Crash Analysis Using Business Intelligence (BI) Data Analysis Software

2019 WesternITE Annual Meeting

Presented by Yung Koprowski, PE, PTOE, RSP

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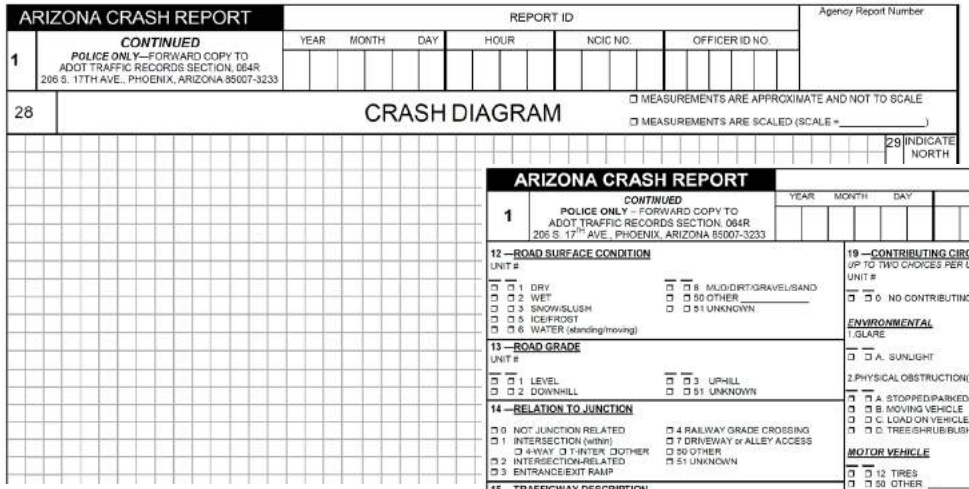
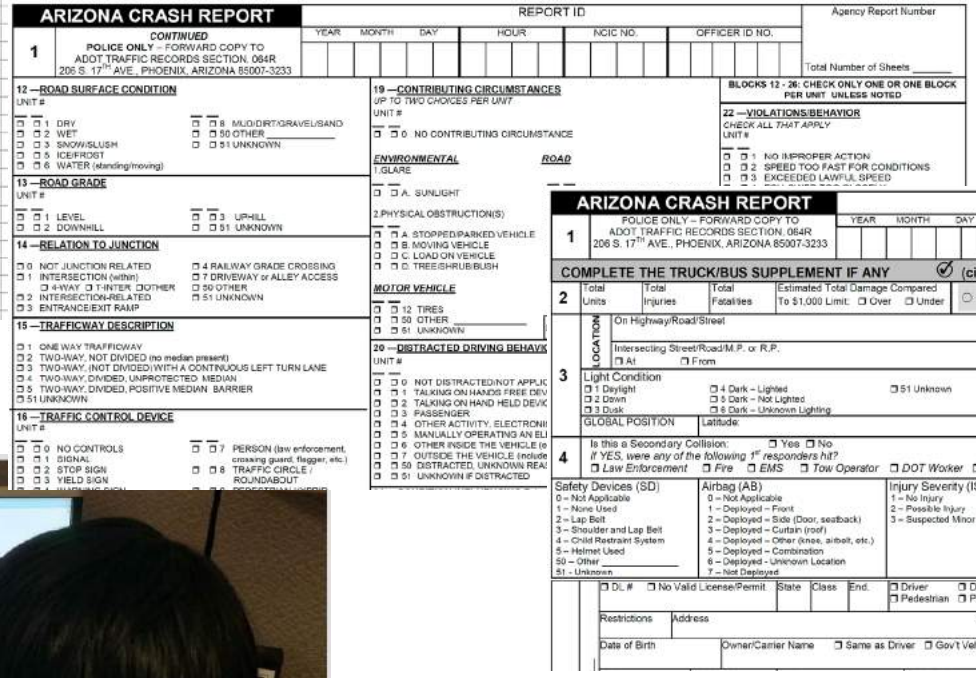
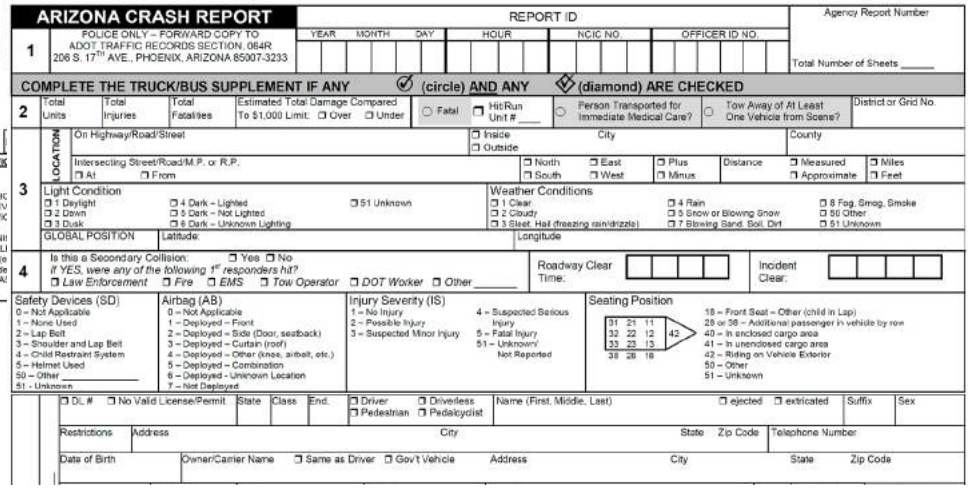
Crash Analysis

