

LEAD WITH CURIOUSITY

Qlik Sense Application Performance
Tuning Using Document Analyzer

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Qonnections 
QLIK GLOBAL CONFERENCE



Rob Wunderlich

Independent Qlik Consultant and Trainer



Masters Summit
for Qlik

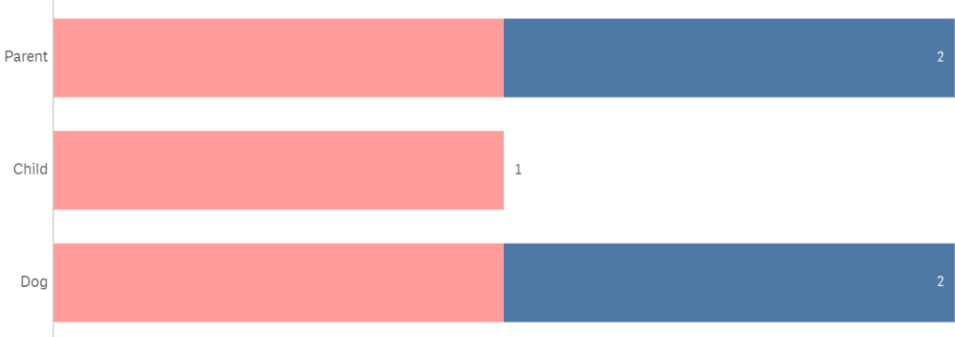




Chief Solutions Architect
BI practice lead, best practices, deployment framework, utilities,
consultant training, multicooker recipes

Years on Earth	Years consulting	Customers served	Coffee breaks
37.1	13.2	216	6,862

Family members
Not listed in order of importance

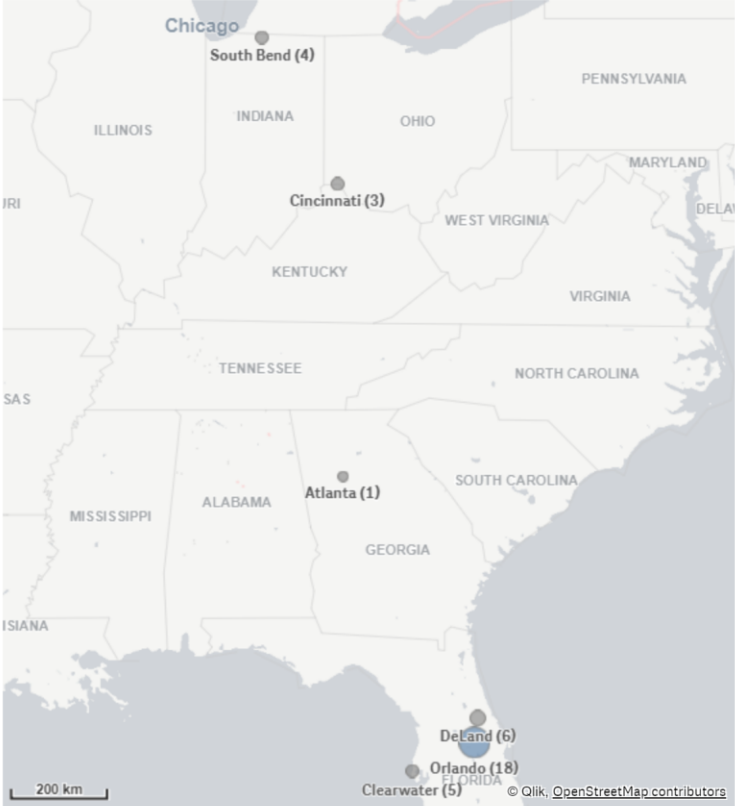


more info: michaelsteedle.com



Places lived (years)

Current: Orlando



Got app problems?

