie
- $ 75000 posted feed charges
(500000 pounds of feed)
Vet charges
- $ 1500 unposted vet charges
Sunday
Cattle Movement
- 49 unposted movements
- 2 unposted deaths
Feed Charges
- $ 76000 unposted feed charges
(520000 pounds of feed)
- 3 errors on feed charges
Vet charges
- $ 1600 unposted vet charges
Monday

Expertise in workflow is regrettably limited

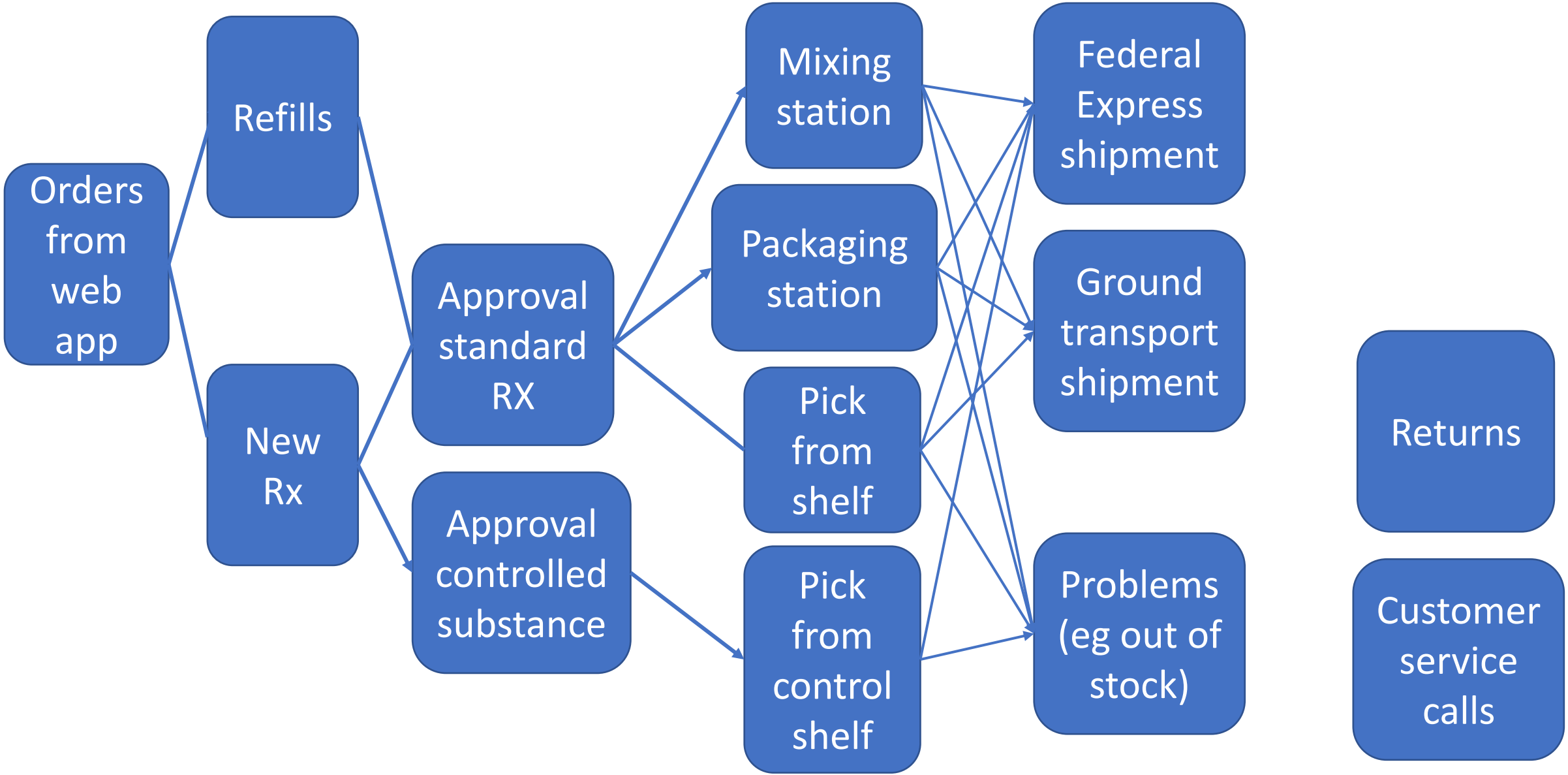
- Commercial solutions are expensive, and often have configuration issues akin to ERP
- Companies like Microsoft just don’t understand workflow
  - They’ve tried multiple times to produce workflow products, none of which gained wide acceptance
- Small to mid size companies usually don’t have the architectural expertise in house to do complex workflow
  - Workflow in those companies usually done in code, with each workflow programmed separately

