The Critical Condition Threatening Your Board: How to Prevent and Treat Data Failure

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Learning Objectives

- Identify and list critical failure points in data management processes
- Demonstrate knowledge of effective data management practices by matching examples of data disasters with appropriate mitigation techniques
- Understand current trends, approaches and environments

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Image Source: https://en.wikipedia.org/wiki/Data_(Star_Trek)#/media/File:DataTNG.jpp

Image Source: https://en.wikipedia.org/wiki/Data_(Star_Trek)#/media/File:DataTNG.jpp

Your Data = Your Process

Your Process = Your Value Proposition

Your Value Proposition = Your Organization

Your Data = Your Organization

Mark Cuban: "Data is the new gold"

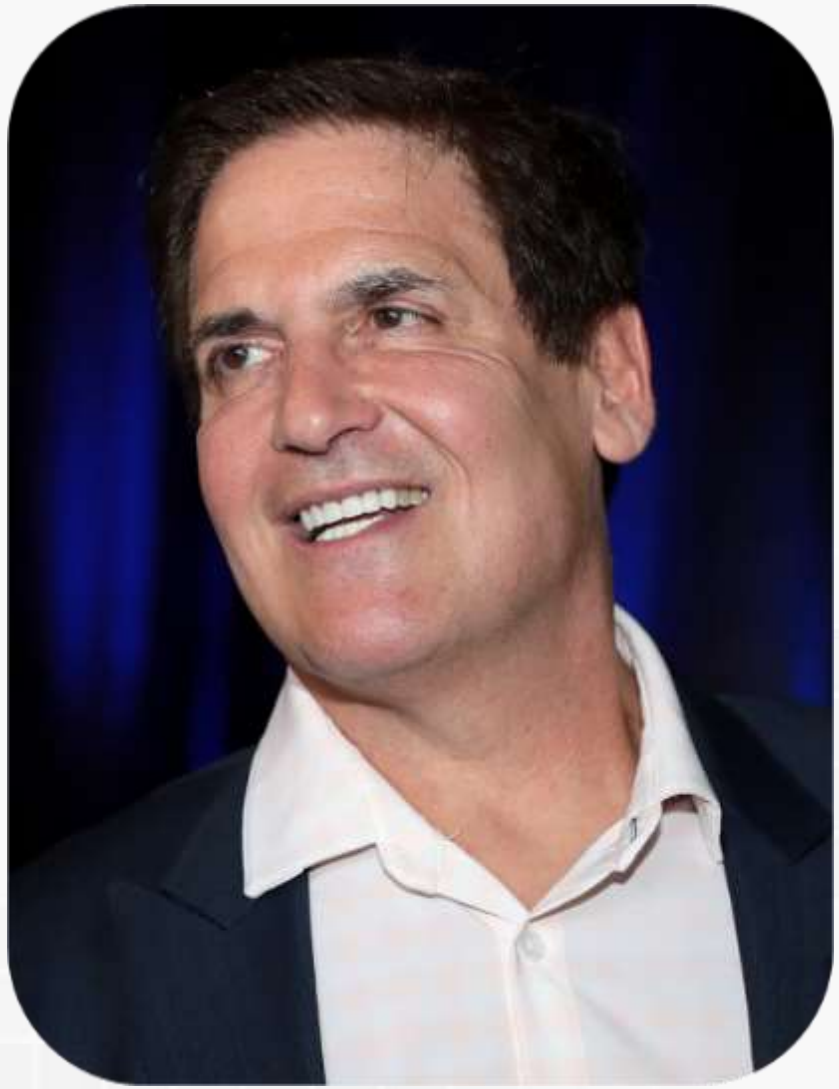


Image Source: https://en.wikipedia.org/wiki/Mark_Cuban#/media/File:Mark_Cuban_by_Gage_Skidmore.jpg

Databases 101

If this image is funny to you, you're probably nerdy enough to already know a lot about databases…

P.S. It's a "data" "bass"

Image Source: https://149348513.v2.pressablecdn.com/wp-content/uploads/2010/10/Databass.png

“Life is like a box of chocolates….”

- Center Flavor
- Exterior Flavor
- Shape
- Interior Color
- Exterior Color
- Ingredients
- Nuts (Y/N)
- Design Type
- Design Color
- Design Style
- Index (Lid)

Image Source: https://www.istockphoto.com/photo/top-view-box-of-fancy-chocolates-candy-gm656670268-119576981

What is a Database?