- Slow application
- Large application
- Reviewing app before deployment
- Auditing for best practices
- Need to document what is in an application
- Missing the "Expression Overview" feature of QlikView

Enter: **Qlik Sense Document Analyzer**

- Created by Rob Wunderlich, Qlik Luminary
- Heir to widely used *QlikView Document Analyzer*
- Built in collaboration with Axis Group

Summary sheet

Qlik Document Analyzer V1.5 | Data | Analysis | Story | Edit | Summary | Selections | Insights

Summary

Environment: Desktop
 Bookmark: Document Analyzer Setup; Bookmark not found
 Selections: none

DA Sample App (C:\Users\vrob_3e7s12b\Documents\Qlik\Sense\Apps\DA Sample App.qvf) analyzed 2019-02-07 11:53:24

Summary 0.9 sec / 0.9 sec.	Flag Count 153/153	Tables 19/19	Relationships 21/21	Fields 75/75	Sheets 27/27	Objects 142/142	Dimensions 129/129	Expressions 165/165	Variables 14/14
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Application
element
counts

Object
calctime,
total and
distribution

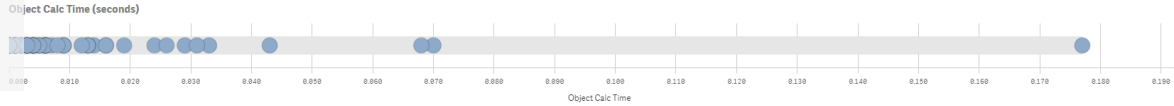
Object Calc Time
0.8630.006
Object Calc Time Avg

Table Count
19

Field Count
75³⁹
Unused

Variable Count
14¹¹
Manually Initialized

Analysis Errors
0



Memory Per User
0.04 MB

	Field Is Used	Q	Total Field Bytes MB	Field Count
Totals			1.3	75
	Y		1.3	36
	N		0.0	39

Removing the 39 unused fields (52.0% of total count) from the data model would reduce RAM consumption by 0.0 MB (2.8%) for the app and 0.0 MB (3.3%) per user.

Simplifying the data model and cleaning up unused Variables and Master Items may reveal additional fields as unnecessary.

Memory per user, used & unused fields

Detail sheets

AXIS Document Analyzer Fields

Field Is Used

Selection filters and flags

Keyfield

Field Flag

Field Tag

N
Y

N
Y

Unused field 39
Suboptimal numeric storage 8
Key not 100% distinct in any table 3
100% Null field 2
Synthetic Key field 1

\$ascii
\$date
\$geomultipolygon

Drop field script export

Navigation and context ribbon

DA Sample App (C:\Users\rob_3e7sl2b\Documents\Qlik\Sense\Apps\DA Sample App.qvf) analyzed 2019-03-12 13:56:34

Summary	Flag Count	Tables	Relationships	Fields	Sheets	Objects	Dimensions	Expressions	Variables
9.8 sec. / 0.8 sec.	153/153	19/19	21/21	75/75	27/27	142/142	129/129	165/165	14/14

Fields (75)

FieldName	Distinct Values	Symbol Width	Symbol Bytes	Total Field Bytes	Field Is Used	Keyfield	Object Count	Reference Count: Expression	Reference Count: Variable	Field Flag
Totals			1,189,733	1,406,0...			142	183	14	53
world Area	247	4563.14	1,127,096	1,127,343	Y		1	2	0	
Longitude_Latitude	68	46.66	2,159	3,248	Y		2	0	0	
Address	92	25.17					0	0	0	1: Unused field
JobTitle	43	23.02	999	1,096	Y		2	0	0	
Company Name	92	20.43	7,809	8,477			21	5	0	
Contact	92	19.48	75	75			0	0	0	
Product	78	19.47	1,519	1,588	Y		8	0	0	
CategoryName	8	19.25	154	184	Y		4	3	0	
Description	8	18.63					0	0	0	1: Unused field
Name	64	18.56	1,188	1,248	Y		6	3	0	
Phone	92	18.16	752	752	N		0	0	0	1: Unused field

Rich detail such as field sizes, row counts, calc times, key relationships

Keys (12)

FieldName	TableName	Cardinality	Distinct Values	NoOfRows	Subset Ratio	Null Row Count	Null Row Pct
CustomerID	orders	M or 0	90	20,251	88.2%	5	0.02%
EmployeeID	orders	M or 0	15	20,251	23.4%	5	0.02%
\$Syn 1	\$Syn 1 Table	1	1,810	1,810	100.0%	0	0.00%
\$Syn 1	calendar	1	1,809	1,809	99.9%	0	0.00%
\$Syn 1	orders	M	1,469	20,251	81.2%	0	0.00%

