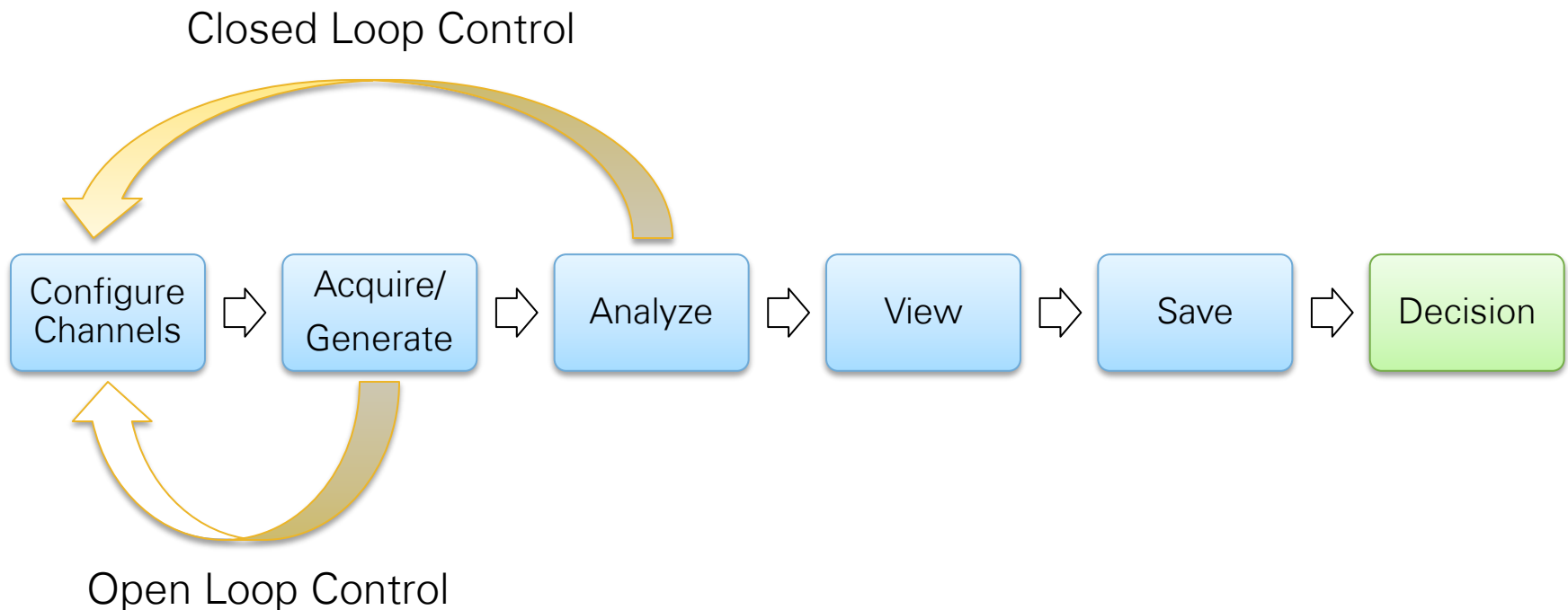


# 5 Red Flags To Consider Before Choosing Configuration-Based DAQ Software

# Goal

To inform you about the tradeoffs between a configuration based approach and a custom built approach to taking a measurement so you can make the right decision for your application

# Let's Start With The Measurement Process



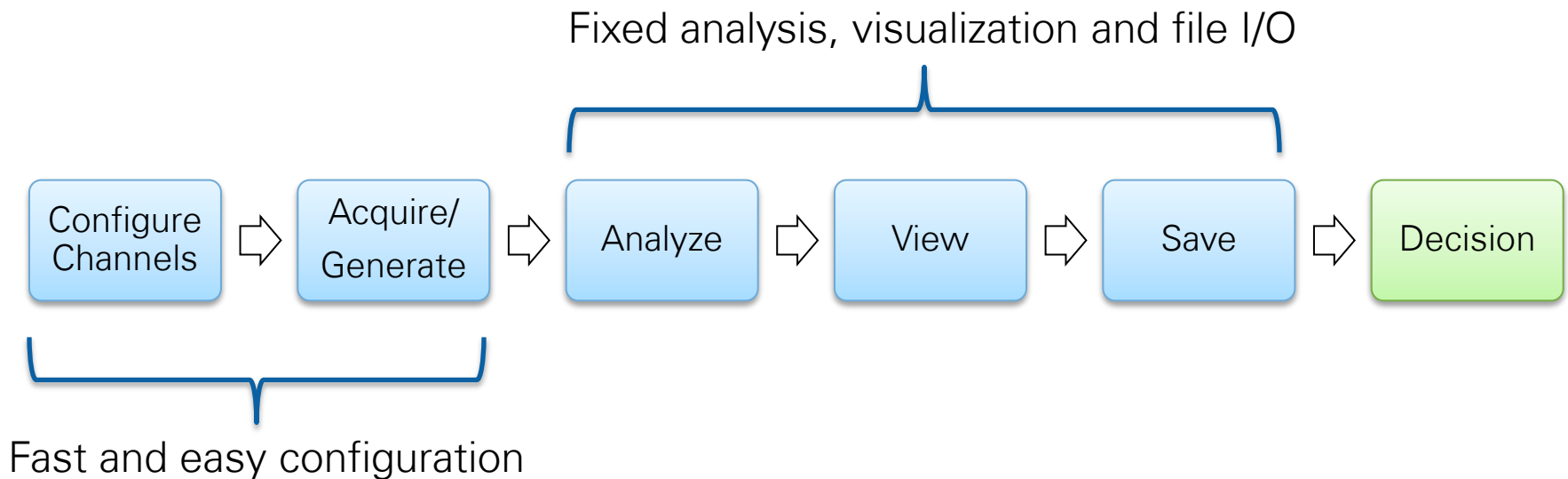
# Let's Start With The Measurement Process

## **Two Methods For Acquiring Data**

- Configuration-based software
- Custom software

# What is Configuration-Based Software?

- Hardware specific, ready to run software with configurable settings

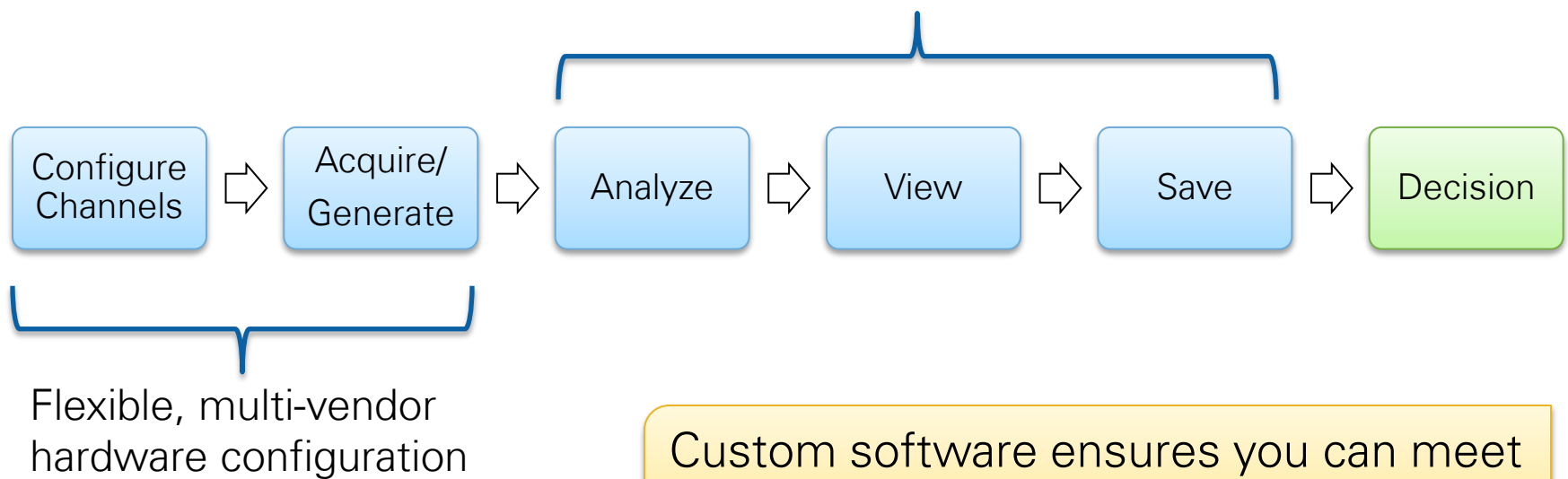


Applications can benefit from this approach through a **fast time to first measurement**

# What is Customizable Software?

- Custom software involves some level of programming, from general purpose languages, like C or .NET, or domain specific, like LabVIEW