- Collection of structured information (data)
- Controlled by a Database Management System (DBMS)
- Typically modeled in rows and columns of data

- Uses structured query language (SQL) to write and query data
- Common: Access, MySQL, Microsoft SQL Server, Oracle, PostgreSQL

Image Source: https://www.flaticon.com/free-icon/database_149206

Spreadsheets vs. Databases

- Spreadsheets hold tabular, non-relational data
  - Core design is for single users
  - Cannot do incredibly complicated data manipulation
  - Simple, hackable security
- Databases hold much larger collections of organized information
  - Allow multiple simultaneous users
  - Can query the data using highly complex logic and language
  - Robust and complex security and encryption

Relational Databases

- A collection of data items with pre-defined relationships
  - Organized as a set of tables with columns and rows into tables
  - Columns hold a certain type of data, a field stores the actual value
  - Rows represent a collection of related values
- Each row in a table has unique identifier called a primary key
  - Rows among multiple tables can be made related using foreign keys
  - Data is accessed many ways without reorganizing the tables themselves

Queries

- Syntax to Query Datasets
- Range from simple to complex
- Includes operators to expand, contract data
- *SELECT FROM GuessWho WHERE HasHat = TRUE OR Hair = 'White' AND Sex='Male'*

Image Source: https://www.gameology.com.au/products/new-guess-who-original-board-game?variant=13847902683251#group-6

Data for Certifying Organizations

If you see this, you didn't confirm your medical professional was board certified…

Image Source: https://www.istockphoto.com/photo/female-doctor-with-syringe-gm484581277-37805568

Data in Certification Organizations…

- Name
- Addresses
- Geographic Location
- Education / Training
- Certification Type
- Certification Requirements
- Certification Status
- Key Re/Certification Dates
- Recertification Status
- Recertification Requirements
- Exam Results
- Continuing Education
- More….

Where Excel Falls Down….

Name	Home Address	Business Address 1
Joe Smith	1060 W Addison St, Chicago, IL 60613	233 S Wacker Dr, Chicago, IL 60606

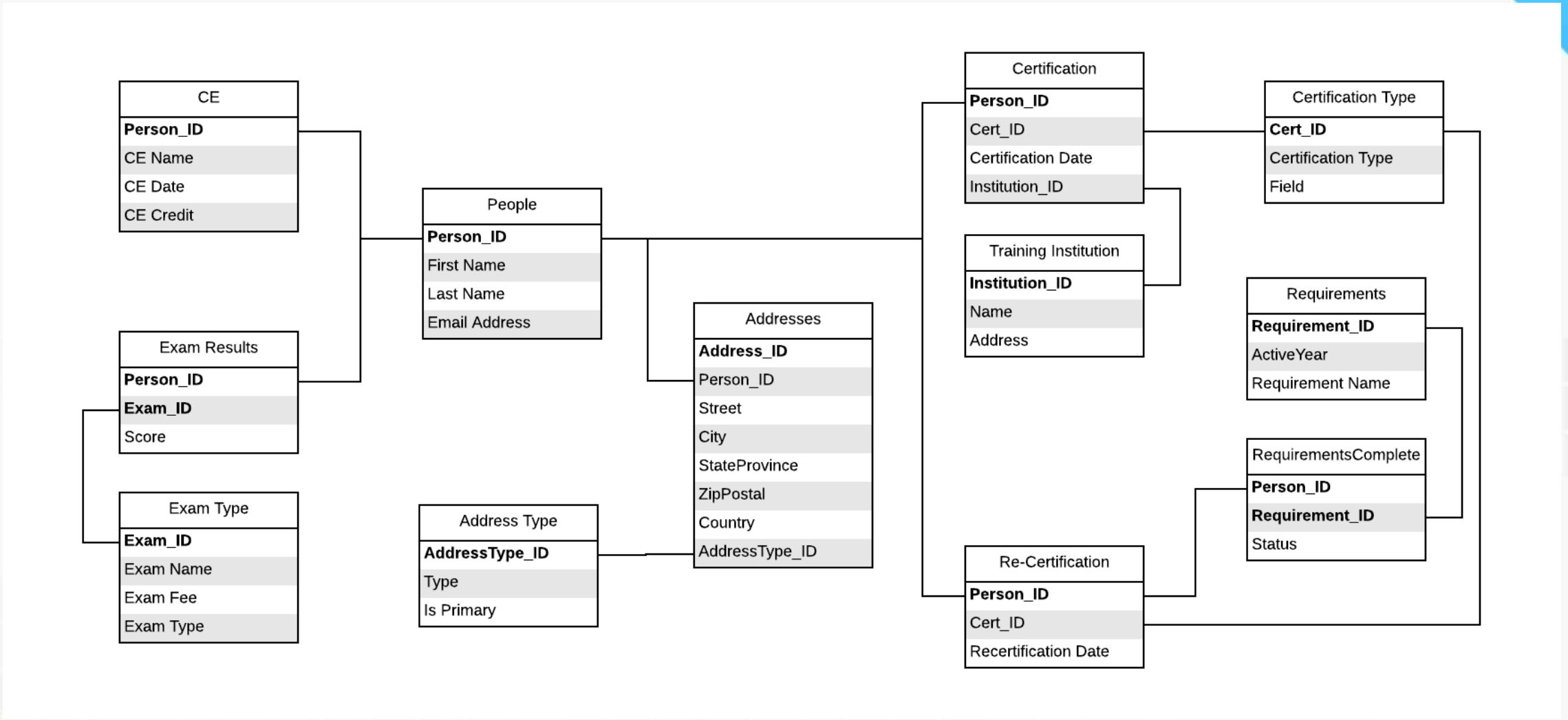
Name	Home Address	Business Address 1	Business Address 2
Joe Smith	1060 W Addison St, Chicago, IL 60613	233 S Wacker Dr, Chicago, IL 60606	875 N Michigan Ave, Chicago, IL 60611