Automation of complex branching workflows can provide huge value

- Complex workflows require advanced architectures
  - Queues of work items
  - Complex rules running the workflow
- Often drive organizational changes to the way work is done
- Can be highly valuable, but usually done with a complete revamp of application



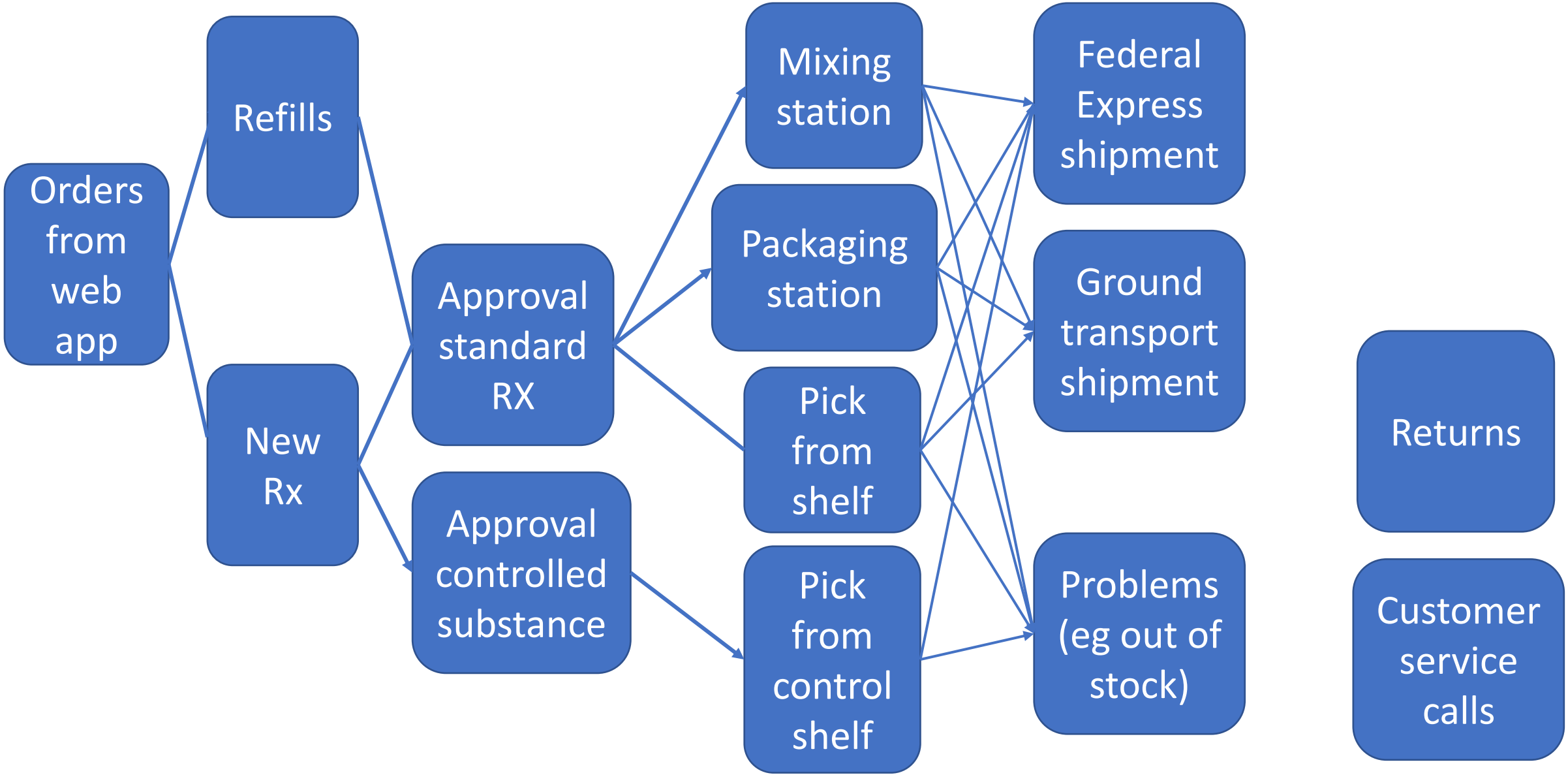
Simplified workflow from real project



Elements of workflow architecture

- Work items – a container for all the relevant information about an item of work
  - References to data involved in that work item
  - Status information – where is the item in the flow
- Queues to hold pending work items
  - Pull queue – item pops off top when user is ready for it
  - Push queue – user selects item to work on from a list
- Validation rules – when is an item valid, and when is it done
- Routing rules – when an item is finished at one stage, what happens to it next?