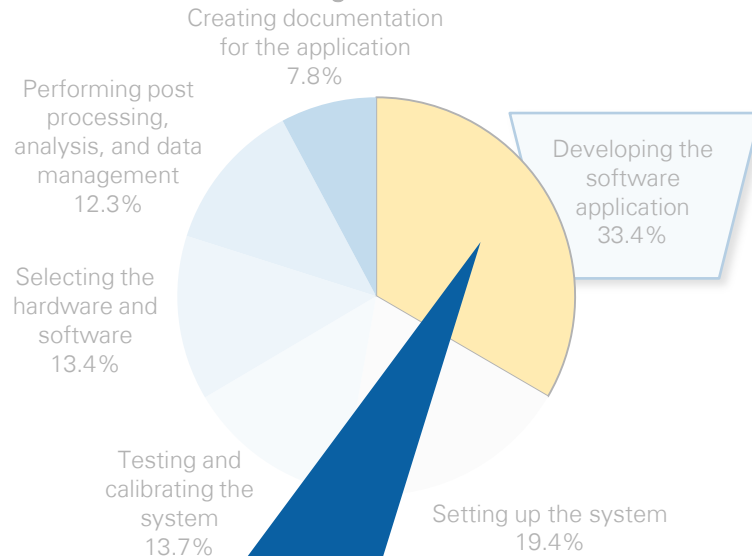
Custom, user-defined analysis, visualization and file I/O



Custom software ensures you can meet **any measurement need**

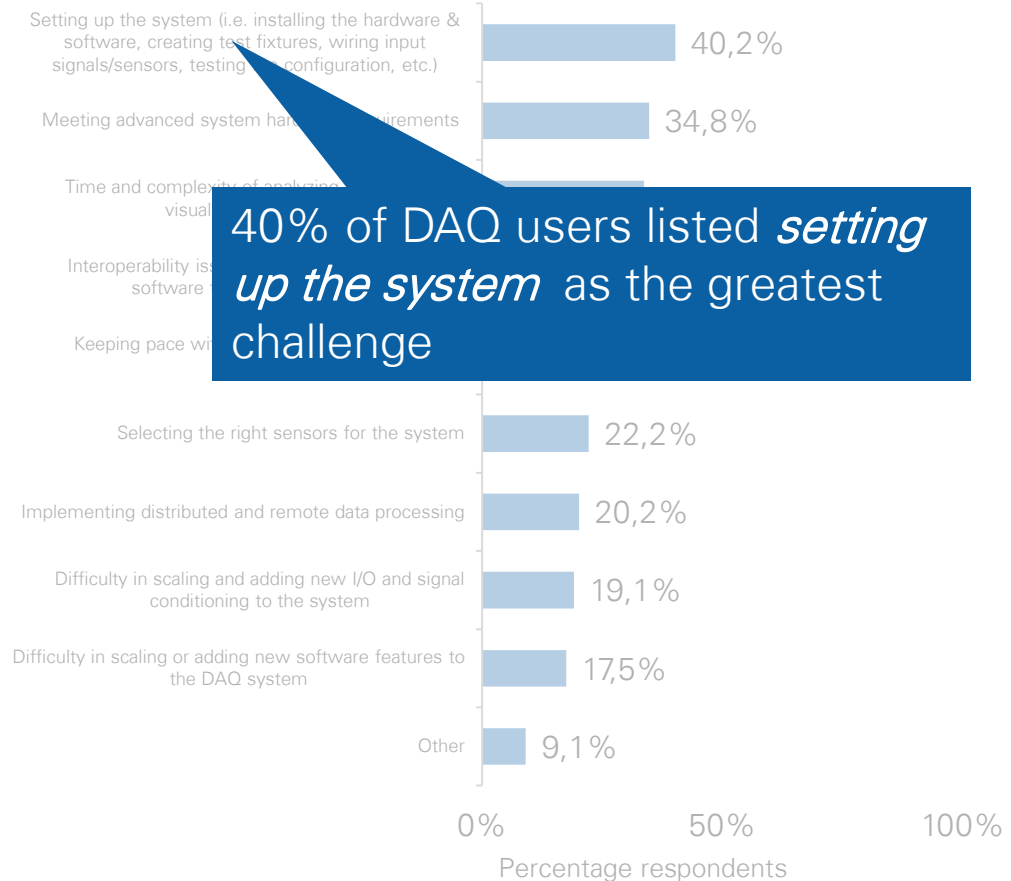
# Where Do You Spend Your Time?

## Time Consuming Tasks (among NI Users)



33% of DAQ users listed *developing the software application* as the most time consuming task

## Greatest DAQ System Challenges (among NI Users)



Research Notes: Q4 2013 DAQ Value Research

Q4. Which three of the following challenges are your greatest concerns regarding your current/future DAQ systems? Select top three. Base: NI Users. n=2,213 (ME=1.7)

Q10. What percentage of time do each of the following tasks take to complete when building a DAQ system? Add to 100%. Base: NI Users. n=2,213 (ME=1.7)

So...

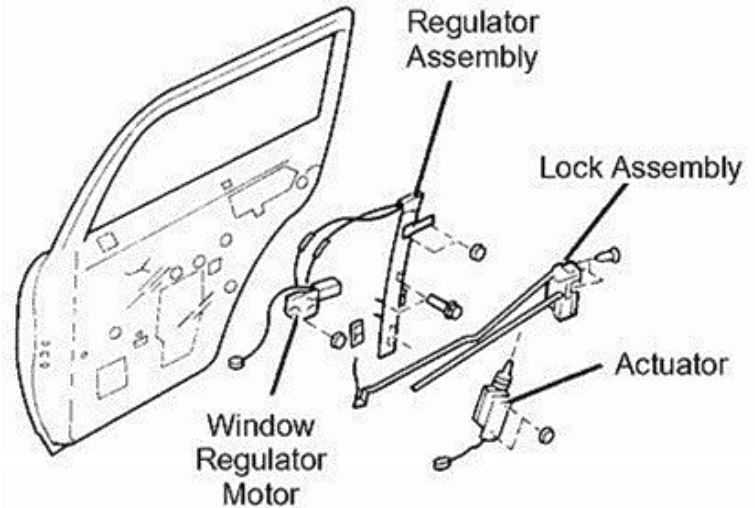
What are the red flags that mean you might be about to choose the wrong tool?



# Case Study: Validation of Power Window Regulators



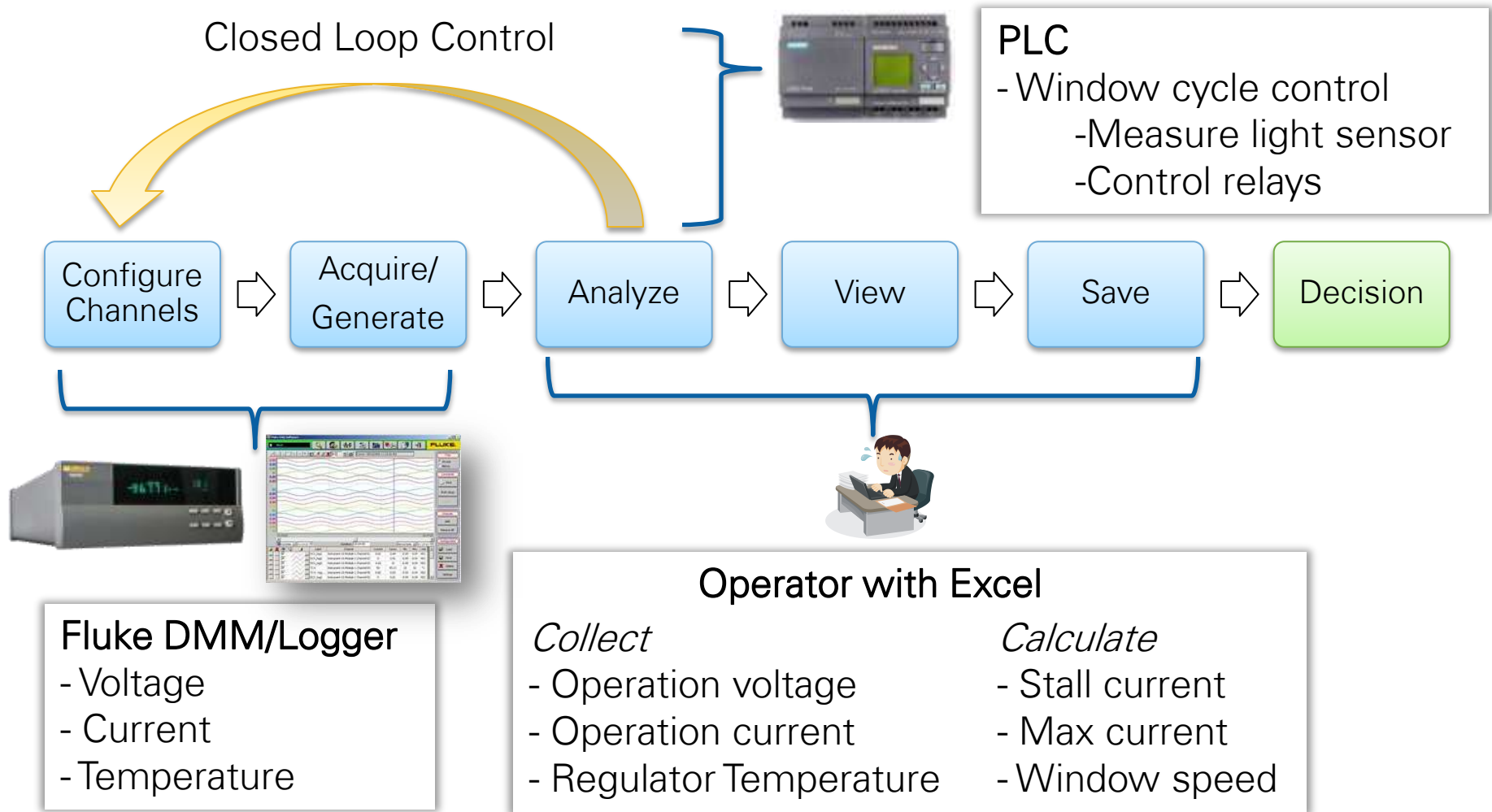
2011 Automotive Component Manufacturer of the Year by Frost & Sullivan