- How about when Joe has five practices? Ten?
- How about Joe with three, five, ten re-certification dates?

Advantages of Relational Databases

- A type of database management system (DBMS) that stores data in related tables
- Data is only stored once (and referenced), avoids data duplication
- Supports very complex queries
- Superior security capabilities as tables, rows and columns can be made confidential or encrypted
- Future oriented design

Enter Relational Databases



Simple Certification / Recertification Cycle

In Reality….

"Oh. He's a lifetime diplomate, so he doesn't have to pay dues, but he does have to do 10 of 30 CE units."

"Actually, she's on the previous set of recertification requirements and doesn't have to complete written Part IV…."

"For that school, they don't have to pay application fees…"

"On our 10-year cycle, they have a recertification exam to complete years 8, 9, or 10.
If they complete the recertification exam on year 8, you need to update the recertification date to the next 10-year cycle's recert date, but keep the older cycle end date because they still need to complete the remaining 2 year's annual fees to stay current."

Workflows

- Moving data in structured process from A to B (to C to D to E)
- Critical to understand how and what transformation must be done
- Always model/diagram your workflows to identify issues, bottlenecks and exceptions
- Exceptions will always bring the greatest level of pain and suffering

Business Process Model and Notation (BPMN)

- BPMN is a global standard for business process model
  - It provides a graphical notation for specifying business processes
  - It provides standard notation understandable by all stakeholders
- More adaptable than flowcharts as it can show:
  - Events / Timers / Looping
  - Complex Decisions / Gateways
  - Multiple Actors / Swim lanes
  - Subprocesses