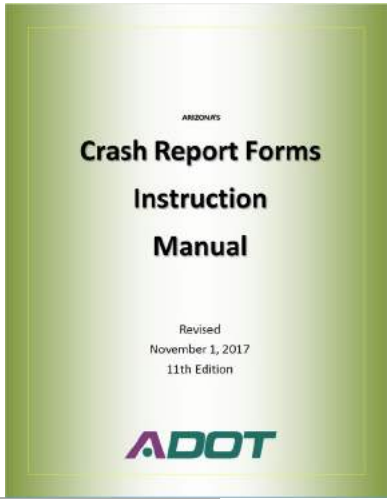
The main purpose of crash analysis is to improve safety by identifying crash patterns, mitigating crash severity, and reducing the number of crashes by adopting suitable countermeasures.

The City of Peoria, Arizona desired a tool that would help staff respond quickly and confidently to requests from management and residents.



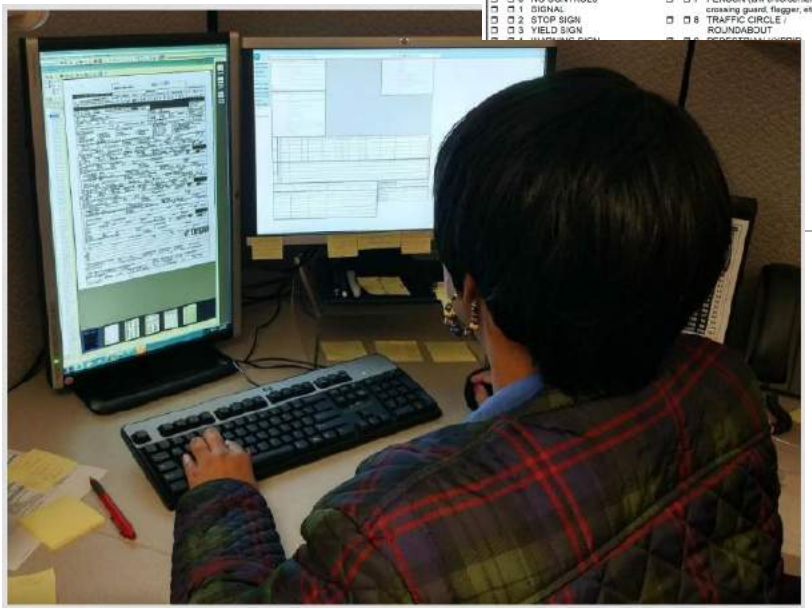






Columns of Data

- Incident – 75
- Person – 45
- Unit – 66



Arizona Motor Vehicle Crash Data

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Existing Crash Data Acquisition