Meaning of Subset <100%: Transaction table = extraneous reference data, Dimension table = missing reference data

Qlik Sense Document Analyzer *best fit*

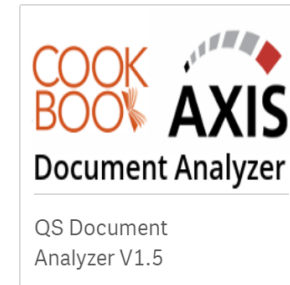
- Identify unused fields
- Find Calculated dimensions
- Find objects that calculate slowly
- Answer general questions about what is in an application's data model and interface, such as compliance with best practices, ex.
 - Are expressions using variables?
 - Are charts using Master Dimensions and Measures?

What gets installed?

1. Custom **data connector**, to extract app metadata
2. **QVF** for analysis
3. Navigation ribbon **extension**



QsAppMetadataConnector



DA Sample App (C:\Users\rob_3e7sl2b\Documents\Qlik\Sense\Apps\DA Sample App.qvf) analyzed 2019-02-01 14:04:13

Summary 0.8 sec. / 0.8 sec.	Flag Count 153/153	Tables 19/19	Relationships 21/21	Fields 75/75	Sheets 27/27	Objects 142/142	Dimensions 129/129	Expressions 165/165	Variables 14/14
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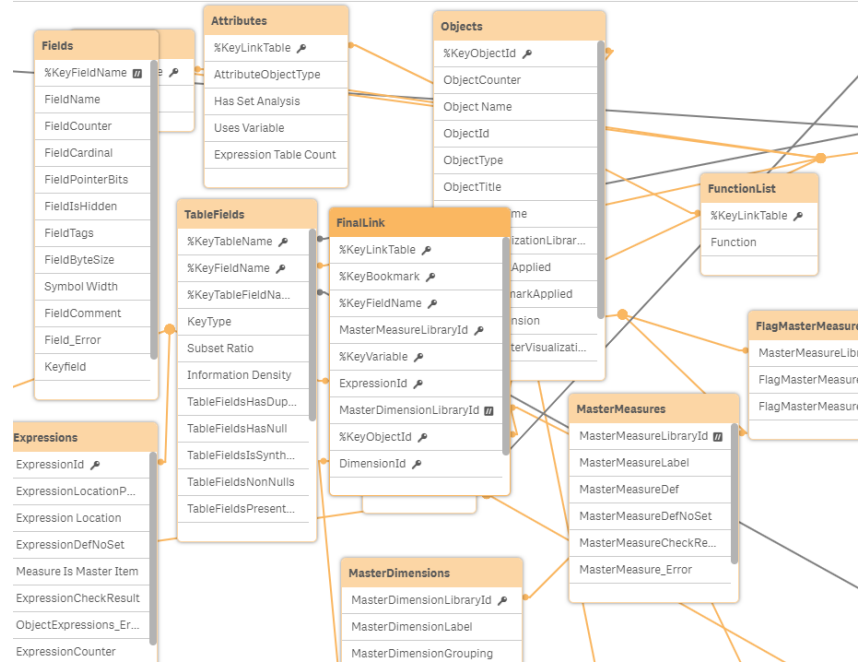
What metadata is extracted?

- Expected
 - Tables, Fields, Table/Field relationships
 - Master Dimensions and Measures
 - Sheets, Sheet/Object relationships
 - Objects, and their Dimensions and Expressions
 - Variables
- Surprising!
 - Object calculation time (make sure app isn't cached first)
 - Expression parsing results, ex. errors in syntax
 - Subset ratios, information density

QS Document Analyzer data model

The QVF script ties the app metadata together

- Central link table connects all the application elements together
- For example: Master Measures to Objects, Fields, Functions, Variables used



Where to get the Qlik Sense Document Analyzer

- Download from the *Tools* section of QlikCookbook.com
- No charge

TOOLS



Tools

› AutoHotKey Script for Qlikview Editors


› Copy Groups Utility

› Import/Export Variables Utility

› Prj Tool

▼ QS Document Analyzer



 QS Document Analyzer

Version 1.5, Feb 4, 2019 - Qlik Sense

This is the Qlik Sense version of the popular "Document Analyzer" tool that provides insights into your application. Discover where fields, variables and master items are used, and importantly, what fields are unused.