BPMN Example: Ordering a Pizza

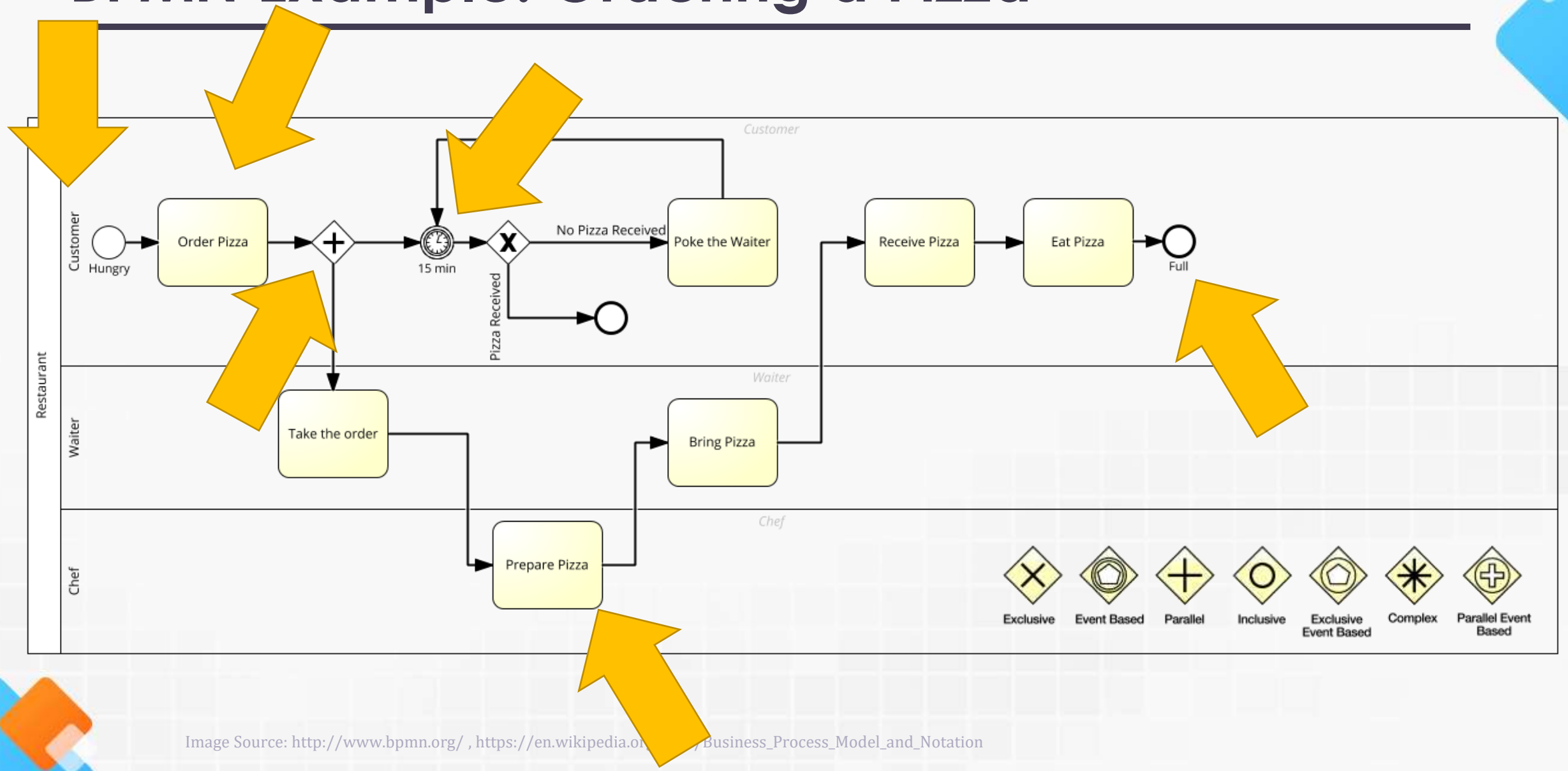


Image Source: http://www.bpmn.org/ , https://en.wikipedia.org/wiki/Business_Process_Model_and_Notation

Data Driven Decision Making (DDDM)

- Every organization needs to understand their funnel
- Collect data based on measurable goals or Key Performance Indicators (KPIs)
  - *What are you measuring? Certification rate? Re-Cert rate? OCE Pass Rate?*
  - *How does what you are measuring help your organization thrive?*
- Focus on the outcomes, goals and then reverse engineer to determine relevant KPI
- Develop strategies and activities based on insights
  - Visualized Data is key to understanding hidden trends

DDDM and Future State Modeling

- *What does your organization look like in 2 years? 5 years? 10 years?*
- *What are the changing demographics?*
- *How can you continue to make your organization relevant?*
- *What does your certification program look like in the age of AI?*
- *How are you adding value to your diplomates and enabling them to be successful?*

Tools of the Trade

You can never go wrong with a picture of a cute animal.