Y	AJ	AV	AW	AX
FirstHarmfulEvent	InjurySeverity	Onroad	CrossingFeature	Offset
16	1	Glendale Ave	07 CENTRAL AVE B	-0.0095
33	1	79th Ave	07 MEADOWBROOK AVE	0
25	1	Virginia Ave	07 58TH DR	0.0379
46	1	22nd Dr	07 GLENDALE AVE	0.0326
16	1	27th Ave	U 060160C	0
38	1	State Route 202 Exit 1 A1-Ramp	M000	0.23
38	1	State Route 51	M007	0.32
16	3	Interstate 17	M270	0.4
16	1	Baseline Rd	07 7TH ST	-0.0057
16	2	Camelback Rd	07 8TH ST	0.018
16	2	Bethany Home Rd	I 017 1	0.0095
255	4	29th Ave	07 BELL RD	0
33	1	Carefree Hwy	07 27TH DR	-0.0189
25	1	Vine Ave	07 LONGMORE	0.0189
16	3	Alma School Rd	07 6TH AVE C	0.0379
25	1	Eugie Trl	07 65TH ST	0.054
255	1	Bell Rd	07 56TH ST	-0.0076
33	1	59th Ave	07 EARLL DR	0
16	1	7th St	07 GLENDALE AVE	-0.0409
16	2	Rittenhouse Rd	07 OCOTILLO RD	-0.0379
16	1	Apache Trl	07 SIGNAL BUTTE RD	0.0568
16	1	Carefree Hwy	07 CAVE CREEK RD	-0.0057
47	1	Van Buren St	07 350TH AVE	0.0047
16	1	Indian School Rd	07 67TH AVE	-0.0473
16	1	Mcdowell Rd	07 83RD AVE	-0.0189

- Arizona Department of Transportation Crash Records Section compiles and maintain a database of all crashes occurring within the state
- Incident, Person, and Unit .csv file obtained annually each summer for the previous year of data

Number Codes

Leading, Inner, and Trailing Spaces, misspelled street names

Crash Analysis Drawbacks

MAG RTSIMS Tool – Exported Report

High Crash Intersections by All Crashes (Peoria)			
9/18/2018	Safety Analysis Report	Years: 2013,2014, 2015,2016,2017	
Rank	Location	Crashes	Agency
1	THUNDERBIRD RD & 83RD AVE	131	Peoria
2	PEORIA AVE & 75TH AVE	90	Peoria
3	OLIVE AVE & 91ST AVE	89	Peoria
4	CACTUS RD & [illegible]TH AVE	77	Peoria
5	BELL RD & 91[illegible] AVE	[illegible]	Peoria
6	BELL RD & 8[illegible]	[illegible]4	Peoria
7	THUNDERBIRD RD & [illegible]TH AVE	70	Peoria
8	UNION HILLS DR & 83RD AVE	69	Peoria
9	OLIVE AVE & S 1010	68	Peoria
10	BELL RD & 87TH AVE	62	Peoria
11	THUNDERBIRD RD & 83RD AVE	61	Peoria
12	NORTHERN AVE & 91ST AVE	60	Peoria