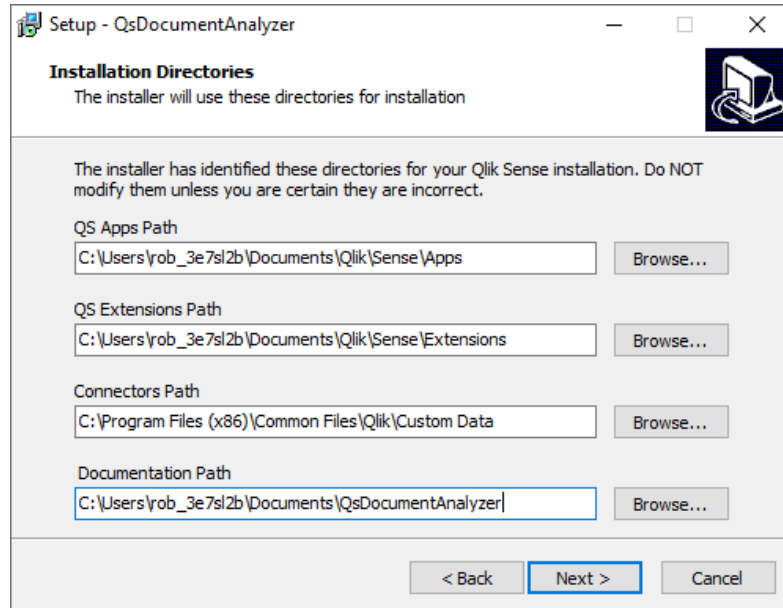
Field	Usage	References	Unused
Field 1	Used	Used	Not Used
Field 2	Used	Used	Not Used

How to install

- Pre-requisites
 - Qlik Sense Desktop (but it can analyze Server apps *from* QS Desktop)
 - Windows Administrator access
- 1. Download from qlikviewcookbook.com/tools
- 2. Unzip
- 3. Launch setup.exe

Installation directories

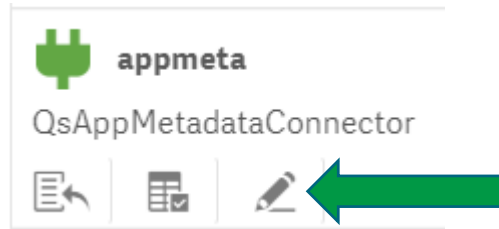
- Modify if you know they are incorrect



Windows Admin access
required if your Connectors Path
is "Program Files (x86).."

Analyzing an application

- Open Qlik Sense Desktop
- Open the QS Document Analyzer QVF
- Open the Data load editor and edit the *appmeta* connection



Select a target app

- To analyze an app stored
 - on your computer, select the *Desktop* radio button
 - on a server, enter the Server name and select the *Enterprise* radio button
- Select one Application from the dropdown

Change QS App Metadata connection

Connection Name
appmeta

Server
qliksense.lab.panalytics.com

Environment
 Enterprise
 Desktop

Application
DA Sample App.qvf
DA Sample App.qvf ▼

Optional Field selections
Field,Selections

Optional Bookmark
Document Analyzer Setup

Cancel Save changes

Target app default selections (optional)

- Bookmark and field selections may be specified to condition the data before computing object calculation times
- After reload, the Summary sheet will indicate if default selections were successful

Change QS App Metadata connection

Connection Name
appmeta

Server
qliksense.lab.panalytics.com

Environment
 Enterprise
 Desktop

Application
DA Sample App.qvf
DA Sample App.qvf

Optional Field selections
Field,Selections

Optional Bookmark
Document Analyzer Setup

Cancel Save changes

Reload

- Save your connection changes (do not rename the connection) and click *Load data*
- Reload time is dependent on complexity of objects and size of data model
- Every UI object in the target will be calculated during the reload. For accurate timing, ensure nothing is cached before reloading:
 - restart Qlik Sense Desktop, if analyzing a desktop application
 - reload the application, then do not open any sheets, if analyzing a server application

Navigating the QS Document Analyzer

- It's a Qlik application, so selecting, searching and associations behave as you would expect
- The navigation ribbon shows element counts for your current selections and also acts as quick sheet navigation

