Business Intelligence and Data Analytics at the Jet Propulsion Laboratory

Session ID: 10475

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Agenda

- NASA's Jet Propulsion Laboratory
- Business IT Services
- Business Intelligence Program
- Data Analytics
- Search (a preview)
- Q & A

NASA's Jet Propulsion Laboratory

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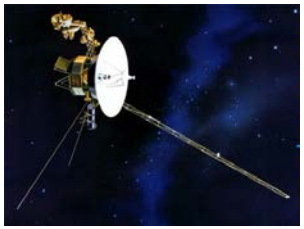
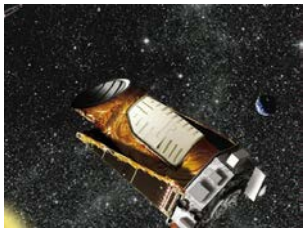
- Location adjacent to Pasadena, La Canada-Flintridge, and Altadena, California
- Federally-Funded (NASA-owned) Research and Development Center (FFRDC), Caltech Operated
- Sample Current Missions

Opportunity



Voyager 1 & 2

Orbiting Carbon Observatory 2



Kepler

MSL - Curiosity

Juno

Business IT Services

Business Application Portfolio/Footprint

Data Driven Decision Making

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Business Application Portfolio/Footprint

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- 30+ Oracle E-BS and related ERP modules
- 80+ JPL custom applications/modules
- 25 additional commercial applications
- Total business application portfolio of ~150 applications/modules/systems

Data Driven Decision Making
A Working Model

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- Where can IT help?
  - Data is easy to access
  - Data is useful

- Better **balance** transaction processing with using data to transition **from effective** business processes **to efficient** business processes

- With:
  - Business Intelligence
  - Data Analytics
  - Search

Business Intelligence Program

Problems

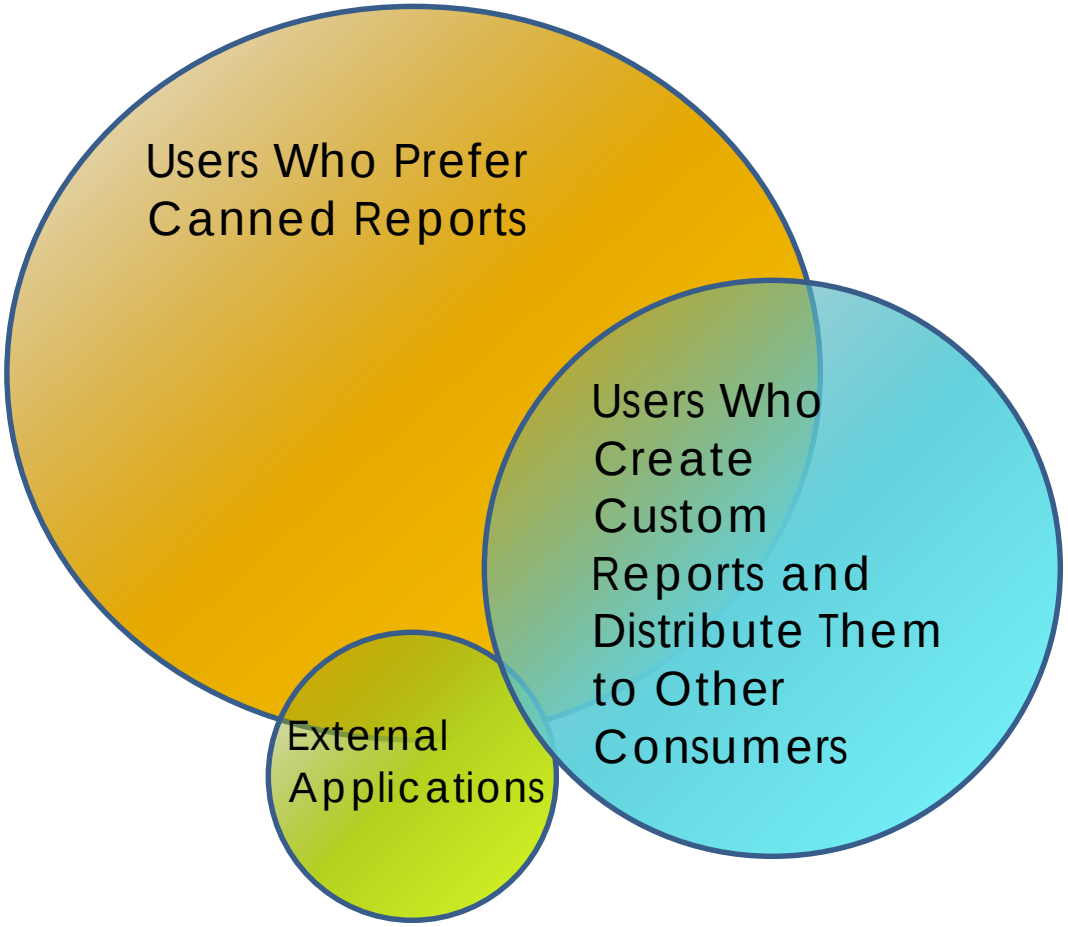
- Users spend much time tool-hopping in order to gather the data they need
- Legacy systems are outdated and became costly to maintain
- Legacy reporting systems offer one-size-fits-all solution – today's requirements are not met

Approach

- Product
- Project

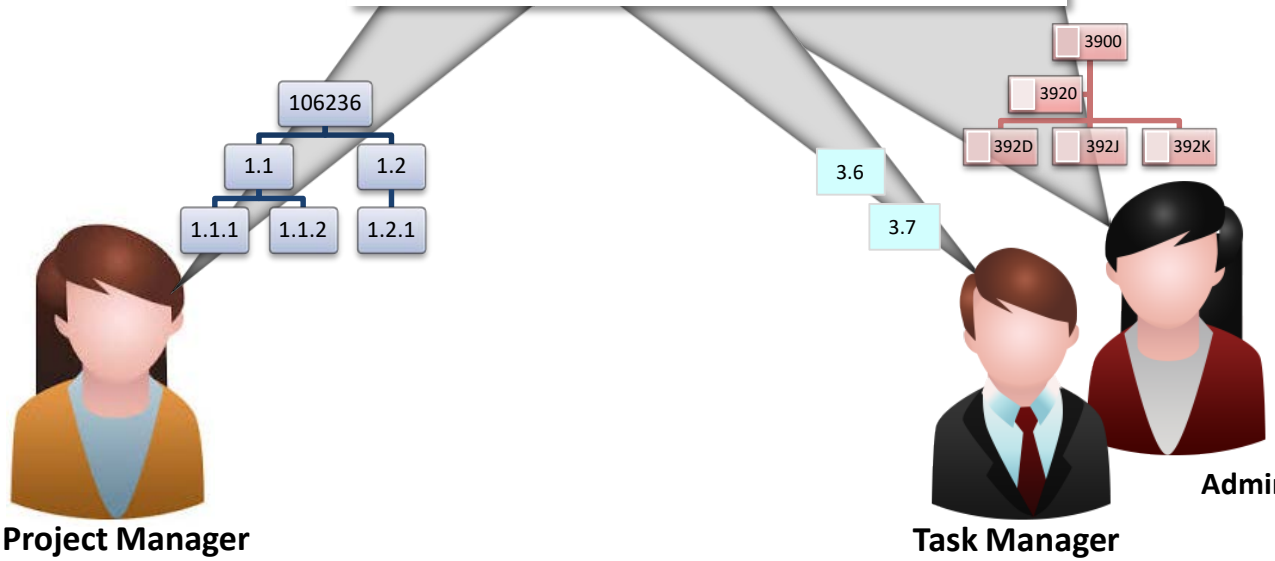
Approach - Product

- Recognize that there are different user segments who have different requirements