Image Source: https://www.istockphoto.com/photo/dog-as-amusing-builder-holding-hammer-in-mouth-standing-near-hardhat-gm1030016148-275992838

WADE (Website, Access, Database, Excel)

- Most “data fragile”
- Extremely difficult to maintain
- Data needs updating in multiple spots
- Lots of staff time spent on very low-value tasks

Image Source: https://www.istockphoto.com/photo/duct-tape-shoe-repair-gm619401150-108014183

Custom Applications

- Custom designed to meet your exact processes and workflows (at that point in time)
- Only as good as the developers' understanding of your workflow
- Often very expensive startup costs, many ongoing costs and development cycles

Image Source: https://www.istockphoto.com/photo/tailoring-gm1088080594-291905741

Association Management Systems (AMS)

- Effective at managing people
- Certification modules/extensions generally handle high level needs (e.g. Paid Through)
- Usually requires other systems, data sources for granular info

Image Source: https://www.istockphoto.com/photo/brute-force-gm141574805-19592187

Certification Management Systems (CMS)

- Designed for certification management and its many, many nuances
- Many are very flexible in workflows
- Ensures data, process consistency
- May require other systems and data stores to meet all needs

Image Source: https://www.istockphoto.com/photo/screw-screwdriver-in-wood-gm95116978-1353428

Great, more things to worry about: Data

If an animal picture didn't make you smile, pull out the big guns and go funny baby…

Image Source: https://www.istockphoto.com/photo/office-babe-gm104241348-6528628

Data Fragility

- Directly related to confidence in your data
- Are you willing to bet $100 that your data is 100% accurate?
  - $100,000?
  - $10,000,000?
- Highly fragile data is often implicitly (not explicitly) referenced
  - Ex: Between the web database and excel sheets, you are using the person's name, not their PID

Data Integrity

- Data integrity is the overall completeness, accuracy and consistency of data
- Imposed during the database design phase with standard procedures and rules
- Maintained with various error-checking methods and validation procedures
- Data Integrity ensures that:
  - Extreme confidence in your data and queries
  - Everything is recoverable and searchable

Backups

- Backups = Insurance
- Understand and know your backup methodology
- Implement a generational approach: Daily, Weekly, Monthly, Yearly
- Run restoration drills often
  - *Has your technology changed in the past years?*
- Backups need to be secure
- Beware: deleted data still exists in backups

Data Security

- Limit and control access with strict auditing
- Element encryption (at rest) is best practice
- Hardware and Software
- Beware of Internet of Things (IoT)
  - Wireless Printers
  - Teapot (ASAE Technology Conference 2018 - Keynote)
- Key element in broader end-to-end technology security practices

Image Source: https://www.istockphoto.com/photo/a-stainless-steel-kettle-isolated-on-white-with-clipping-path-gm1169237264-323142924

Continuity

- Unique challenge for certifying boards is understanding business processes and institutional knowledge with everchanging directors, staff
- Explicit systems, software, can force institutional knowledge into a formalized and structured format (with historical context)
- At the very minimum, documentation of processes and workflow is a must

Image Source: https://www.istockphoto.com/photo/success-flow-chart-diagram-blackboard-gm1006439848-271625285

Ransomware (aka Super Viruses)

- If you are not worried about Ransomware, you're probably okay with playing 6 rounds of Russian roulette…
- It affects a business every 14 seconds and cost businesses over $8 billion in 2018*
- Usually originating from an infected email, data is held hostage
- Can lie in waiting for weeks, months
  - Becoming more sophisticated every day
- Only defense is eternal vigilance, risk mitigation and training

* https://cybersecurityventures.com/global-ransomware-damage-costs-predicted-to-exceed-8-billion-in-2018/

Image Source: https://www.istockphoto.com/photo/russian-roulette-gm453844567-26005413

Personal Identifiable Information (PII)

- PII is any data which may lead to identification of an individual
  - Describes any information that identifies, links, or relates to a person
  - Single data point can be merged with other specific user/ visitor data to become PII
- Concepts of PII and personal data are not straightforward
- Legislative changes create fluidity and give them their shape
- Two primary types: Linked and Linkable

Image Source: https://www.istockphoto.com/photo/portrait-of-funny-manager-with-gdpr-note-gm945686562-258290566

Linked PII Examples

Any piece of personal information that can be used to identify an individual.