## Endurance test of power window regulator assembly

- Exercise the window assembly to determine if the assembly will meet quality standards of the manufacturer
- Measure current, voltage and temperature
- Create a standard report for each test article

# Initial Test Solution Using Closed Tools





# Red Flag 1

Your analysis or file I/O needs are not 100% met

# There are 2198 weather apps in the iTunes Store

iPhone Weather



NOAA Weather



Fishing Weather



Many applications **need more than what is offered** and with closed tools **you rely on the manufacturer** to add the right functionality

# Analysis and File I/O: Configuration-Based

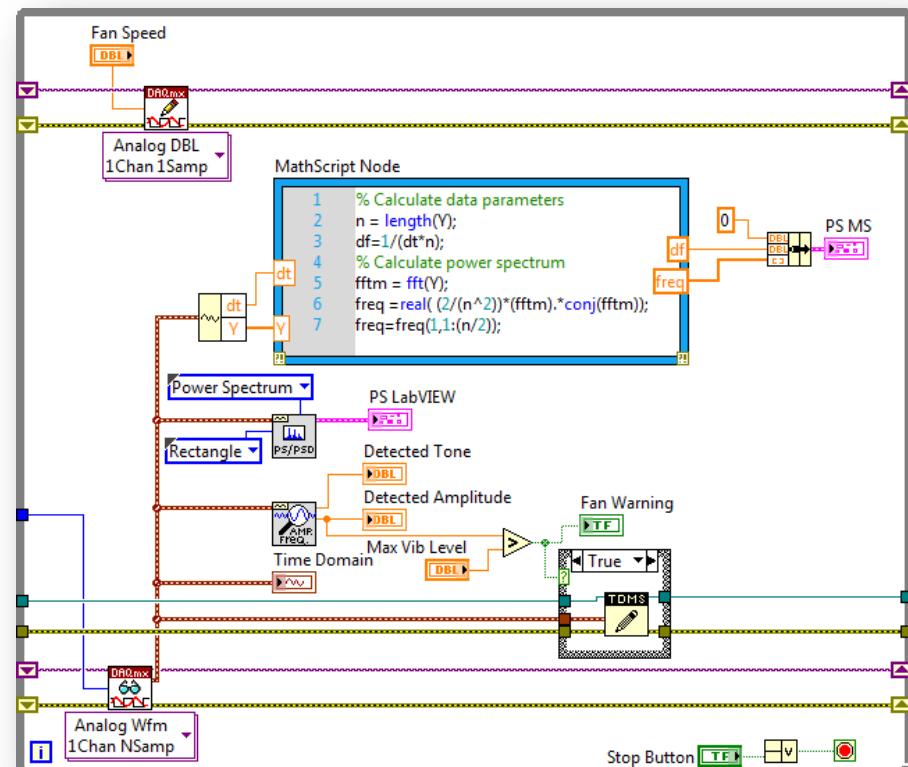
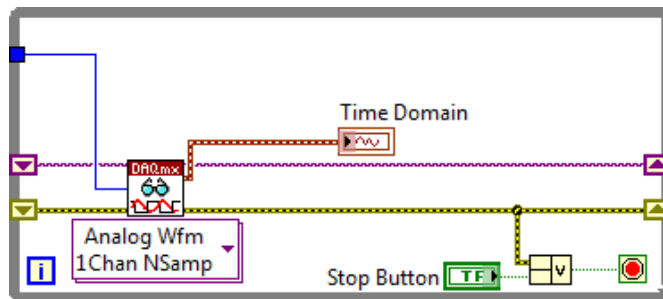
- Quickly configure logging and collect a lot of data
- Fast and easy

## **But –**

- Limited customization
- If your exact needs are not built in, you are forced to:
  - Settle and find a work-around
  - Wait for the manufacturer
  - Pay an integrator

## Analysis and File I/O: Custom Designed

- Customize logging and analysis to meet any requirement
- Reduce datasets to useful data before writing to file or limit what gets written with conditional logging



# Analysis and File I/O: Case Study

## Configuration approach

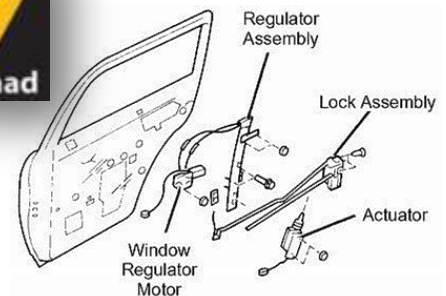
- Logged all data to a single file
- Analysis, organization and reporting performed in post-processing

## Result

- Eliminated time processing after the test
- Eliminated reporting errors

## Custom Approach

- Custom formulas to calculate derived values like stall current and window speed
- Only relevant data is saved to file in a custom report



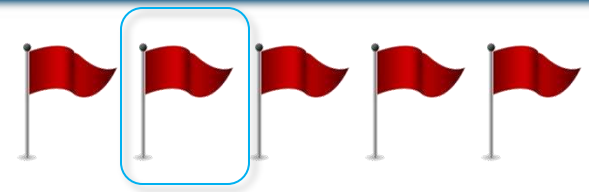
# Analysis and File I/O: Key Takeaways



**Your analysis or file I/O needs are not 100% met**

- With custom software, you will always have options to add the functionality you need
- Customizing file I/O and analysis in-line with acquisition can reduce your post-processing burden, getting you to a decision faster