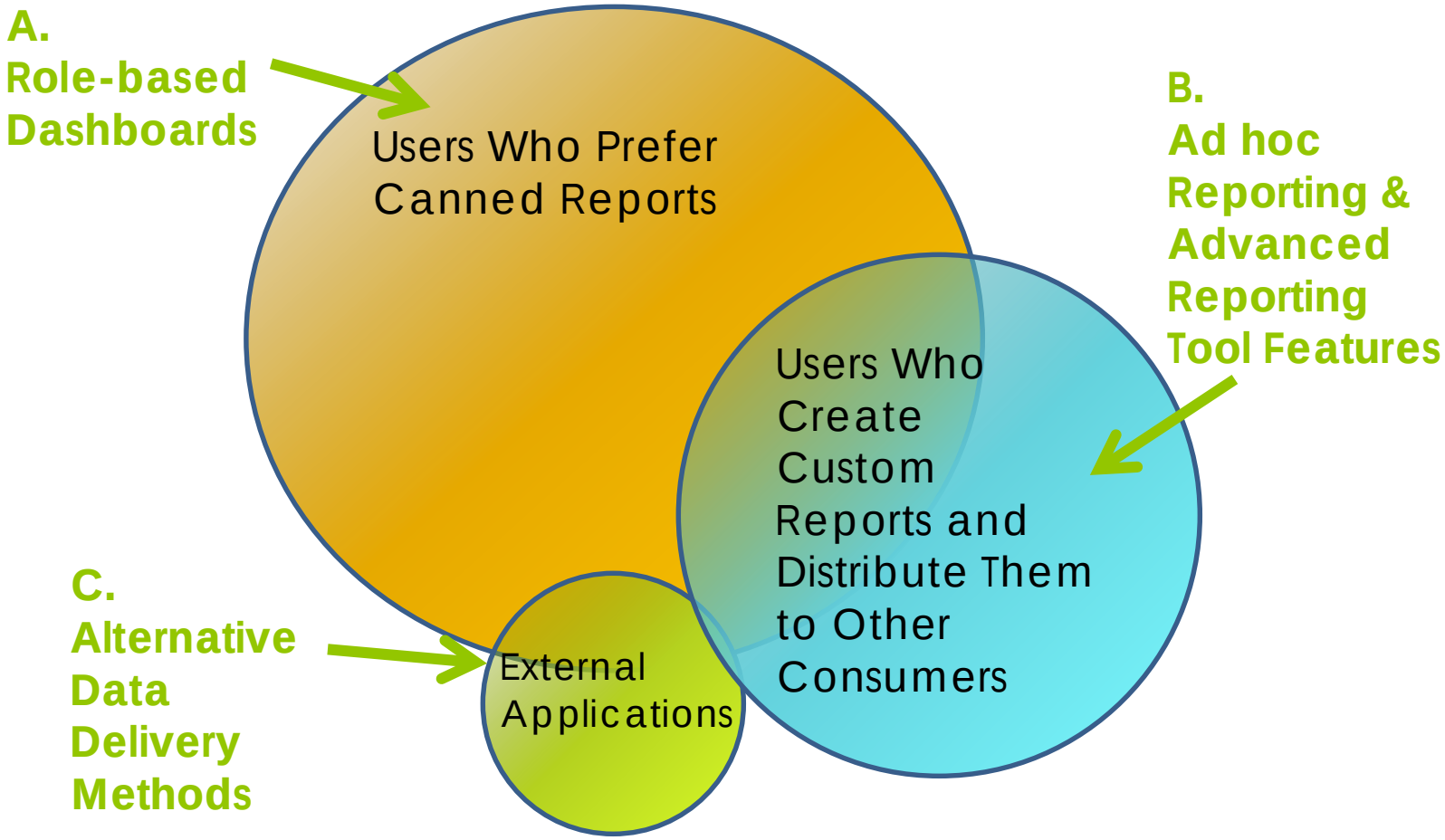
Approach - Product

- Within the canned report user segment, different functional roles have different perspectives on the data



Approach - Product

- Solution: Different product offerings for each user segment



Approach - Project

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- "Natural" Iterations
  - Each BI project delivers a business subject area
  - Role-based content developed based on which roles are interested in the subject area
- Stakeholder Engagement Strategy
  - Advisory Council established at the executive level to advise on project prioritization annually
  - BI Working Group is engaged in all phases of the systems development lifecycle

Deliveries

1. Prove OBIEE worked
   - *Why*: Original implementation of OBIEE led users to believe the application was slow
   - *How*: Proof of concept to confirm OBIEE performed well against a properly structured star schema
2. Stand up the BI infrastructure
   - *Why*: Development of multiple subject areas require the infrastructure first
   - *How*: Trade study of canned analytics (chose a competitor of Oracle Business Intelligence Applications); Capacity planning: storage, servers; OBIEE scaling
3. Roll out first business subject area: procurement
   - *Why:* Lower risk by avoiding a monolithic initial delivery and partnering with a trusted and forgiving stakeholder and their customers while we learned about what we didn't know
4. Roll out high risk, large subject area: plans and actuals

Challenges / Lessons Learned

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- Reassigning online transaction processing resources to BI projects resulted in steep learning curves
- Developing a new BI tool while legacy systems continue to exist pose a dilemma when other IT projects get requirements for reporting: continue to enhance legacy systems or make customers wait?
- Finding the real, unexpressed requirements
- JPL is a do-it-yourself culture and self-serve analytics is hard

What's Remaining

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- Work the BI roadmap with stakeholders to complete the implementation of 24 business subject areas
- Fulfill application to application data delivery requirements
- Formulate a strategy for a new generation of power users
  - Require access to all data
  - Favor decentralized data dissemination
  - Presents a new paradigm and challenge to existing architecture
- Retire legacy applications
  - Convince diehard users to adopt a new system
  - Phase out Discoverer as the primary ad hoc reporting tool
  - Find a replacement for Discoverer to meet operational / real-time reporting needs
  - Results in retiring 26 legacy reporting tools

Data Analytics

What is Data Analytics?

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A process of inspecting, cleaning, transforming, and modeling data with the goal of discovering useful information, suggesting conclusions, and supporting decision making

Simply put, data analytics is –

Using data to make smarter decisions

Phases of Analytics

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1. **Descriptive:** What *happened in the past* and why?
   - *Example:* Interact with data visualizations to explore invoice patterns

2. **Predictive:** What will *most likely happen in the future*?
   - *Example:* Forecast future flight project staffing

3. **Prescriptive:** What *future actions* should we take?
   - *Example:* Optimize rover parts pricing

Data Analytics vs. Business Intelligence (BI)

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Business Intelligence	Data Analytics
General business scope	*Specific* business question
Reporting and trends	More *complex* statistical and predictive *models*
Dashboards, KPIs, slice & dice	*Interactive* visualization & experimentation
Well-defined, internal data sources	*Disparate* internal and *external* data sources
Mostly *structured* data	Structured & *unstructured* data
Longer-term projects focusing on *precision*	Shorter-term projects focusing on *quick turn around*

JPL Business IT
Data Science Projects

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Q: *Which Schools* should we target for business employee recruitment?

Business Employee Recruiting

Which schools and majors should we target?

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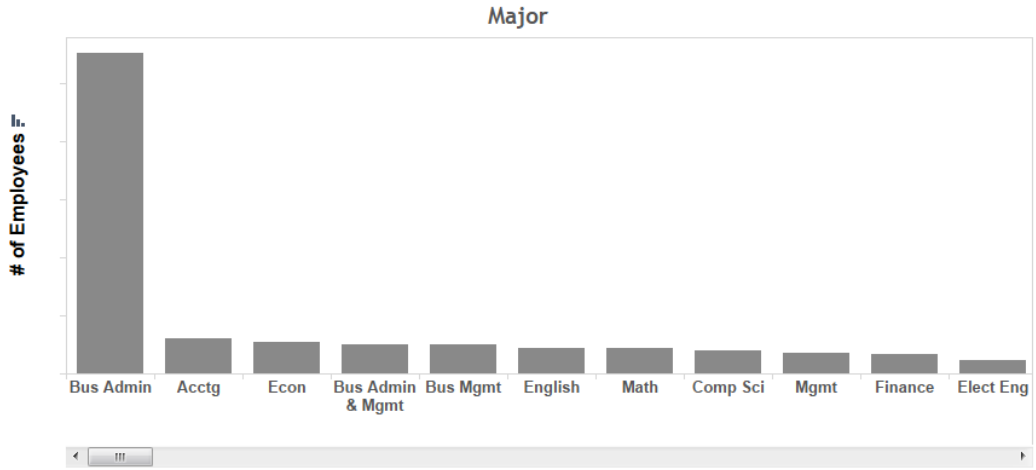