- Name: full name, maiden name, mother's maiden name or alias
- Email
- Home address
- Date of birth
- Phone number
- Login
- **Personal identification numbers:** Social security, passport, driver's license number, taxpayer id, etc.
- **Personal characteristics:** photo, fingerprint, handwriting
- **Biometric data:** retina scans, voice signatures, or facial geometry

Linkable PII Examples

Info on its own may not be able to identify a person, but when combined with other pieces can identify, trace, or locate a person.

- First or last name (if common)
- Country, state, city, postcode
- Place of birth
- Gender
- Race
- Religion
- Non-specific age (e.g. 30-40 instead of 30)
- Employment information
- Business telephone number
- Business mailing or email address

General Data Protection Regulation (GDPR)

- EU Government mandate that covers data PII for EU citizens
  - Basic identity information such as name, address and ID numbers
  - Web data such as location, IP address, cookie data and RFID tags
  - Health, genetic and Biometric data
  - Racial or ethnic data
  - Political opinions
  - Sexual orientation
- Data controls and processes must demonstrate compliance
- Some version of this will become a US standard in the future

Image Source: https://www.istockphoto.com/photo/russian-roulette-gm453844567-26005413

Journey to GDPR Compliance

- **Access** - investigate & audit what personal data is being stored, used
- **Identify** - extract, categorize and catalog what PII you are using
- **Govern** - privacy rules must be documented, governance of roles and definitions of who can access what data with auditability
- **Protect** - protect the data: encryption, pseudonymization and anonymization
- **Audit** - reports clearly show regulators you are protecting all PII data

PCI Data Security Standard (PCI DSS)

- Standard set of policies and procedures
  - Optimize & protect credit, debit and cash card transactions
- Six Primary Steps
  - **Security** – end-to-end security for software, hardware
  - **Protection** - data encryption (in transit and at rest)
  - **Vulnerability Management** - anti-virus/spy/malware software/process
  - **Restricted Access** – limit and audit who can view PII information
  - **Monitoring** – constantly monitor for issues, vulnerabilities
  - **Policies** – make sure the above are being religiously followed