DA Sample App (C:\Users\rob_3e7sl2b\Documents\Qlik\Sense\Apps\DA Sample App.qvf) analyzed 2019-02-07 11:53:24

Summary 0.2 sec. / 0.9 sec.	Flag Count 16/153	Tables 8/19	Relationships 8/21	Fields 8/75	Sheets 3/27	Objects 3/142	Dimensions 16/129	Expressions 13/165	Variables 0/14
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Sample analysis scenario

1. Find and select an Object with high calculation time.
2. Review the expressions and functions used by this chart object.
3. Review other objects that use the same expression.
4. Improve the expression in the target app, save, then reload the QS Document Analyzer to quantify the improvement.

Managing by exception: *flags*

- Conditions that warrant your attention are flagged during the reload: *tables, relationships, fields, dimensions, expressions, variables*

Q Flag Expression

Calculation error: Bad field ... ✓

- expression syntax inconsist...
- Resource-intensive functio...
- Formatting function: Num 3
- Quote-delimited number 2

Expressions (3, 1 distinct)

Expression	Reference Count: Expression	Object Count	Fields in Expression	Expression Table Count	Flag Expression	ExpressionCheckResult
Totals	3	1	-	1	3	
Count(distinct CompanyName)	3	1	Name	1	3: Calculation error: Bad field name(s)	Bad field name(s) "CompanyName"

Flags

- All data model and UI flags are summarized on the Flag Summary sheet, while detailed flags are provided in context on the associated sheets
- Extended flag descriptions and recommendations are on the Glossary sheet

Flags

FlagReason	Q	FlagDescription
0-row table		The table contains zero rows. It could likely be dropped from the data model with no loss of analysis.
100% Null field		The field contains only null values. This field could likely be dropped from the data model with no loss of analysis.
All fields unused but keys		None of the fields in this table are found to be used in charts. Unless this is a link table, the table could likely be dropped from the data model with no loss o
Cleansing function: KeepChar		Consider performing this data cleansing in the script where possible.
Cleansing function: PurgeChar		Consider performing this data cleansing in the script where possible.

Flag examples

- Outright problems: Calculation Errors, Missing Extension, No Matching Keys
- Inefficiencies: Unused Fields, Resource-intensive Functions, Indistinct Keys, Calculated Dimensions
- Known “gotchas”: SynKeys, Many-to-Many Relationships, Inconsistent Syntax or Labels



Demo



Some tips from Mike

Improving Qlik apps doesn't have to be difficult

80/20

data
model



UI

1. Reduce app size

- Drop unused fields
- Drop extraneous rows from non-fact tables

2. Improve app efficiency

- Eliminate non-essential calculated dimensions
- Look at slowest few sheet objects closely

Data model

Synthetic key

Multiple fields common between two tables

- Recommendation: Figure out what columns are even necessary to keep, then **understand the use case to determine best resolution**, if the problem still exists.

🔍 Field Flag

Synthetic Key field 1 ✓
Unused field 39
Suboptimal numeric storag...

FieldName	🔍	TableName
\$\$Syn 1		\$\$Syn 1 Table
\$\$Syn 1		calendar
\$\$Syn 1		orders

Data model

Unintended many-to-many relationship in the data model

- Recommendation: **Investigate why** – bad source data, bad assumption about source data, bad transformation (especially resulting from joins).

Relationship Flag

Many-to-many relations... ✓

RelationshipKeyFieldName	LTableName	RTableName	RelationshipCardinality
Totals			
City	customers	CustomerCoordinates	M:M

Data model

Vague or poor field names in the data model

Poorly named fields must be relabeled repeatedly throughout the front end – often inconsistently – and appear as a different name in the current selections

- Recommendation: **Name things well in the script.**

MasterDimensionLabel	↻	MasterDimensionDef
Company		Company Name

Data model

Inconsistent expression definitions

Two Measures with the same label, but different definitions, are likely to cause confusion among users

- Recommendation: **Only one measure per label**

🔍 Flag Master Measure

Expression defintion inconsistency 2 ✓
Expression labeling inconsistency 2
Expression syntax inconsistency 2
Calculation error: Bad field name(s) *...