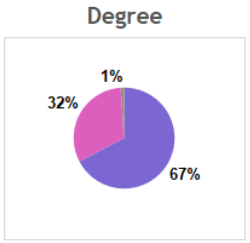

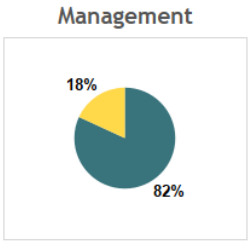

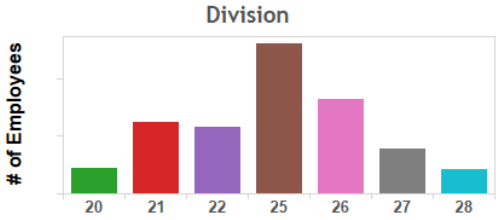

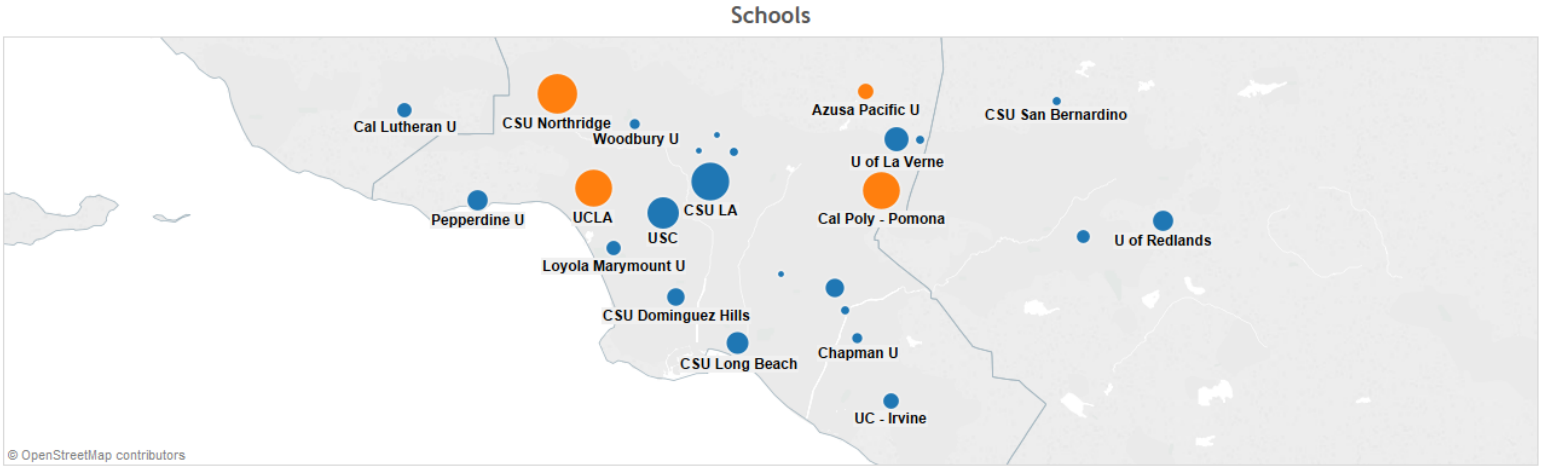

Business Employee Recruiting

What majors should we target at UCLA?

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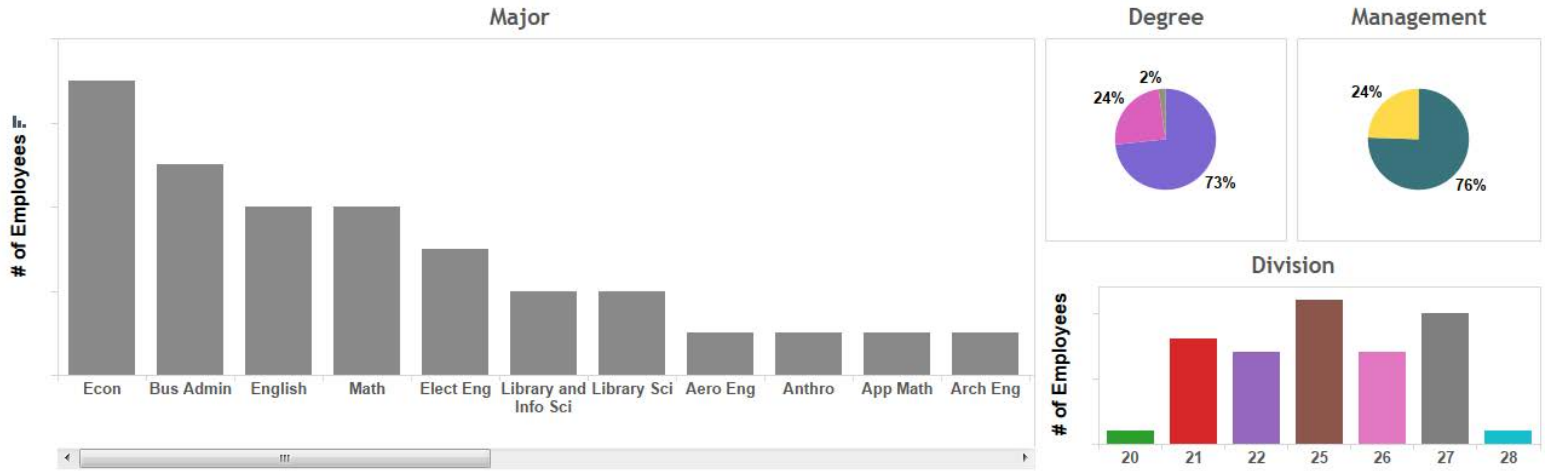
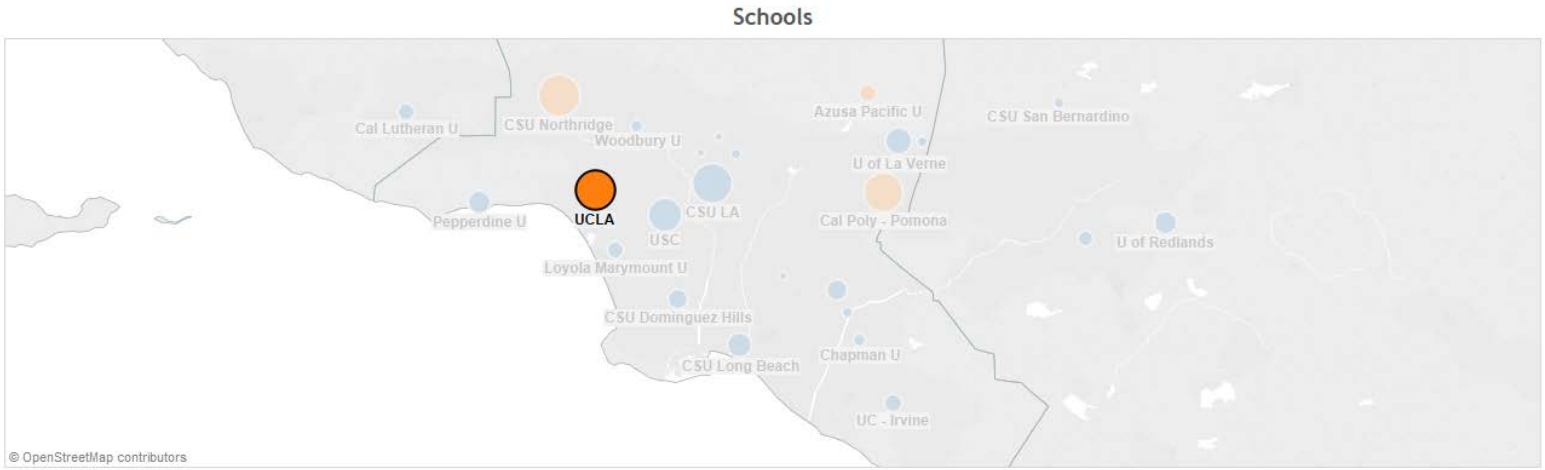
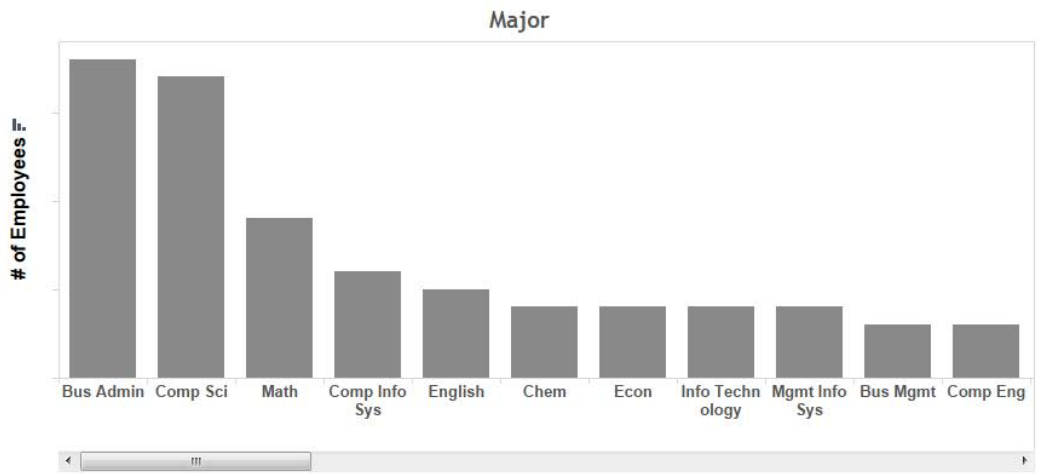
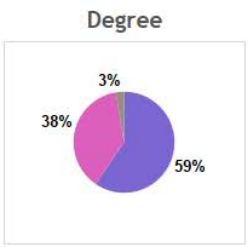