Accuracy

MAG RTSIMS Tool – Query Exported to Excel

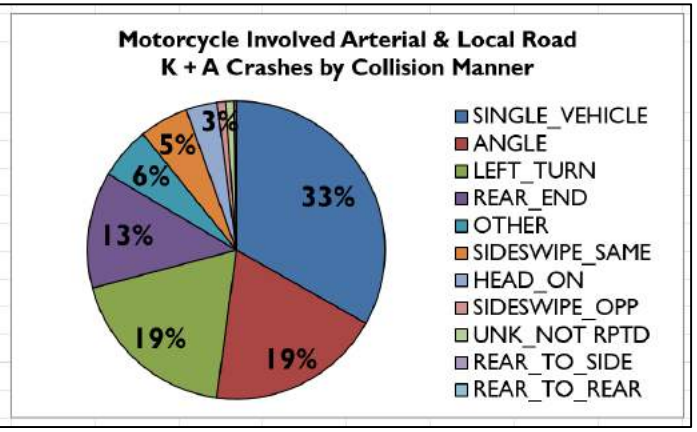
Collision Manner	No Injury	Possible Injury	Non Incapacitating	Incapacitating Injury	Fatal
UNKNOWN	1,123	55	64	16	9
[illegible]NGLE_VEHICLE	2,604	[illegible]	2,144	933	151
SIDES[illegible]ME_[illegible]TIC	878	[illegible]	5	179	18
SIDESW[illegible]E_OF[illegible]REC[illegible]O	[illegible]	[illegible]	[illegible]	25	1
[illegible]N					
REAR_TO_SIDE	454	18	21	7	0
REAR_TO_REAR	97	19	7	1	0
REAR_END	9,529	2,634	1,612	458	50

Formating

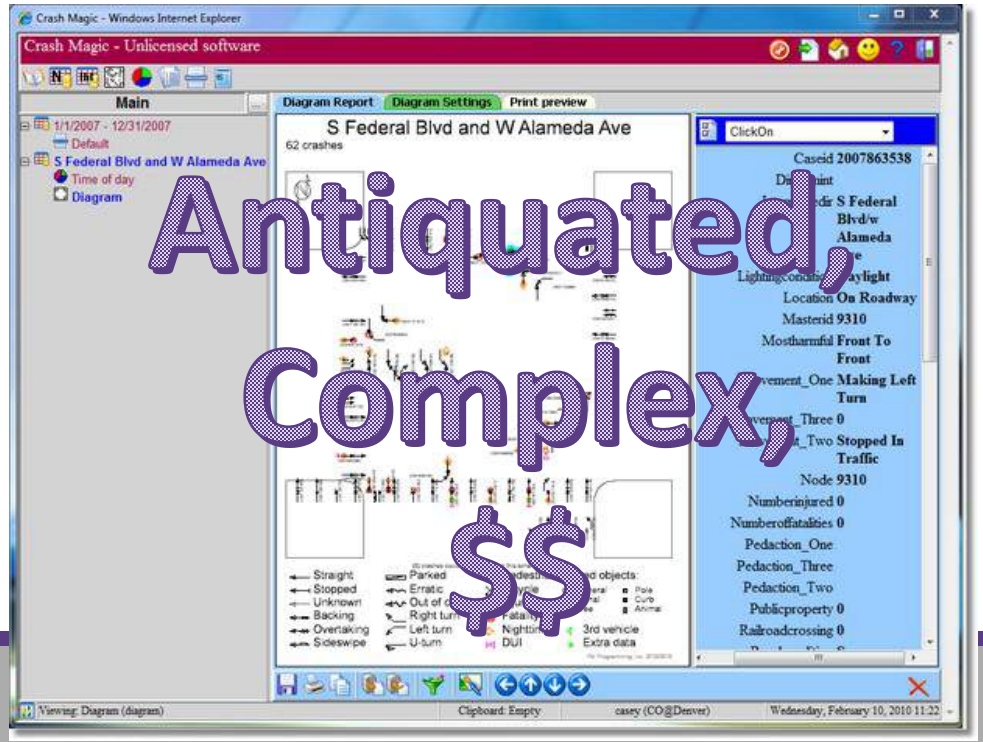
Manual Pivot Table Queries in Excel & Charts

9/5/2013			
All Arterials and Local Roads Motorcycle Involved Crashes by Collision Manner	Serious Injury	Fatal	TOTAL (K+A)
SINGLE_VEHICLE	768	126	894
ANGLE	437	73	510
LEFT_TURN	435	71	506
REAR_END	314	26	340
OTHER	111	42	153
SIDESWIPE_SAME	130	14	144
HEAD_ON	74	17	91
SIDESWIPE_OPP	24	1	25
UNK_NOT RPTD	14	9	23
REAR_TO_SIDE	7	0	7
REAR_TO_REAR	1	0	1