GDPR vs PCI DSS

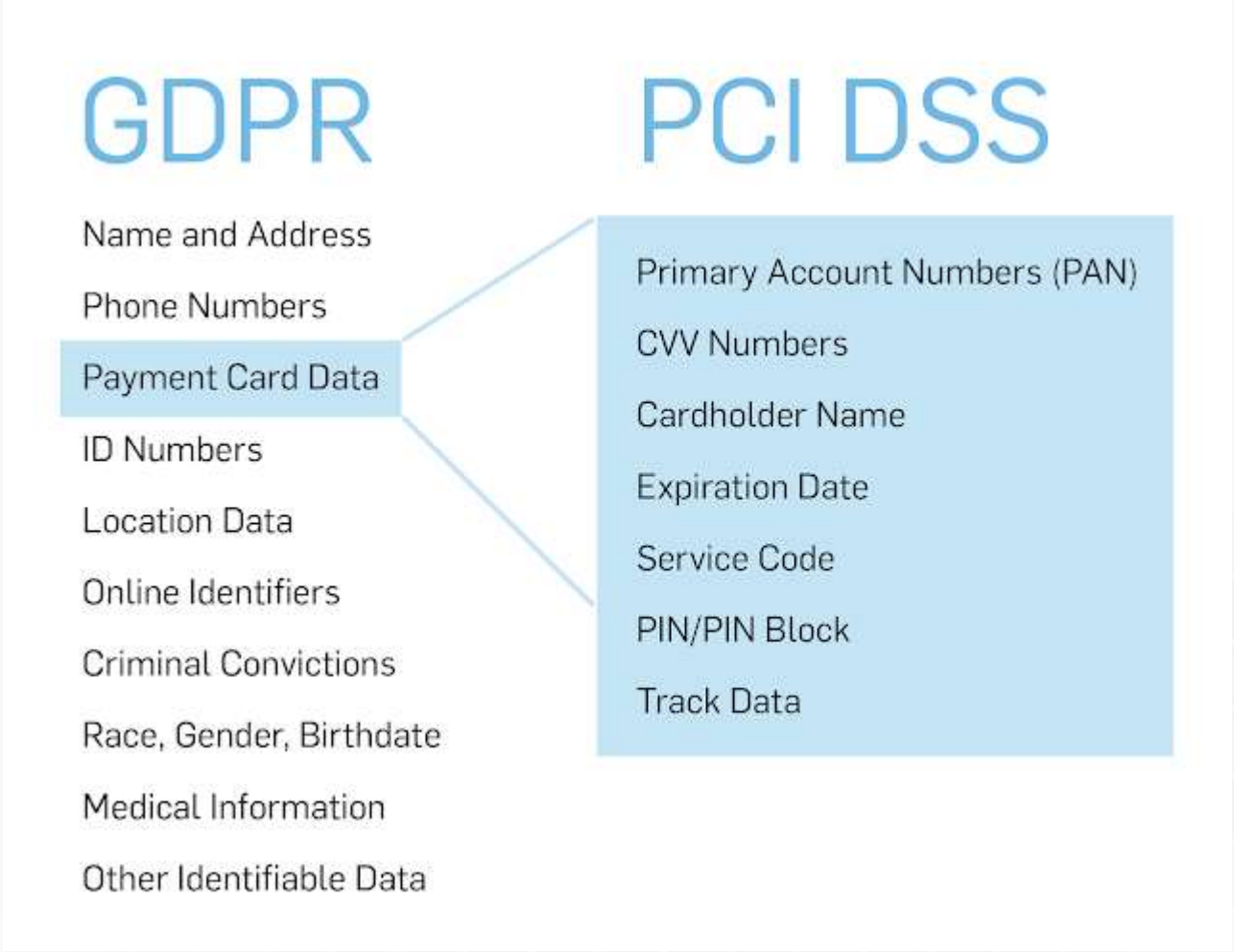


Image Source: https://www.securitymetrics.com/blog/pci-vs-gdpr-whats-difference

Compliance (…And the Rest)

- ISO/IEC 27001
- HIPAA
- SOC 2
- WCAG 2.1
- And other industry-specific acronyms

Having watched too much Nick at Nite in my childhood, I know both versions of Gilligan's Islands theme song…

Image Source: http://www.4alltravelers.com/13-things-you-didnt-know-about-gilligans-island-2/14/

Wrapping Up

Having two teenage boys, I'm pretty sure I would (sadly) need to remind them not to do this…

Image Source: https://www.istockphoto.com/photo/dog-as-amusing-builder-holding-hammer-in-mouth-standing-near-hardhat-gm1030016148-275992838

Preventing Data Disasters

- *If you woke up tomorrow and discovered your entire organization's data was gone, what would you do?*
- Much better to be proactive than to be reactive
- Having a thorough Business Continuity Plan (BCP) is critical
  - Must have clearly documented procedures for all processes
  - External communication to various stakeholders
- Staff and/or directors should be doing tabletop scenarios to help identify and address process gaps

Things to Keep You Up at Night…

- *Where is my data?*
- *How do I know my data is correct?*
- *How is it backed up?*
- *Where is it backed up?*
- *How long are backups kept?*
- *Are backups onsite or offsite?*
- *When was the last backup drill executed?*
- *Who has access to, who can see my data?*
- *How is my data secured?*
- *How is it encrypted?*

How are you doing: Data Scoresheet

On a confidence scale from 1 to 5, where 5 is extremely confident…

1. How confident are you in naming the exact locations of where ALL your critical organizational data is stored?
2. How confident are you in your ability to fully audit what data has been accessed, who has access to it, and when it was accessed?
3. How confident are you that if key members of your board and/or staff left your organization tomorrow, that you would be able to continue without missing a step?

Your Results?

- If your answer is **less** than 15…
  - These topics needs to be on your next board agenda
- If you answer is **equal** to 15
  - Congratulations, you can sleep easily tonight!
- If your answer is **greater** than 15
  - You are not good at math

Final Thoughts and Review

- For executives & directors, Technology and Data is not “an IT issue”
  - No director says “it’s a finance thing, we’ll let them worry about it”
  - It’s an organizational issue, your survival depends on protecting your data
  - Get external audits of your current environment
- The right tools/process/systems will position you for future success
- Are your backups really working?
- Ignorance IS NOT BLISS
- Your Data = Your Organization

Questions?

- John Osako, CEO, ROC-P, LLC
- Kyle Kew, CTO, ROC-P, LLC

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