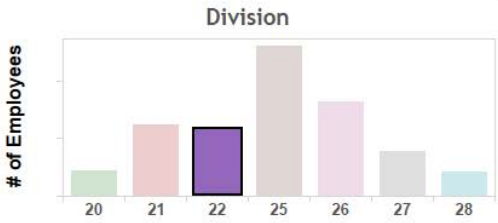


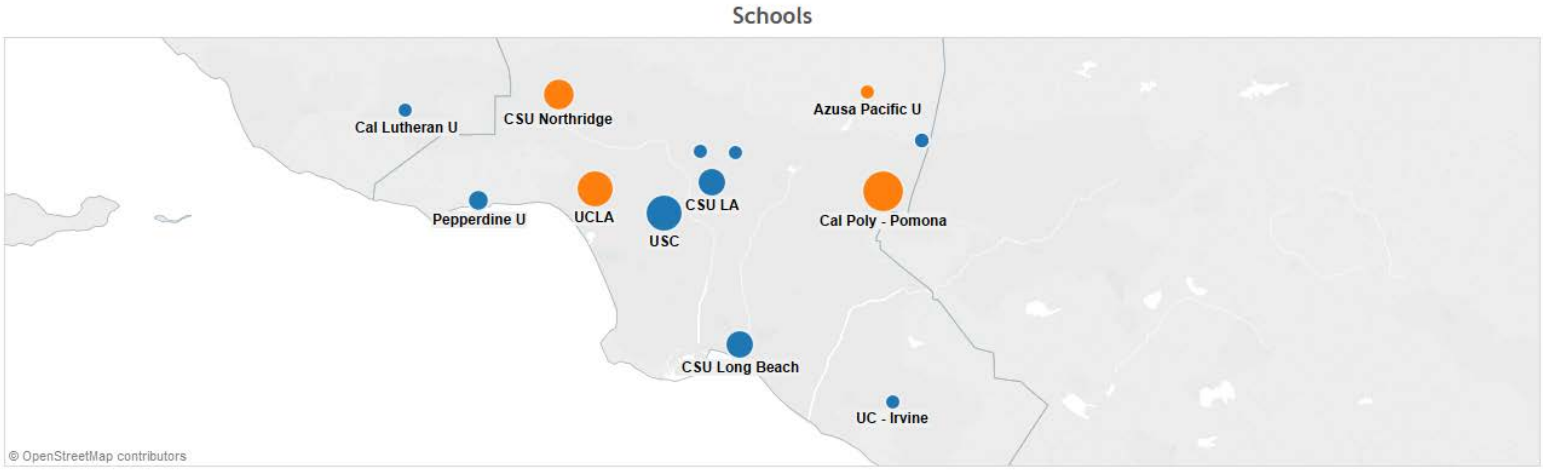
Business Employee Recruiting

What majors should we target for Business IT Recruiting?



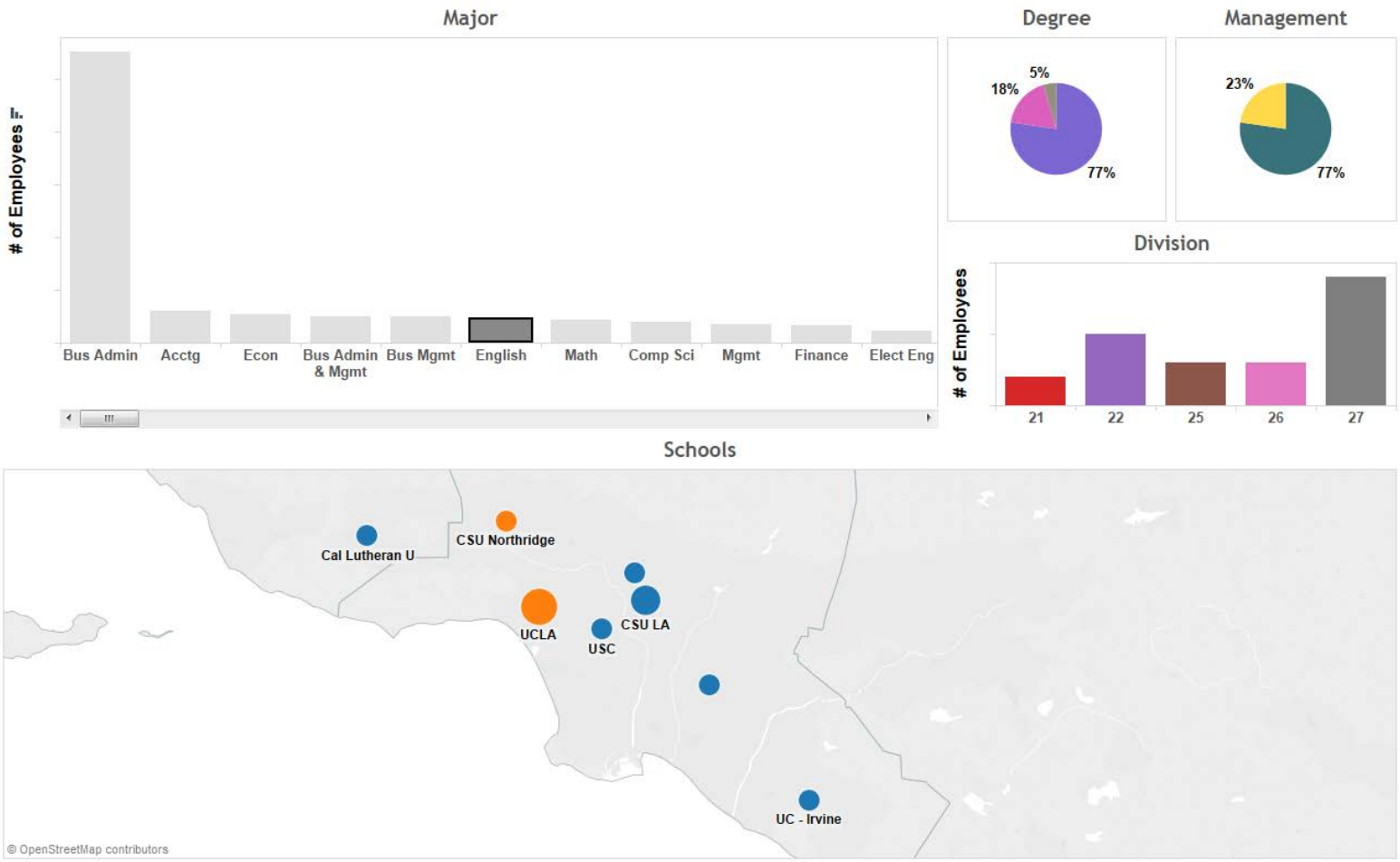






Business Employee Recruiting

Where would an English major best fit in at JPL?