Time



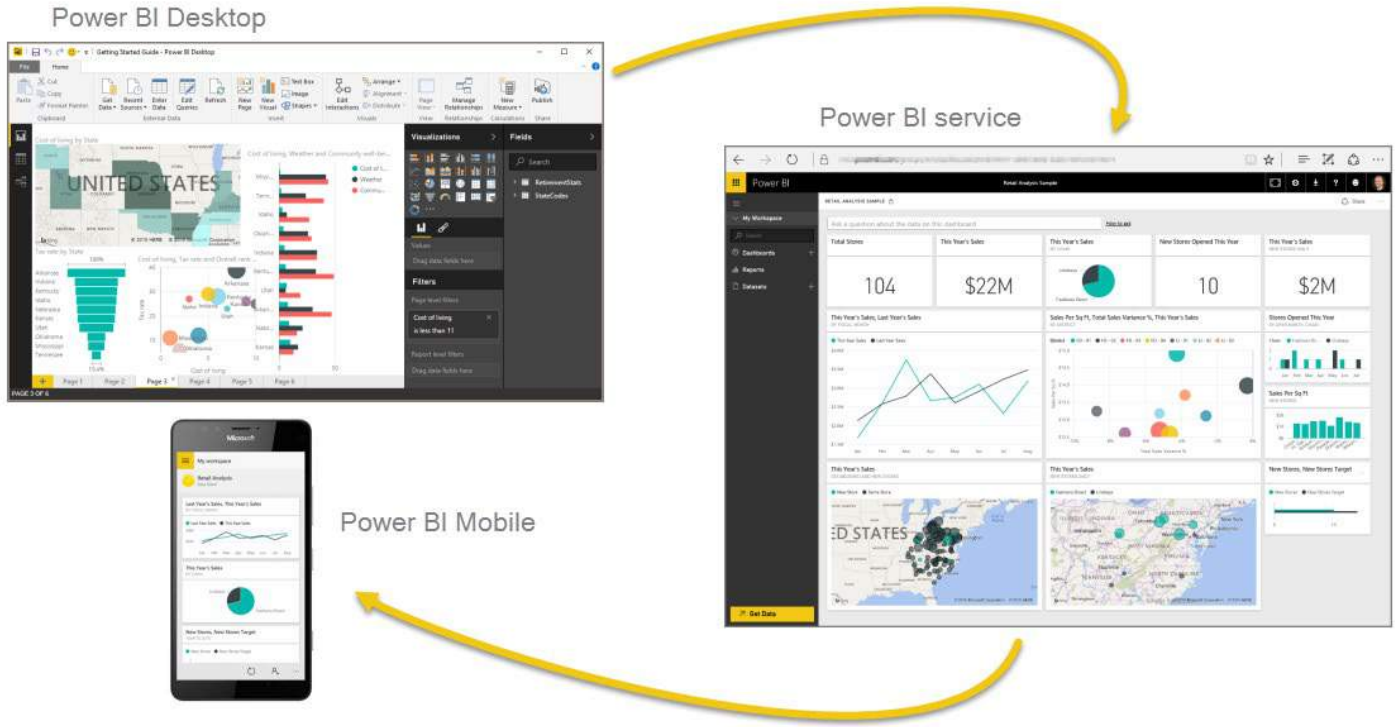
Crash Analysis Tool Vendors



Antiquated, Complex, $$

Business Intelligence (BI) Software

- Suite of tools designed to source, sort, consolidate, analyze and present complex data into digestible reports for insights
- Leverages big data and cloud-computing to simplify complex data analysis
- Easy to deploy, use and integrate with existing systems
- Standalone applications or part of an enterprise suite