MasterMeasureLabel 🔍	MasterMeasureDef
Sales	Sum(Sales)
Sales	Sum(Sales) *1.1

Data model

Inconsistent expression labeling

Two Measures with the same definition, but different labels, forgoing reuse

- Recommendation: Don't duplicate expressions, **use Master Measures and/or Variables** when possible

🔍 Flag Master Measure

Expression labeling inconsi... ✓

Expression defintion incon...

Expression syntax inconsis...

Calculation error: Bad field ...

MasterMeasureLabel 🔍	MasterMeasureDef 🔍
Sales CYTD	Sum({\$<CYTDFlag={ '1' }, Year=, Quarter=, Month=>} Sales)
Sales Current Year	SUM({\$<CYTDFlag={ '1' }, Year=, Quarter=, Month=>} Sales)

Data model

Unused fields

Often resulting from Load * from wide QVDs, arbitrarily loading a lot of uninteresting columns

- Recommendation: **Unused fields can be dropped**, if not needed for self-service. In some cases the remaining data could then be aggregated, to improve calculation performance.

🔍 Field Is Used

N ✓
Y

Drop field script export

Data model

Extraneous dimension table rows

Dimension tables contain extraneous rows with no associated transactions, which will never appear in charts

- Recommendation: Always load fact tables first, then **dimension tables using the *Exists* function** to eliminate unnecessary rows.

Keys (12)

FieldName	Q	TableName	Q	Subset Ratio
CustomerID		CreditStatus		0.0%
CountryISOCODE		CountryCodes		8.4%
CustomerID		SupportTickets		9.8%
Currency		Base currency		23.1%
EmployeeID		orders		23.4%

UI implementation

Calculated dimensions

Calculated dimensions found, negatively affecting calculation time and cache reuse

- Recommendation: **Clean up innocuous calculated dimensions and move the rest to the data model.**

DimensionType	DimensionName	Object Count
Totals		101
Calculated	=[Field]	1
Calculated	=Dual(Year([OrderDate])&'-&Month([OrderDate]),MonthStart([OrderDate]))	2
Calculated	=[Table]	1
Calculated	=aggr(only({<Division={EMEA}>}[Company Name]), [Company Name])	1
Calculated	=ValueLoop(1,100)	1
Calculated	=Aggr(2

UI implementation

Invalid expressions

Measure expressions broken after data model changes

- Recommendation: **Fix them**

🔍 Flag Expression

Calculation error: Bad field ... ✓

Expression syntax inconsis...

🔍 Flag Master Measure

Calculation error: Bad field ... ✓

Expression defintion incon...

Expression	ExpressionCheckResult
Totals	
Count(distinct CompanyName)	Bad field name(s) "CompanyName"

UI implementation

Missing extensions

Application uses extension object that was never deployed on server or has been removed from server

- Recommendation: **Look into whether it should be deployed.**

🔍 ObjectIsExtension

False
True
Widget
Missing ✓

🔍 ObjectType

zzz++

barchart
cl-container*

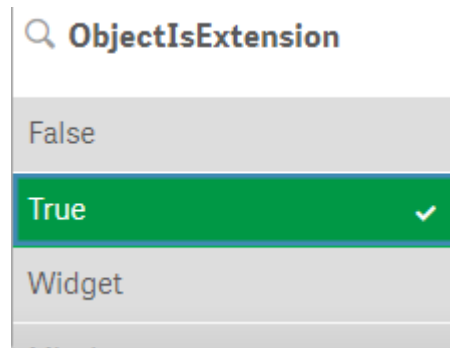
**Extension, ++ Missing Extension*

UI implementation

Extension exhaustion

Using a lot of extensions to do things that don't add much value and thus aren't worth the risk introduced

- Recommendation: **Use extensions only when needed.** Use approved or popular extensions, and replace with native charts as they become available.



🔍 **ObjectType**

cl-container*

com-qliktech-orgchart*

devtool*

*Extension, ++ Missing Extension

UI implementation

Excessive use of conditional functions

Excessive use of the Pick function, Pick/Match, and nested Ifs, slow performance and a pain to update

- Recommendation: **Use a variable to “look up” values from an island table, instead.**

🔍 Flag Expression

Multiple If statements 1 ✓

Expression syntax inconsis...

Resource-intensive functio...