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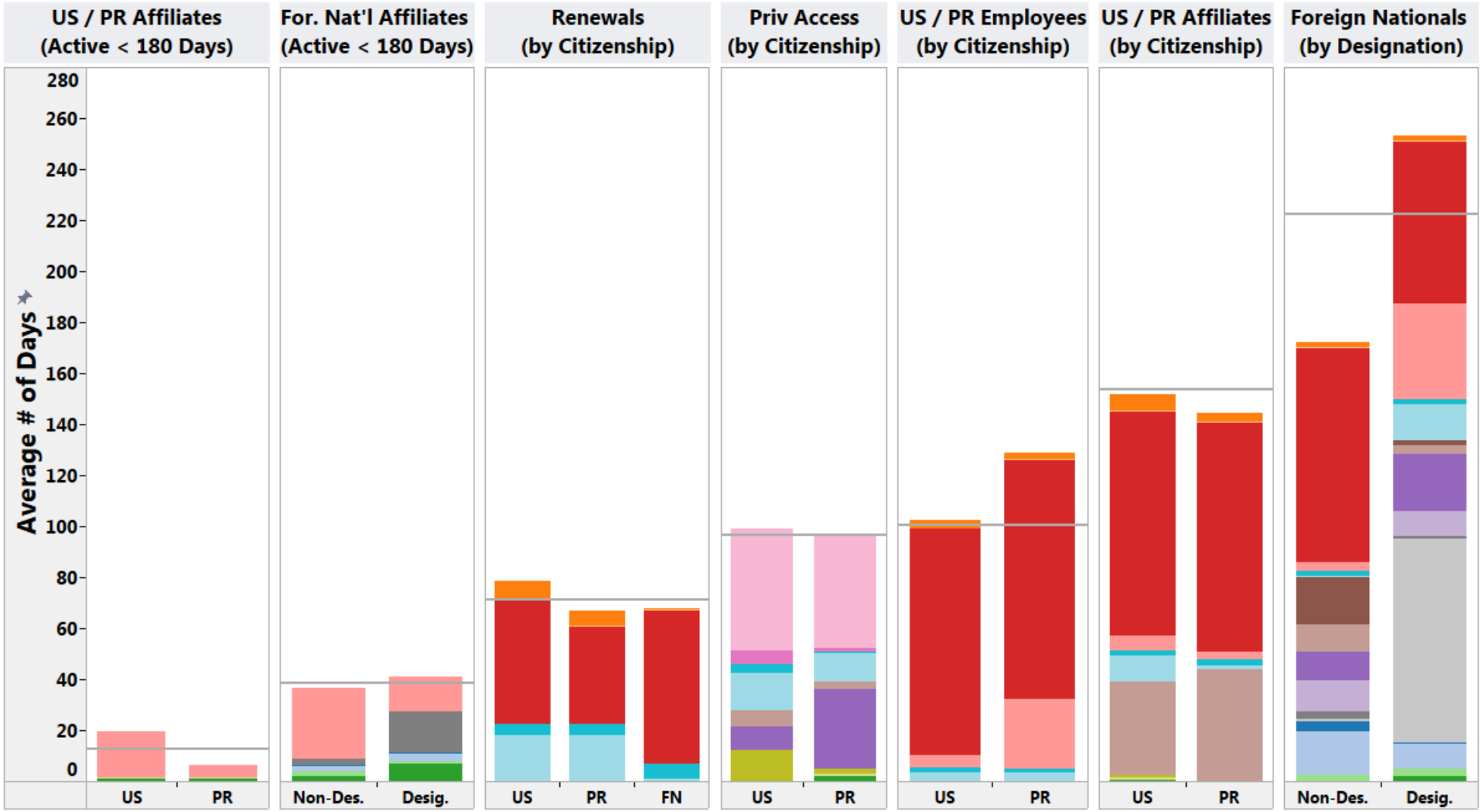
Q: Which steps of the *badging process* take the longest time?

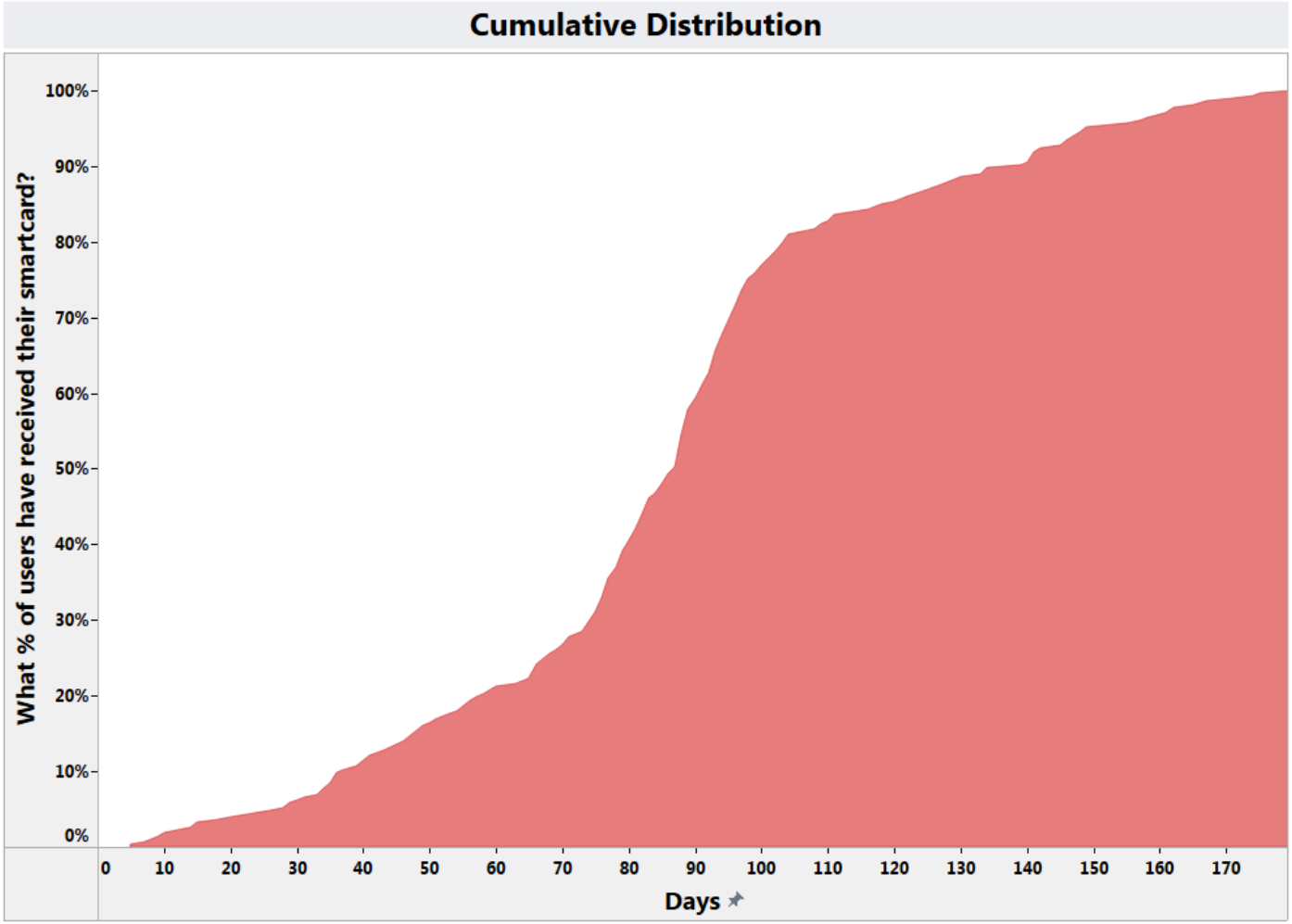
Onboarding Analytics

Average days to badge access and approvals



Onboarding Analytics

How long does it take to receive a smartcard?