# Red Flag 2

You regularly setup and take the same measurement

*“setup and take the same measurement”*

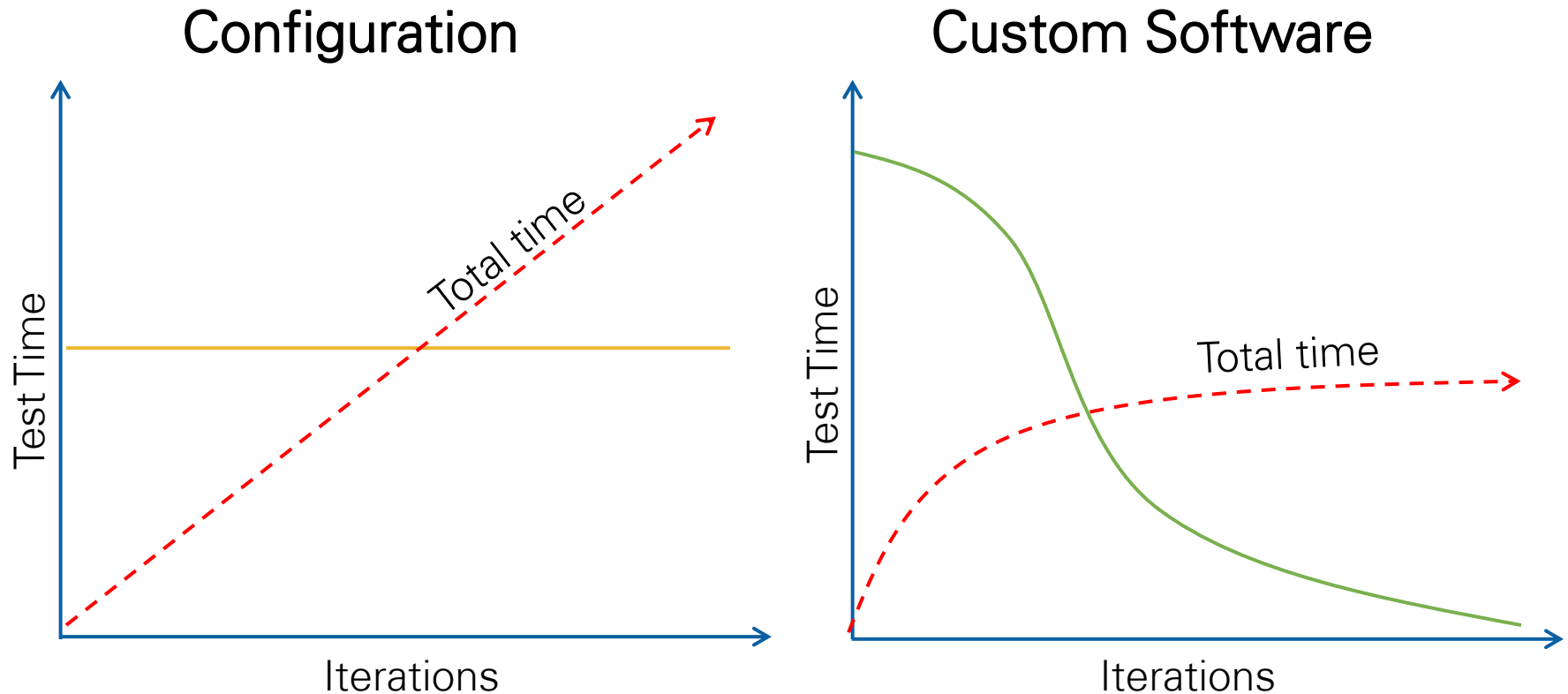


*Automation*



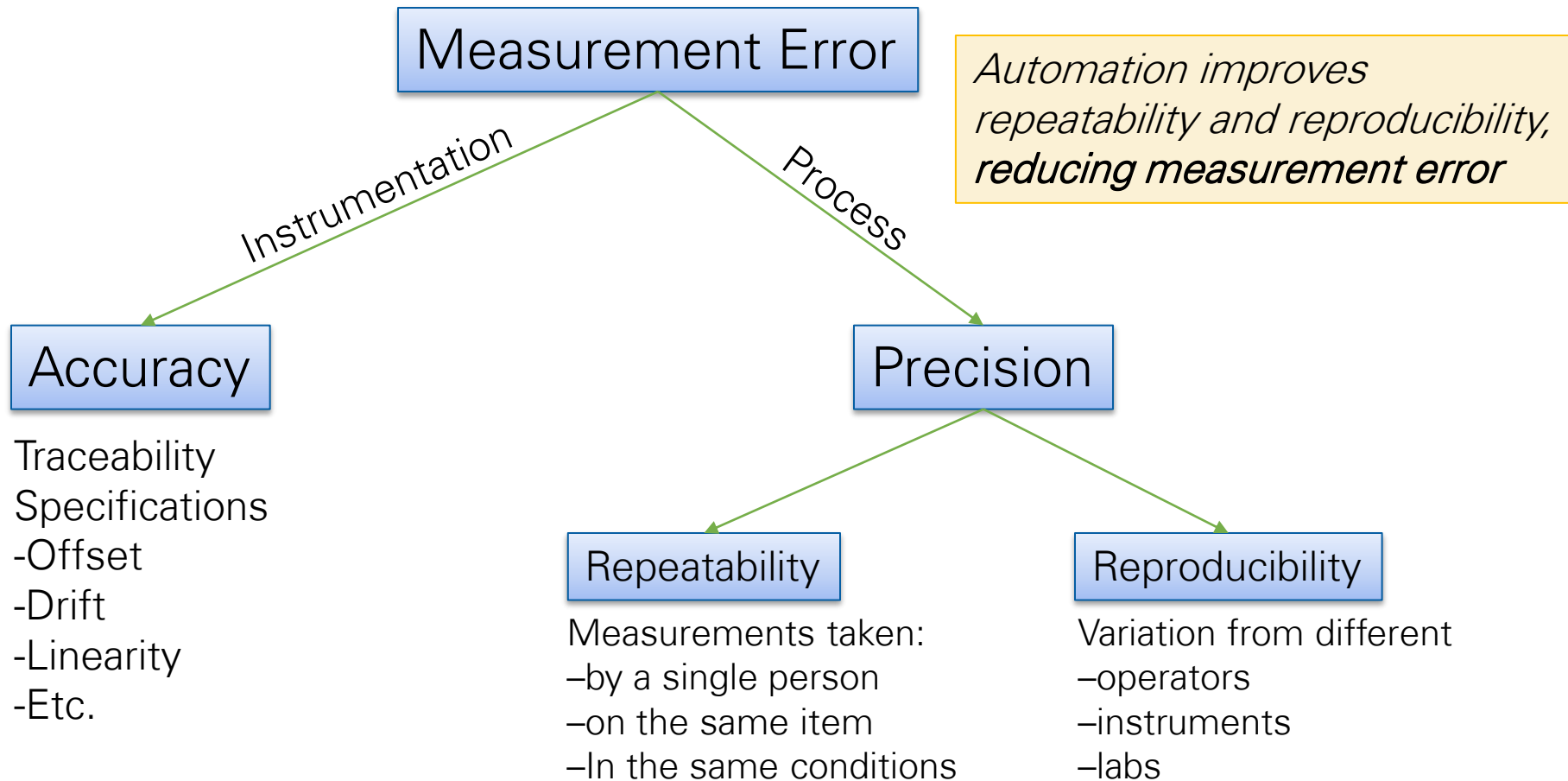
- 1. Lower test time*
- 2. More reliable measurements*

# Automation: Reduce Measurement Time



The time under the curve represents the total time spent performing the measurement

# Automation: Increase Accuracy



# Automation: Case Study

## Configuration approach

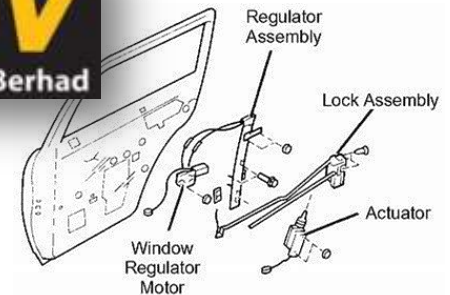
- PLC used to control while supervised by a test operator
- Data organized and analyzed manually in post processing

## Result

- Test time was drastically reduced
- Less reliance on the operator expertise

## Custom Approach

- Control, acquisition, analysis, and reporting all designed into the code and happen without human interaction

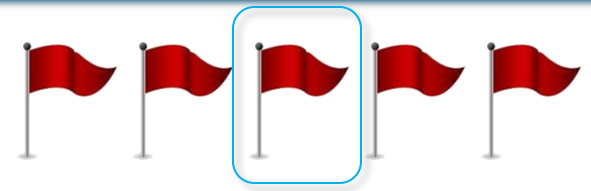


# Automation: Key Takeaways



**You regularly setup and take the same measurement**

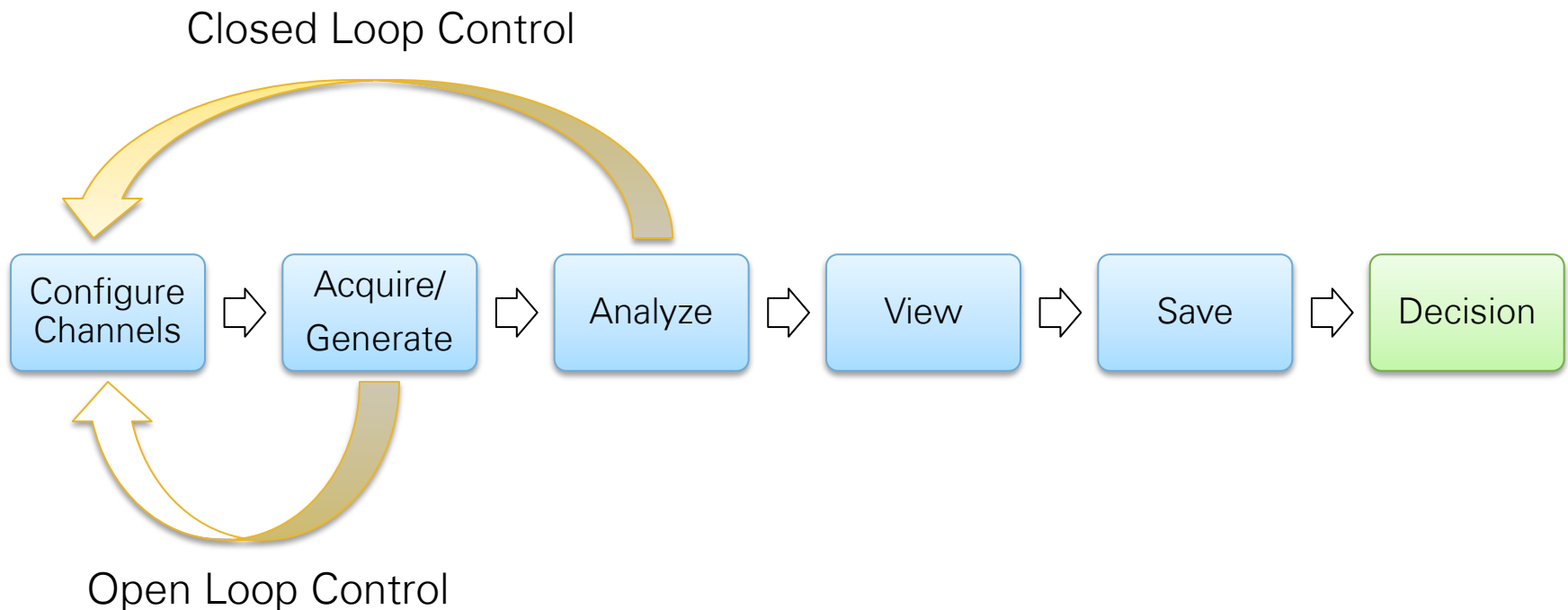
- Automation reduces measurement time for tasks that are repeated
- Reducing human involvement in the measurement process decreases measurement errors