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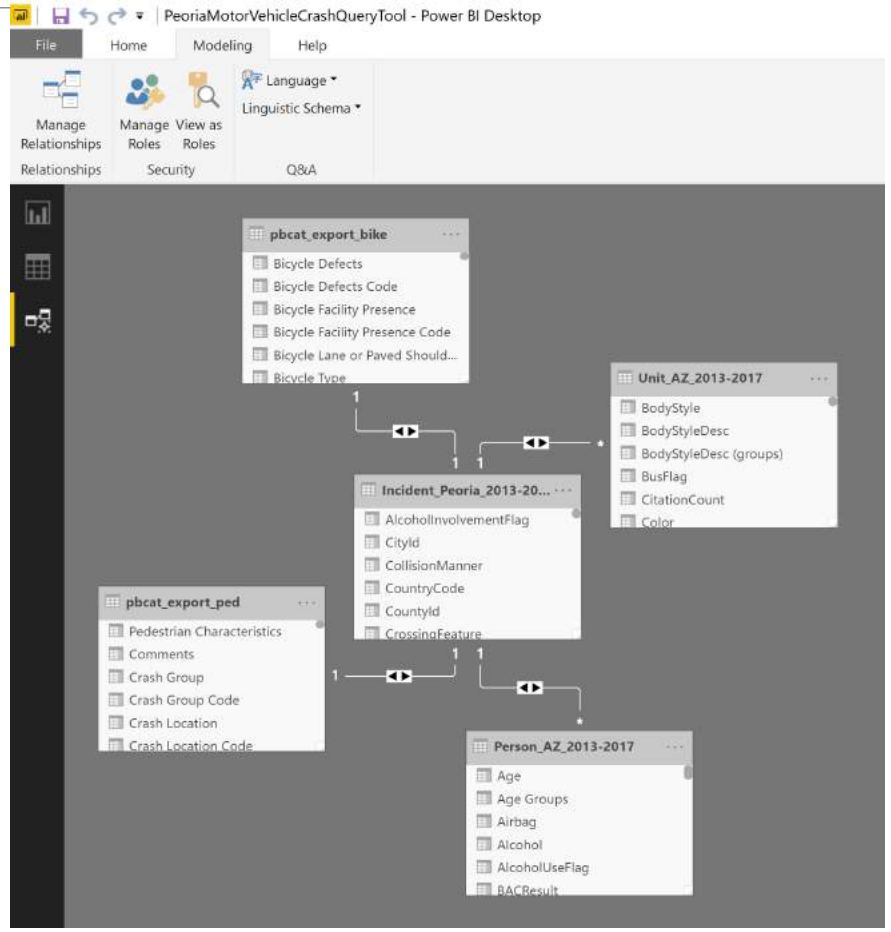
Building the Power BI Report – **Connect, Prep, and Transform the Data** *Relationships*

- Connected the Excel files for the Incident, Person, and Unit crash data.
- Created a relationship between Incident, Person, and Unit through the “Incident ID” common to each.
- Applied over 140 steps to de-code attributes, correct data, and add new sorting columns.



Code → Text

TrafficWayType	IntersectionType	JunctionRelation	Weather
Two Way with TWLTL	Four Way Intersection	Intersection	Clear
Two Way with TWLTL	Four Way Intersection	Intersection	Clear
Two Way with Painted Median	Four Way Intersection	Intersection	Cloudy
Two Way with TWLTL	Four Way Intersection	Intersection	Clear
Two Way with TWLTL	Four Way Intersection	Intersection	Clear

New Columns

IncidentDayofWeek	IncidentMonth	Intersection	DayofWeekSortOrder
Wednesday	April	81ST AVE and OLIVE AVE	3
Monday	May	89TH AVE and OLIVE AVE	1
Monday	May	83RD AVE and PEORIA AVE	1
Friday	July	71ST AVE and PEORIA AVE	5
Saturday	August	75TH AVE and PEORIA AVE	6

Building the Power BI Report – **Create Interactive Report**

- Hundreds of modern data visuals from Microsoft and partners
- Drag-and-drop canvas
- Design the report with theming, formatting, and layout tools
- From Power BI Desktop published to Power BI Service (web)

City of Peoria Motor Vehicle Crash Query Tool
WHEN
1,864
9,321
4,418
41
1,119
85
2,281

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