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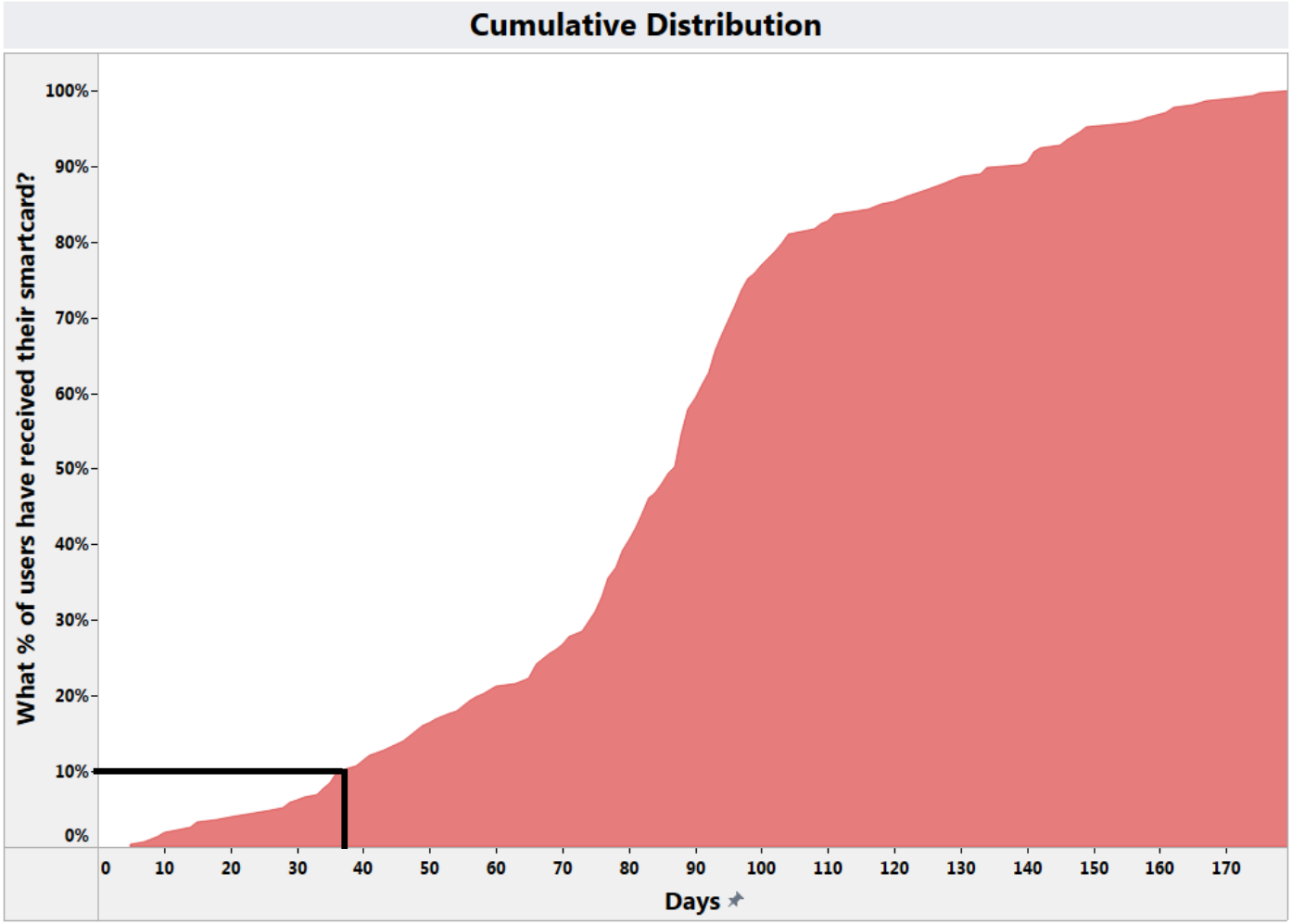

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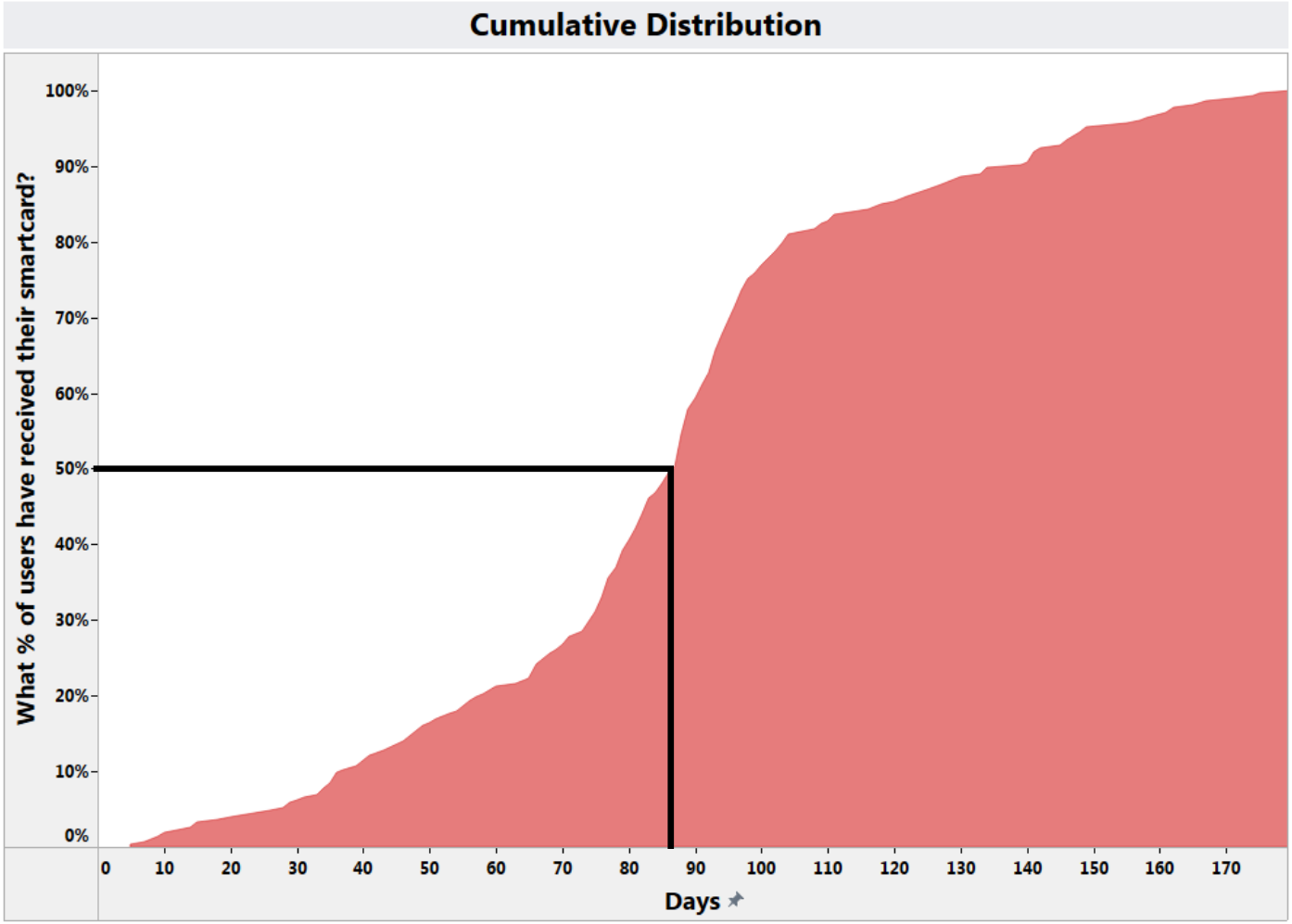