Formatting function: Num 3

Calculation error: Bad field ...

UI implementation

Excessive use of conditional functions

Use a variable to “look up” values from an island table, instead.

MeasureIndex	MeasureLabel	MeasureBase	MeasureYTD...
1	Quantity	Sum(Quantity)	...
2	Sales	Sum(Sales)	...

```
Only({<MeasureIndex = {$(v_VariableIndex)}>} MeasureLabel)
```

UI implementation

ValueList() function

ValueList function used for list of metrics in “metric tables”, leading to poor performance

- Recommendation: **Use island table for several times better calculation time** (<https://www.axisgroup.com/data-industry-insights-blog/synthetic-dimensions-with-better-performance-than-valuelists>)

Function Usage

Function	Count
Totals	236
aggr	15
avg	24
color	5
colormix1	2
count	30

UI implementation

Manually defined variables

Manually defined variables that are time consuming to update, or no variables at all, which are also time consuming to update

- Recommendation: **Script-defined Variables are still the easiest way to make mass updates (find and replace) and reuse expressions.**

VariableName	Is Created in Script
Totals	
e.Cost	N
vASP	N
vAvgDealSize	N
vMargin	N

UI implementation

Complex business rules in expressions

Expressions contain complex business rules that could be pushed to the data model, including frequent text comparisons

- Recommendation: **Create simple fields in data model to encapsulate business rules**, using numeric values when possible for best performance.

Before	After
Relationship={'Employee'}	RelationshipCode = {1}
Relationship={'Spouse'}	RelationshipCode = {2}
Relationship={'Child','Disabled Dependent','Adult Dependent','Student'}	RelationshipCode = {3}

UI implementation

Overcomplicated calculations

Overcomplicated calculations that could be simplified mathematically

- Recommendation: **Look carefully at complex calculations**, automate simplification with Wolfram Alpha

$$\text{ex. } (CY - PY) / PY = (CY / PY) - 1$$

$(A / (B / C)) / C$



 Browse Examples  Surprise Me

Assuming "A" is a variable | Use "A / (B / C)" as a [unit](#) instead

Input:

$$\frac{\frac{A}{\frac{B}{C}}}{C}$$

Open code 

Result:

$$\frac{A}{B}$$

Step-by-step solution

UI implementation

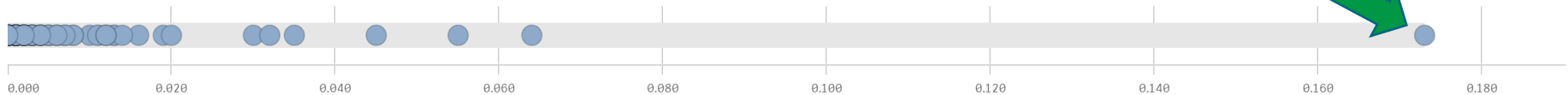
Default sheet/chart is slow to render

Default view is a TON of data, which takes a long time to calculate and render, whether users care about it or not

- Recommendation: **Use calculation conditions.** If users are stingy, create an override toggle using a variable.

```
Sum(RecordCount) <= 100000 OR v_CalcOverride = 1
```

Object Calc Time (seconds)



UI implementation

Repeated color derivation in charts

Complicated and repetitive expressions in UI used to assign specific colors to dimensional values

- Recommendation: **Store colors in data model fields, then use those directly in the front end.**

```
Pick(  
Match(right([DateOfService Quarter],1),1, 2, 3, 4),  
RGB(0,85,125),RGB(128,130,132),RGB(47,159,56),RGB(1  
22,205,196))
```

Function Usage

Function	Q	Co
Totals		
color		
colormix1		
rgb		

UI implementation

Upgrade Qlik Sense

Upgrade Qlik Sense to take advantage of performance features and enhancements included in the latest release, ex. billions abbreviation formatting, segment colors for Master Measures.

```
pick(ceil(log10(Sum(<{<$ (set_DateOfServiceCYTD)>}TotalAmountBilled)/3),'$' &  
num(Sum(<{<$ (set_DateOfServiceCYTD)>}TotalAmountBilled),'#,##0.00'),'&  
num(Sum(<{<$ (set_DateOfServiceCYTD)>}TotalAmountBilled)/1000,'#&  
num(Sum(<{<$ (set_DateOfServiceCYTD)>}TotalAmountBilled)/1000000,'#&  
num(Sum(<{<$ (set_DateOfServiceCYTD)>}TotalAmountBilled)/1000000000,'#&
```