Rules are executed by rules engines to validate and route work items

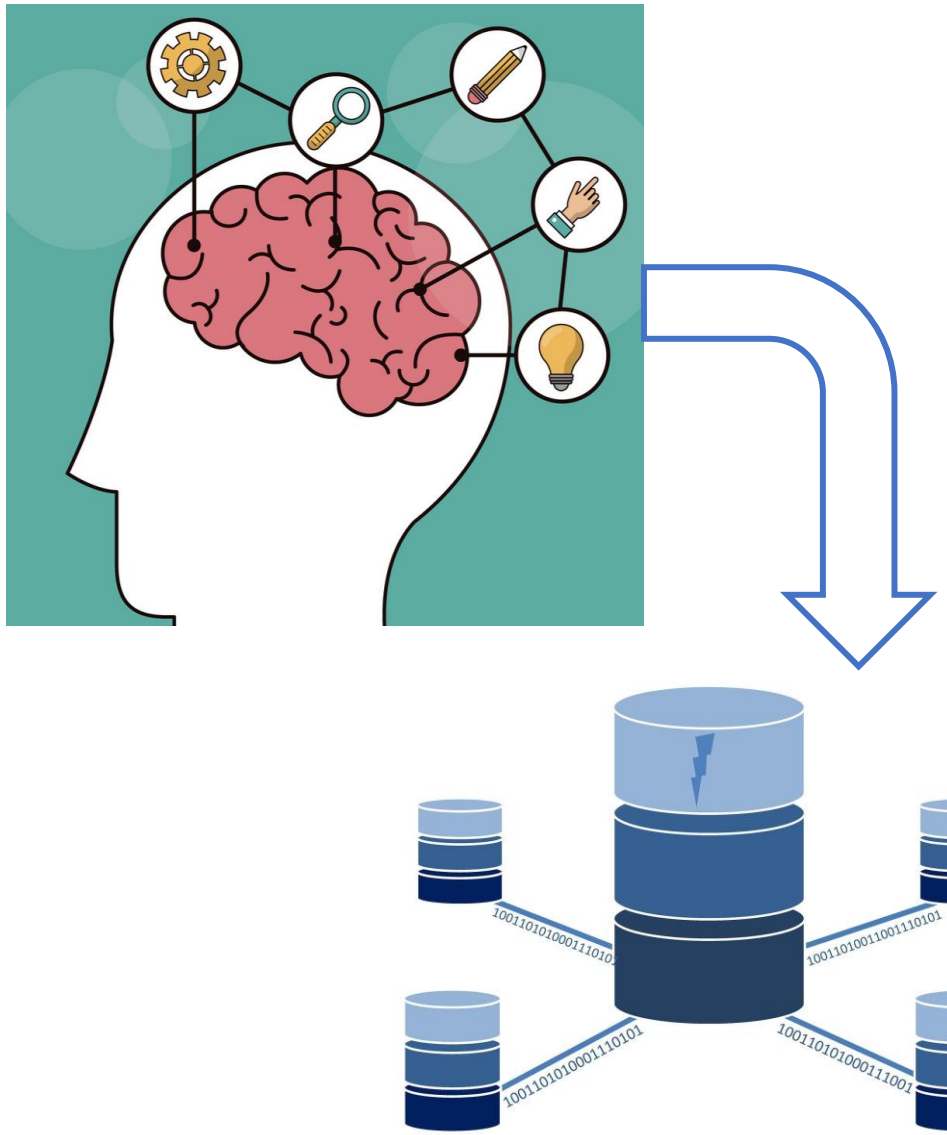


Commercial workflow options are often too complex

- They have every feature under the sun
- Expensive
- Hard to implement
- Yet, often still fail at some capability that your business needs

How workflow addresses Generational Turnover

- Workflow can automate the transitions between systems, relieving users of knowing how to do it
  - Makes individual apps more loosely coupled
- Workflow can contain a rules repository, so the users don't have to know as much
- A workflow system can produce telemetry and metrics that help with continuous improvement



You can ping me to discuss Generational Turnover or Workflow in more depth

- I'll do an informal talk with your internal people for free
- I can help you if you are taking the more ambitious, advanced routes
  - Advise on architecture and processes
  - We can work directly on a workflow engine if you need that

- Front end design, prototyping, and development
- Training on UX design and design thinking
- Design facilitation
- Set up a **free web meeting** to discuss
  - Changing platforms
  - Getting started with user experience design
  - Understanding return on investment of UX design
  - Evaluation of your current app: opportunities for architecture and UX improvement
  - Applying UX design to legacy apps

Billy Hollis



Video courses by Billy

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