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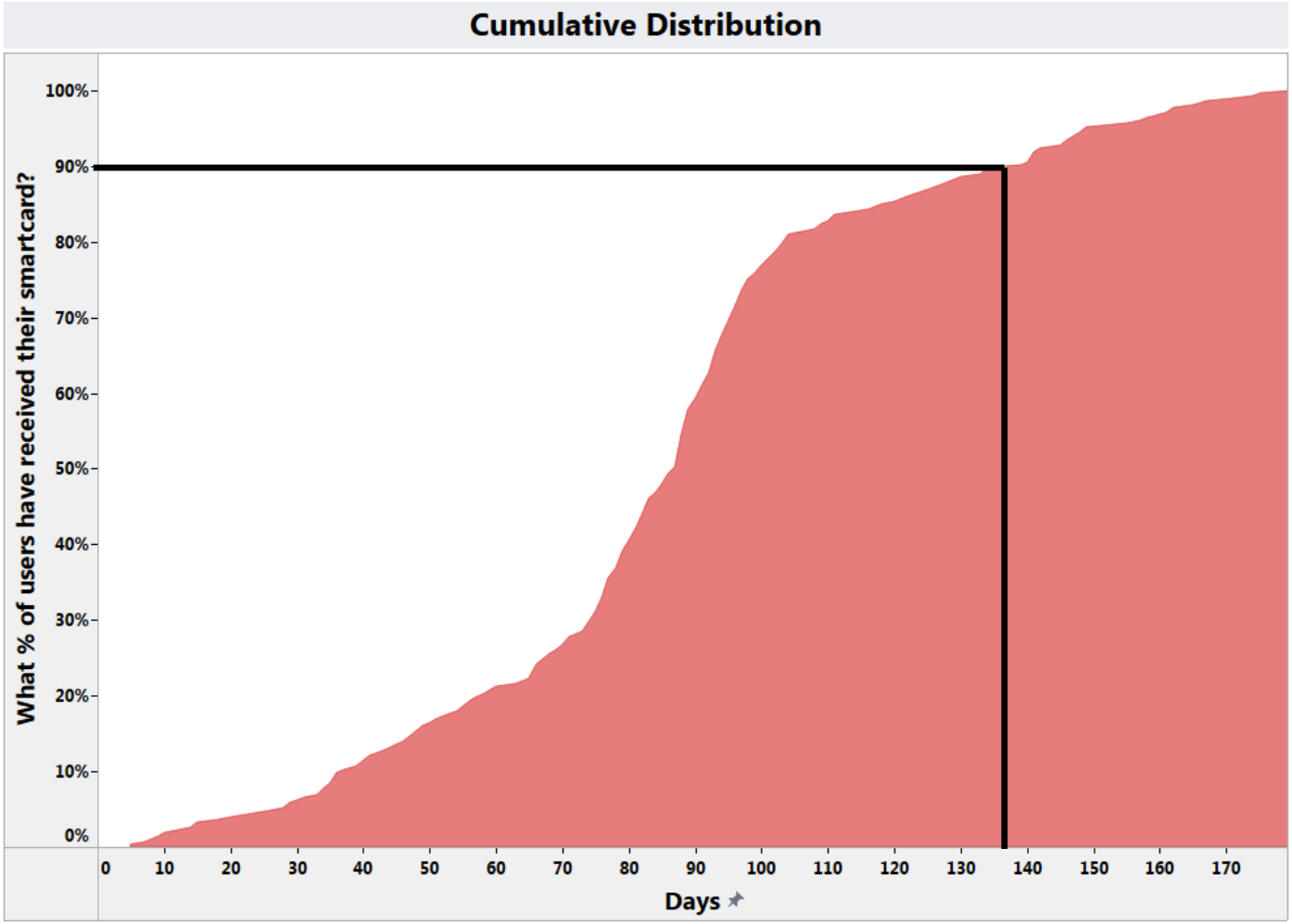
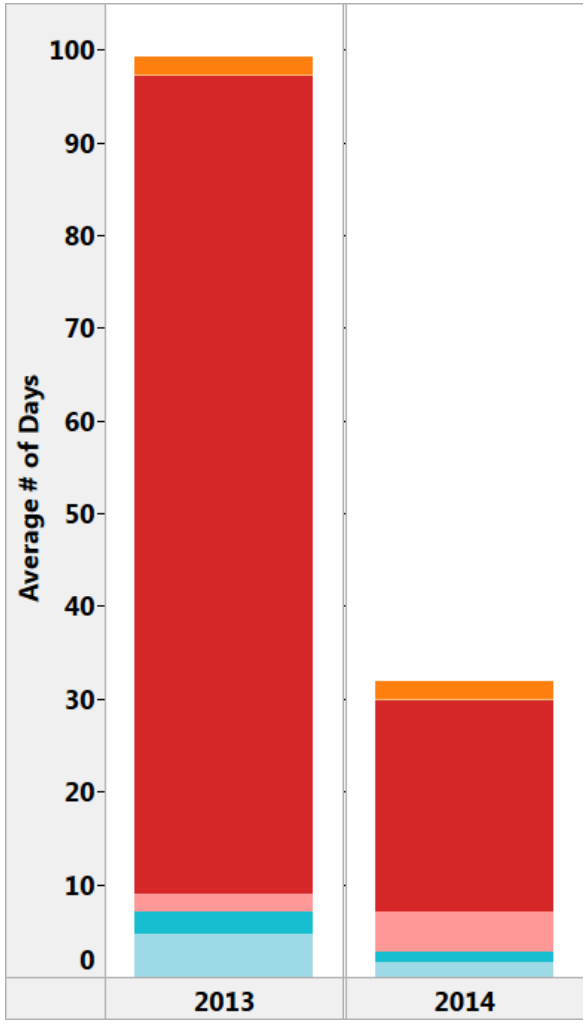


Faster New US Employee Badging

July to October 2013 vs. 2014



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Q: *How many tickets* should we release for *Explore JPL* and how should we *allocate the tickets* throughout the day?

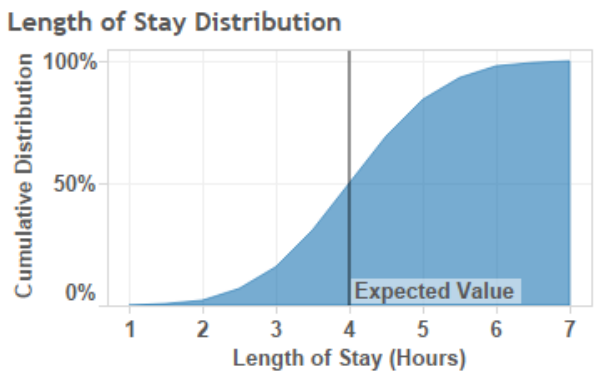
Explore JPL Ticketing Analytics

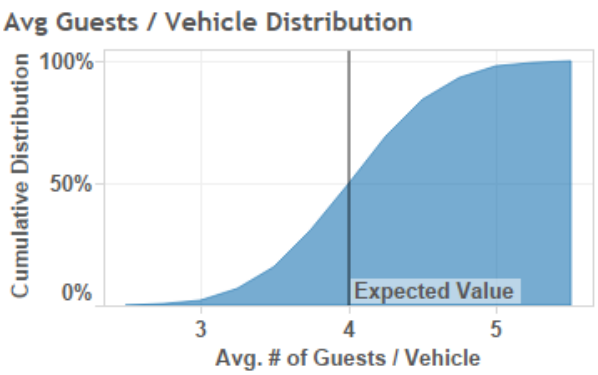
How many tickets can we issue given our current parking constraints?

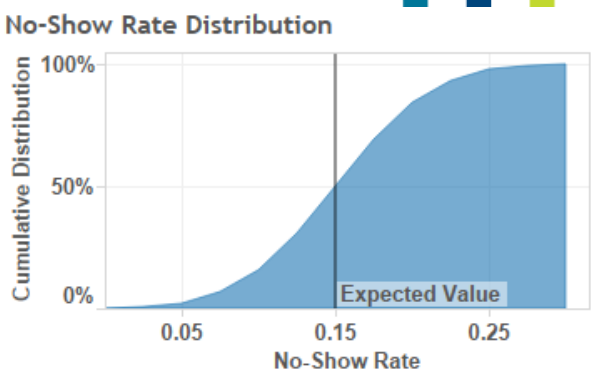
1) Used *optimization* to determine *max # of tickets* we can release before we expect to *run out of parking*. Modeled guest *arrivals* and *exits* using estimated:

- length of stay distribution,
- expected # of guests / vehicle, and
- expected no-show rate

Based on *past event data* where possible



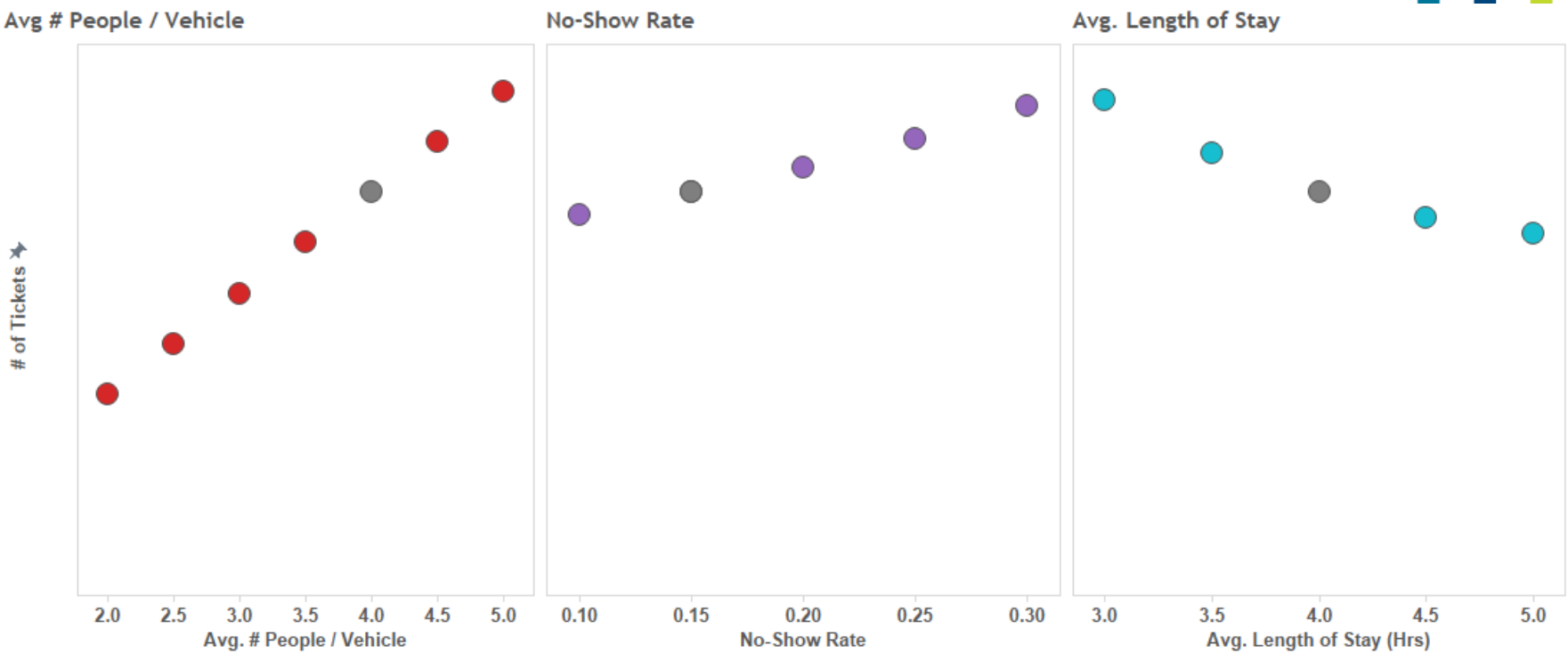




Explore JPL Ticketing Analytics

How many tickets can we issue given our current parking constraints?