# Red Flag 3

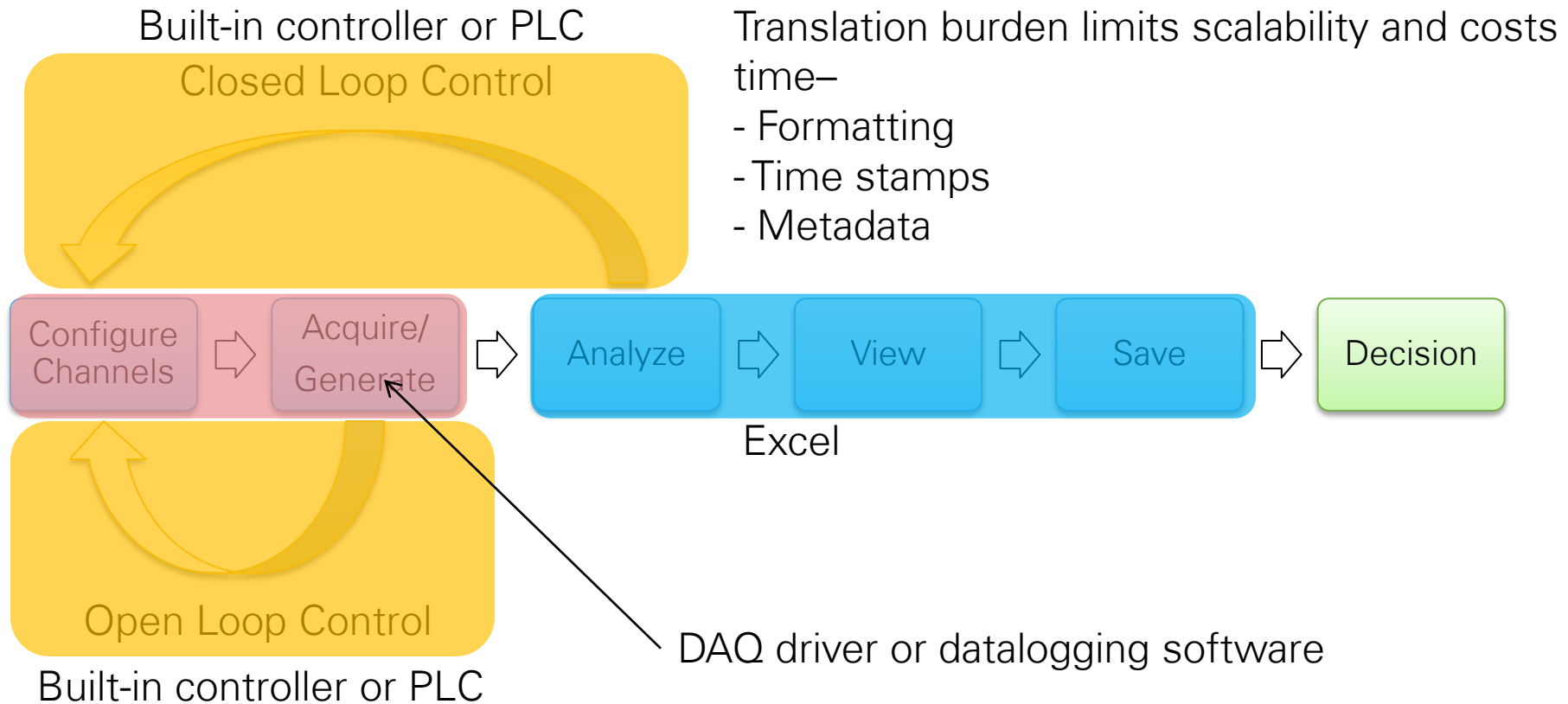
You find yourself juggling different hardware, software and data formats for measurement, control and analysis

# Most Projects Are More Than Just Acquisition

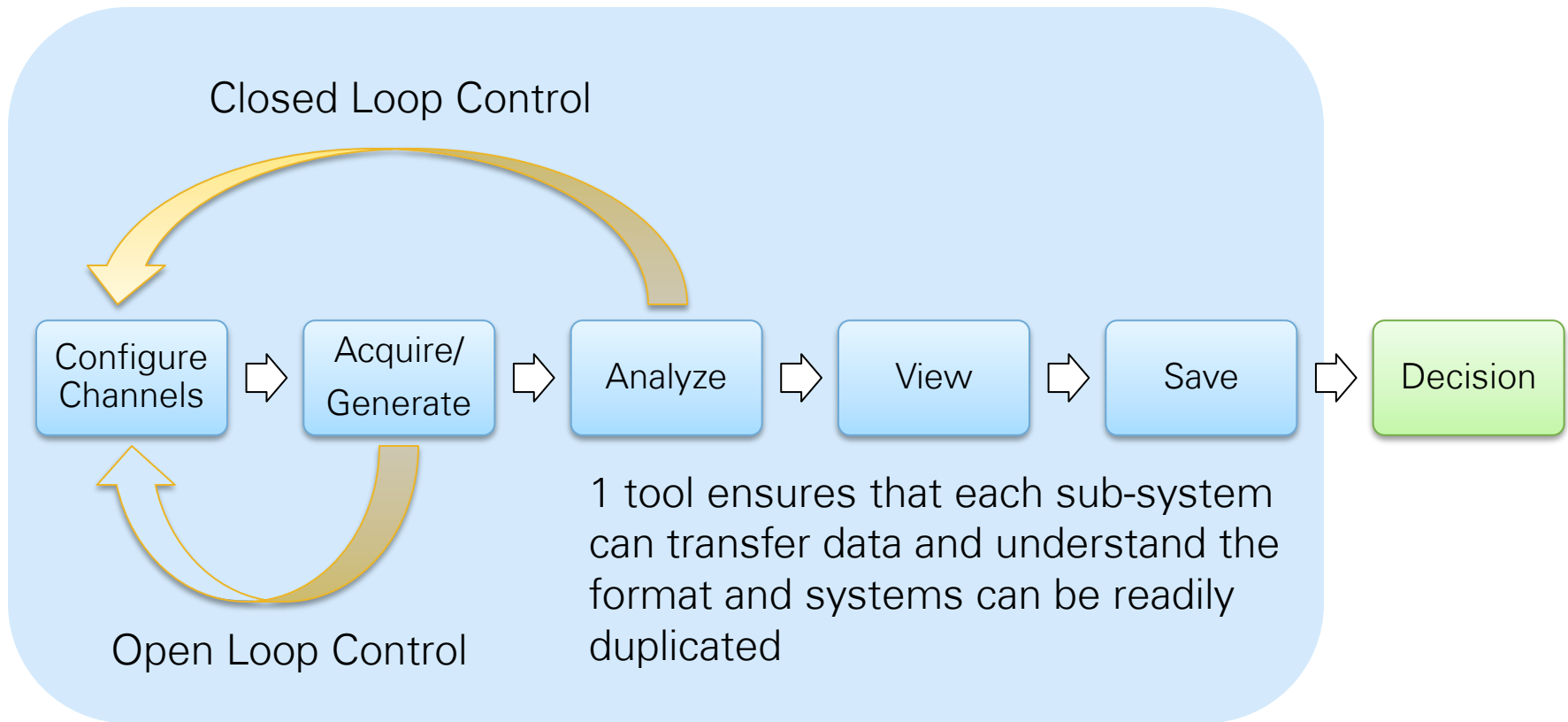




# System Integration: Configuration Based



# System Integration: Custom Designed



# System Integration: Case Study

## Configuration approach

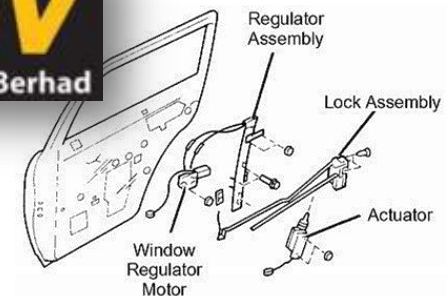
- PLCs controlling the window movement
- Fluke meter measuring parameters
- Operator copying data into excel and performing analysis