Thank You

Want to learn more? Check out these resources:



Stay in the know on Qlik product innovations. Register for our quarterly webinar series.

qlik.com/QlikInsider



Connect with Qlik enthusiasts around the world. Learn, share and explore. Register today.

community.qlik.com

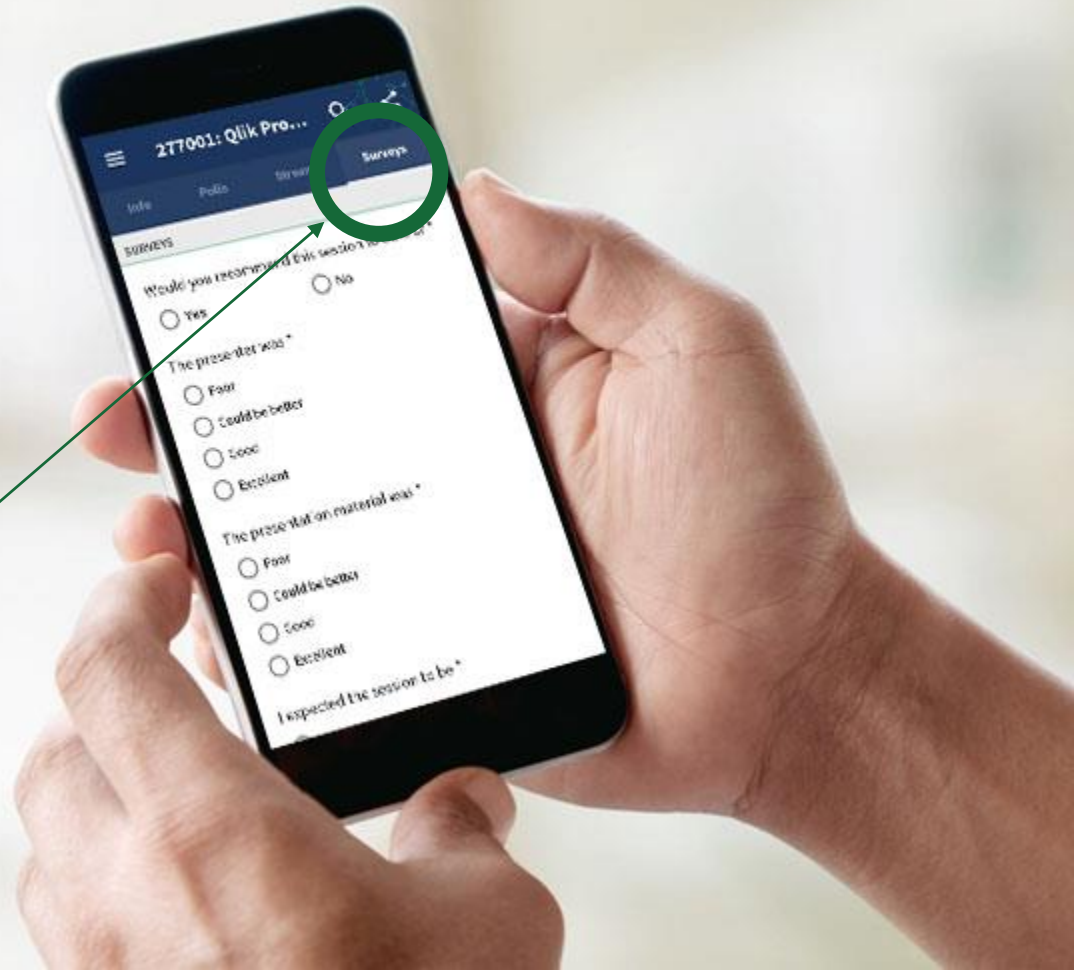
Breakout Session Survey

We strive to improve the event each year and are interested in hearing your feedback on this session.

To access the session survey please log into the mobile app and click this session on your personal agenda.

Click the Survey button in the top menu to complete the survey.

We thank you in advance!



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Thank You