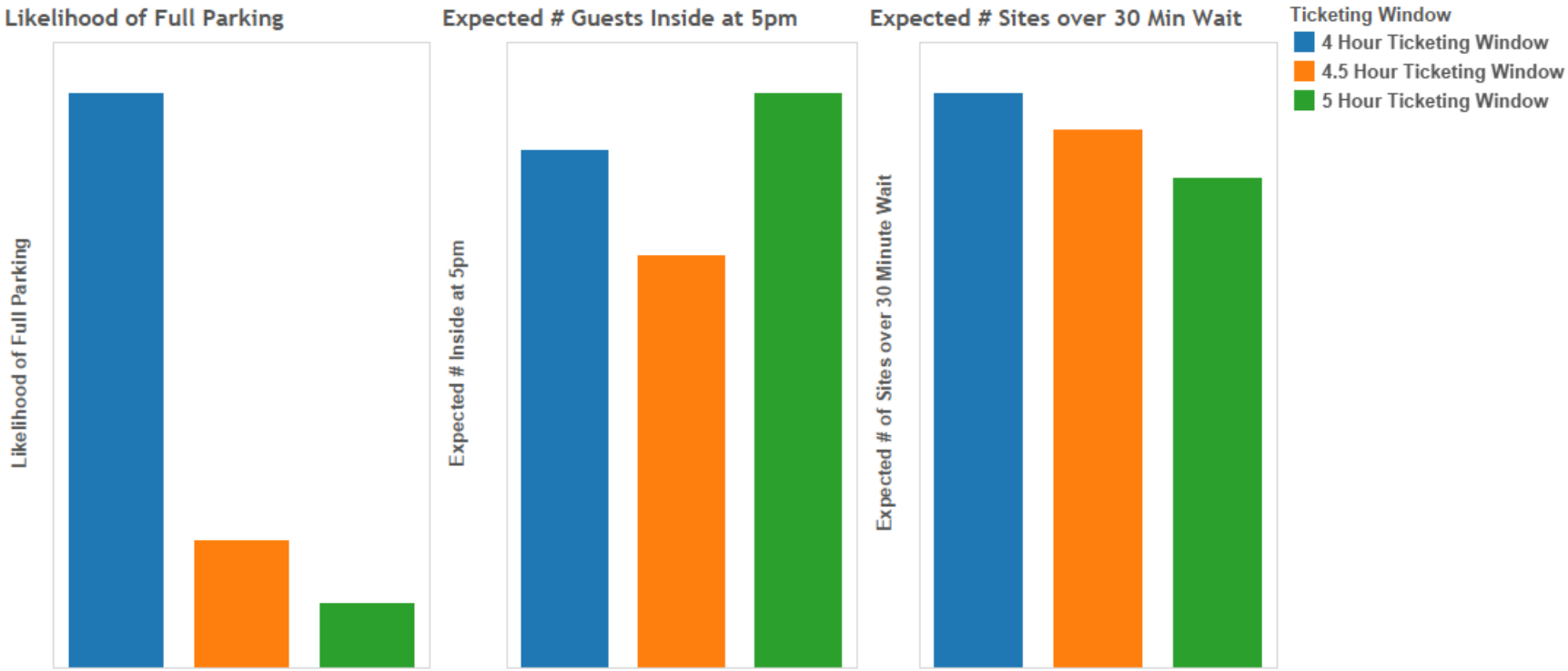
2) Performed a *sensitivity analysis* to determine how changes in input parameter estimates impact the number of tickets we should issue



Explore JPL Ticketing Analytics

How long should we make our ticketing window length?

3) Compared several *ticketing window length* scenarios using *simulation*, a method we use to take into account *input parameter uncertainty*



Search (a preview)

Search (a preview)

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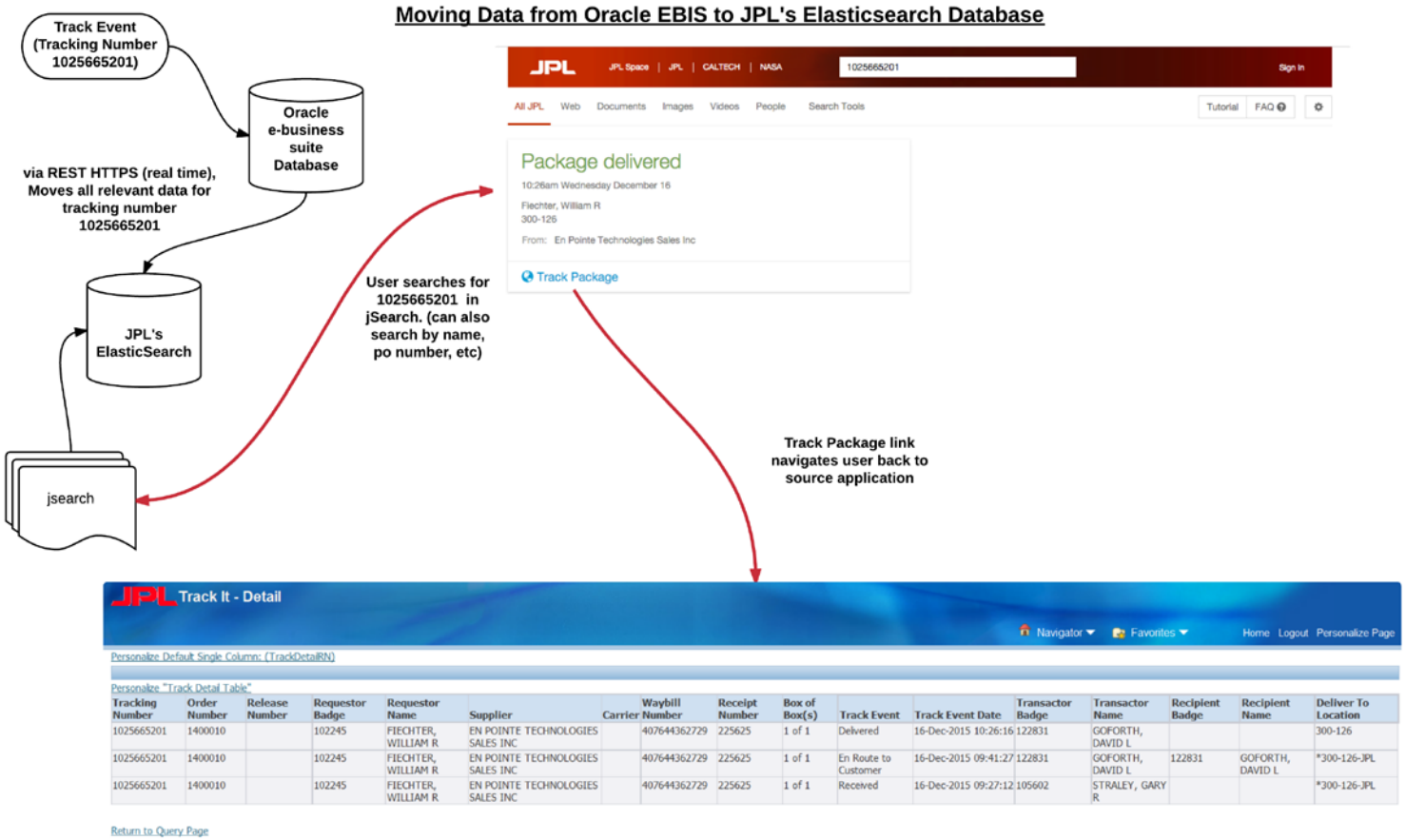
- Enable data search in JPL business applications in “non-traditional” approach such as typical query forms/screens
- Enable using open source technologies where possible through heterogeneous technical architecture
- Begin small, expand
  - Internal TrackIt data (non authenticated data)
  - Legacy travel data (authenticated data)

Search (a preview)



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Q & A

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