## Result

- Less friction from translation/formatting between tools saving time and reducing errors

## Custom Approach

- Used LabVIEW for control, acquisition, processing and reporting
- Final reports included test information, data and results

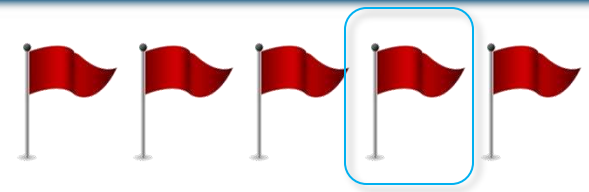


# System Integration: Key Takeaways



You find yourself juggling different hardware, software and data formats for measurement, control and analysis

- Integrating measurement, control, analysis and decision making into custom software eases the burden of translation in post-processing



# Red Flag 4

You have multiple users or multiple views of the same dataset

# The Same Data Can Be Optimized for Different Users



Pilots need real time diagnostics about the plane, navigation information and a way to control the flight

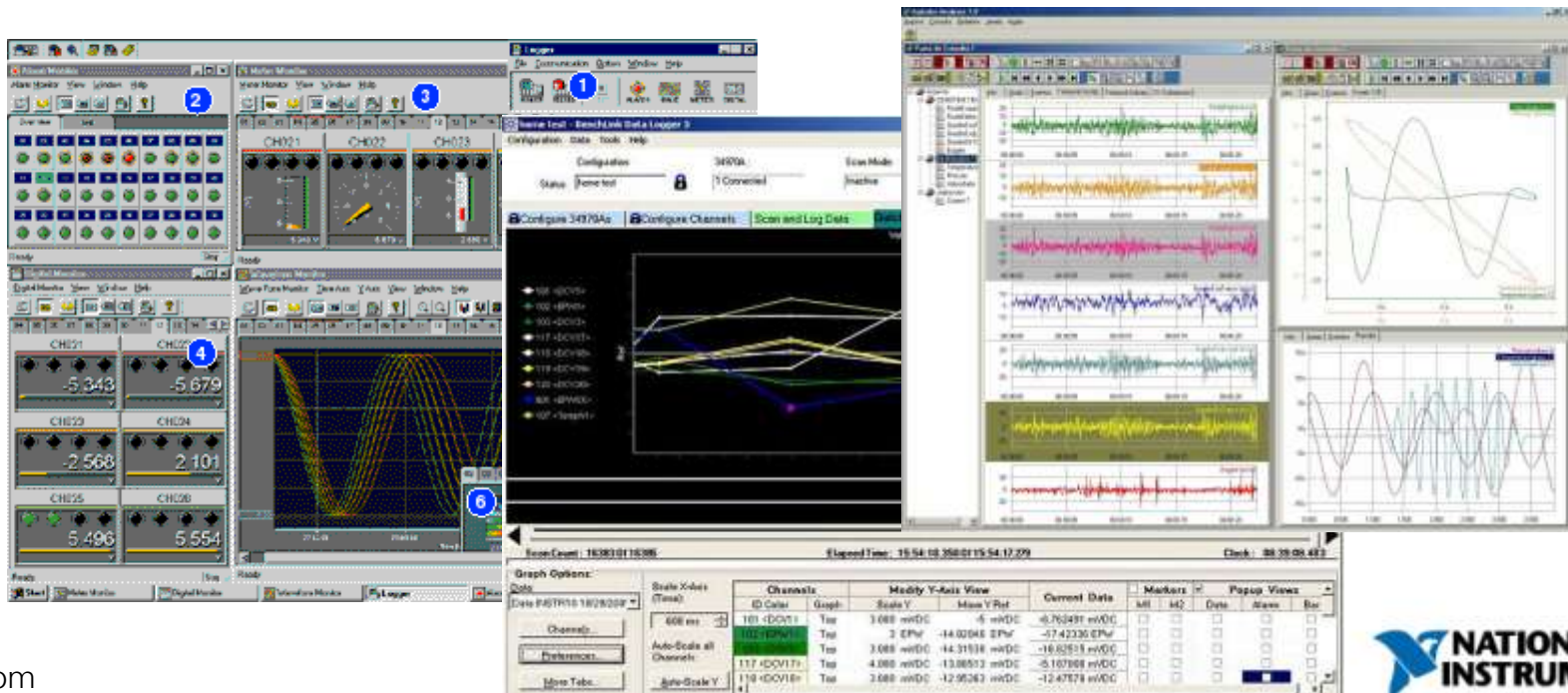
Passenger displays may have some of the same info, but are limited compared with the pilot user interface



# User Interface: Configuration Based

Configuration software is a general purpose tool built to address the needs of a wide range of users

- Quickly viewing data and performing some analysis for someone who is familiar with the tool
- Confusing/distracting for more advanced operations or visualization



# User Interface: Custom Designed

- Customizable software can be designed with the operator in mind, eliminating distractions and providing context to the data
- UI's can be customized for simplicity and familiarity to the operator (including yourself)



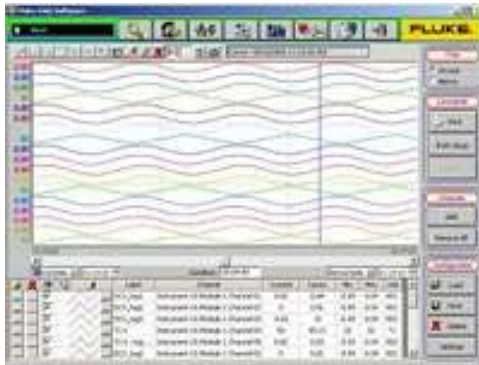
Source: <https://decibel.ni.com/content/thread/23145?tstart=0>



# User Interface: Case Study

## Configuration approach

- General purpose UI

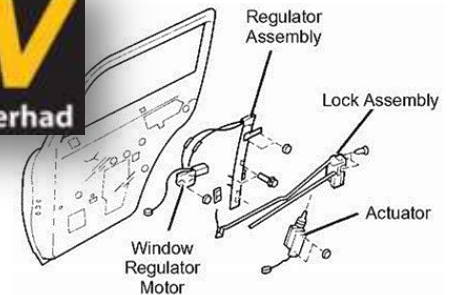
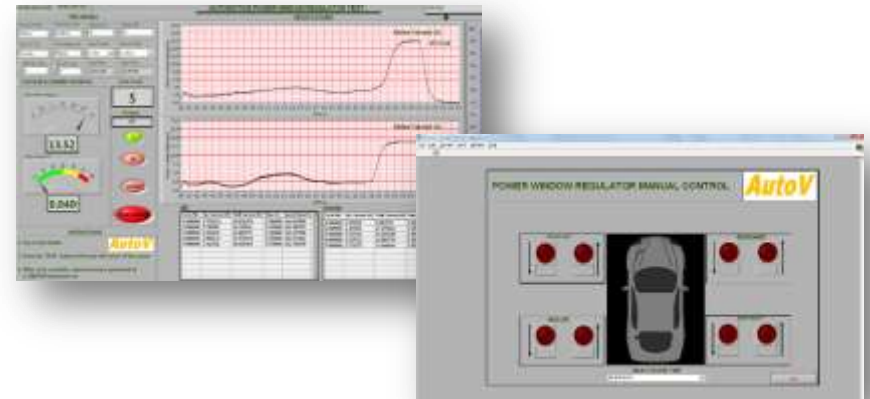


## Result

- Manual mode used to load/test new articles
- Operator mode provides the right data at the top level

## Custom approach

- Custom operator/task - centric UI



# User Interface: Key Takeaways



You have multiple users or multiple views of the same dataset

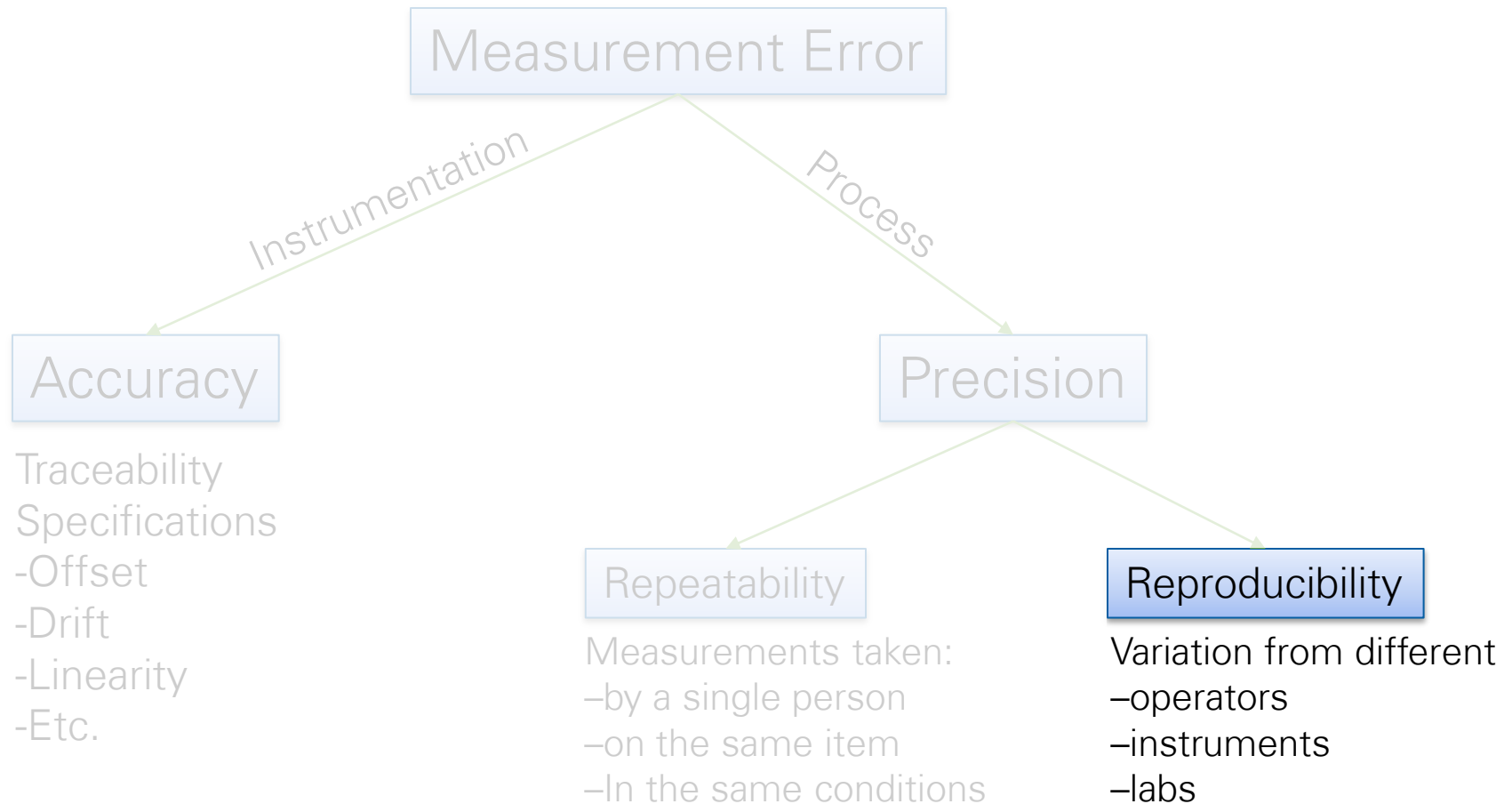
- Initial development time may increase, but creating **operator-centric UIs** will decrease sources of measurement error by providing contextually aware information



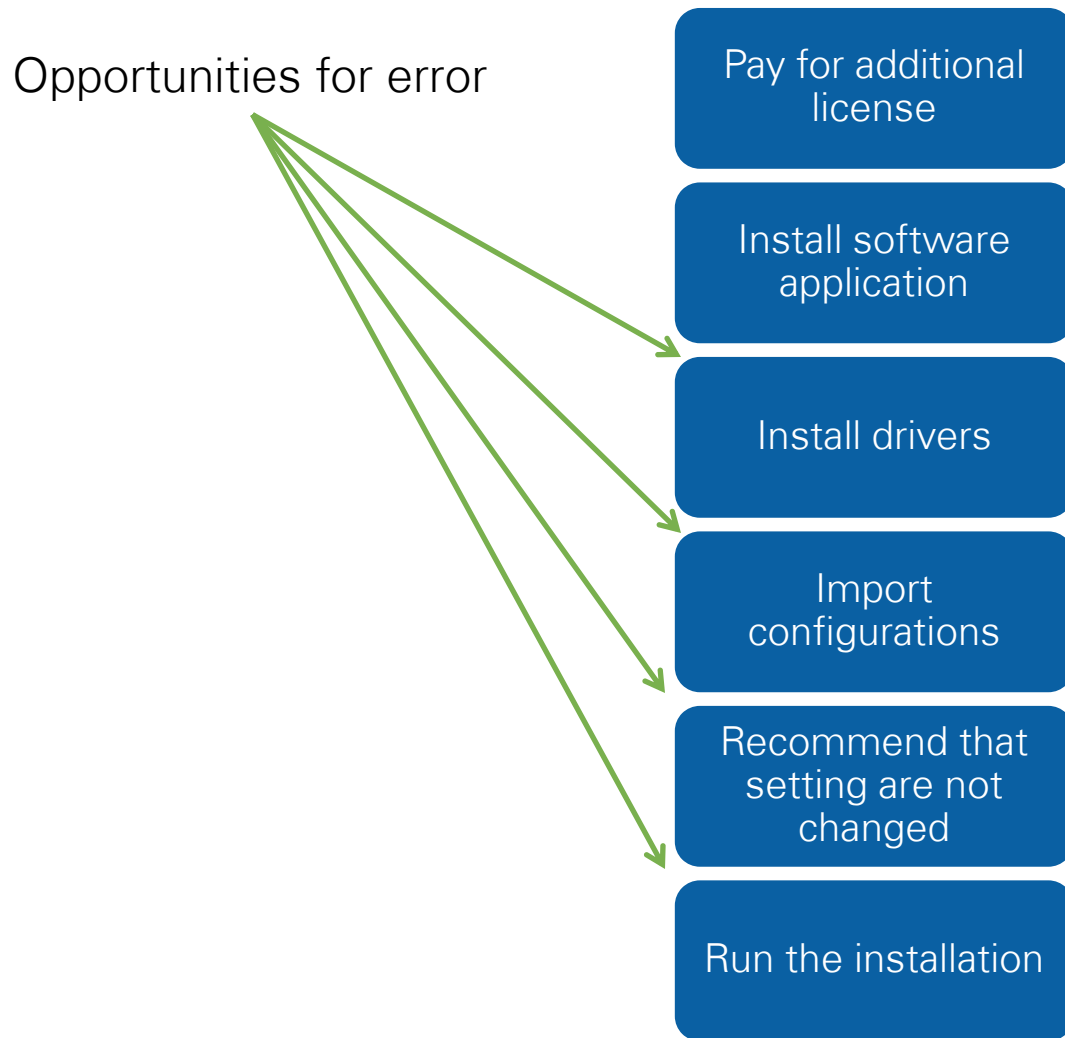
# Red Flag 5

You need to distribute the software or system to multiple sites or test locations

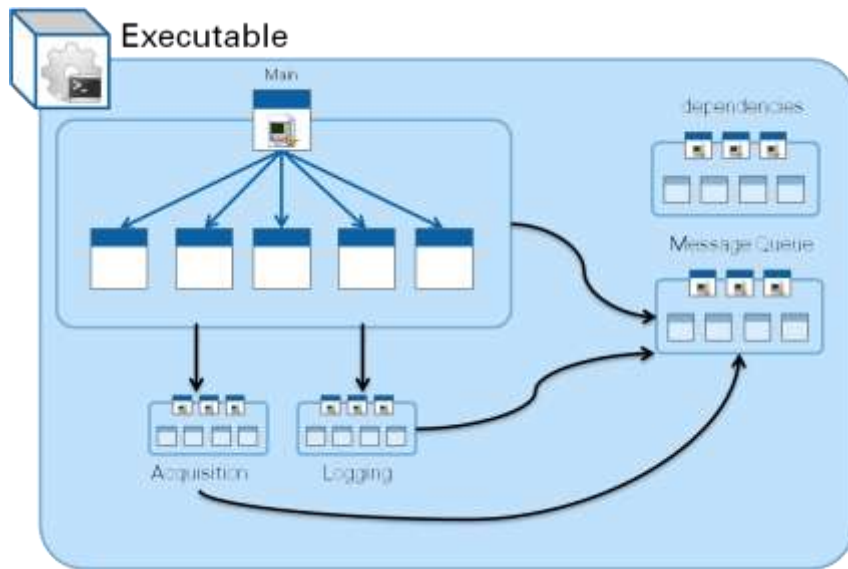
# Increase Accuracy by Eliminating Errors



# Distribution: Configuration Based



# Distribution: Custom Designed



- Pay for a single development environment
- Combine everything you need into a single installer
  - Drivers
  - Run-time engine
  - Application
  - Additional software
- Fool-proof installation

# Distribution: Case Study

## Configuration approach

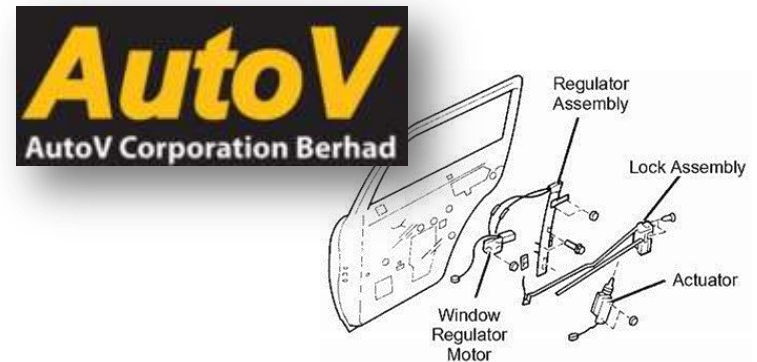
- Test systems used development software
- Accuracy relied on the technician configuring each channel properly

## Result

- Systems were easily duplicated
- Process burden of installation was eliminated

## Custom Approach

- Software was bundled into an installer with the appropriate drivers and settings



# Distribution: Key Takeaways



**You need to distribute the software or system to multiple sites or test locations**

- Compiling custom software to an executable enables you to distribute your application to parallel systems
- Custom installers ensure that everything to run the test is installed automatically
- Executables are not modifiable by end users, meaning you can better control how your data is acquired



# Red Flag Recap

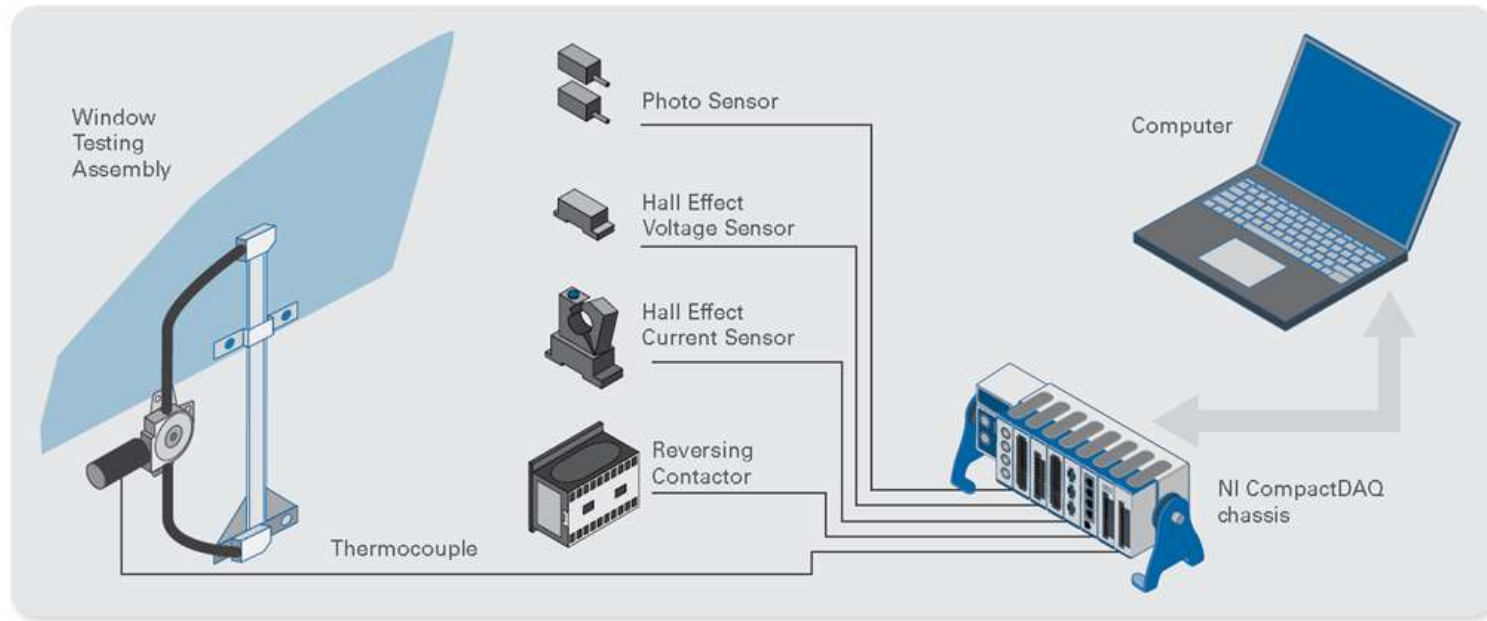
- Your analysis or file I/O needs are not 100% met
- You regularly setup and take the same measurement
- You find yourself juggling different hardware, software and data formats for measurement, control and analysis
- You have multiple users or multiple views of the same dataset
- You need to distribute the software or system to multiple sites or test locations

# Configuration or Custom?: Key Takeaways

- With configuration-based data acquisition software, you can get data quickly, but that **isn't enough for many applications**
- Writing custom software gives you the **flexibility to meet your exact system needs**, reducing opportunities for measurement error and **increasing the accuracy of your data and getting you to a decision faster**

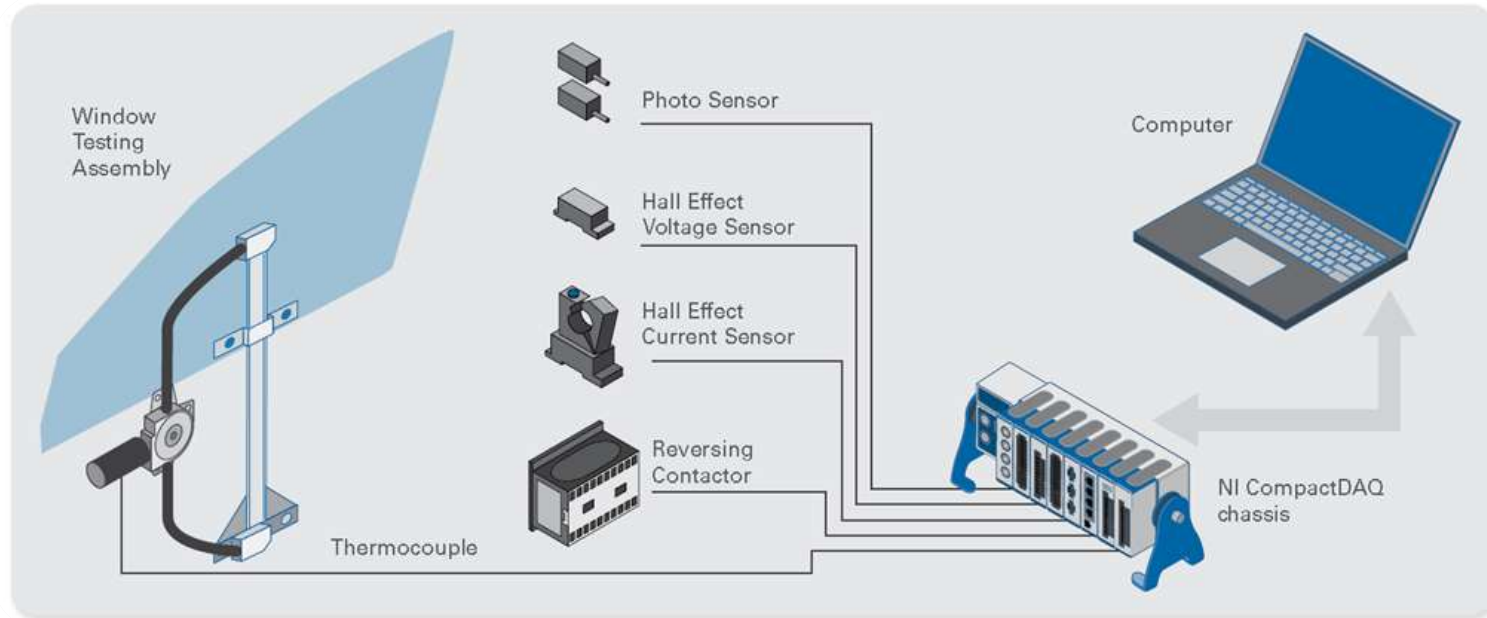


## Final Result: More Accurate Data



	Closed/Multi-Tool	Custom/Integrated
Motor parameters	Manual reading and calculation	Automated in-line processing
Data acquisition ability	1 datapoint per 1000 cycles per parameter	30,000 points logged and processed
Processing and Reporting Time	No traceable data	Data can be traced and linked to quality issues
Errors	Prone to human error	Negligible

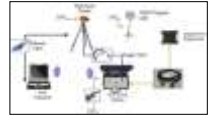
## Final Result: Faster Decisions



	Closed/Multi-Tool	Custom/Integrated	Improvement
Test Capacity	3 samples	4 samples	1.25x
Testing time/sample	10 days	10 days	-
Processing and Reporting Time	3 days	0.1 days	30x
Completed Tests Per Month	7	12	1.7x
Req'd Overtime Hours Per Month	70	40	43 percent

# Custom Software Can Solve Any Application Need

Rugged System for Impact Force  
Data Acquisition and Recording



Capturing Groundbreaking  
Tornado Phenomena



Prototyping Tidal Stream  
Turbines for Power Generation

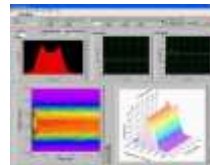


Feedback Control for Road Vehicle  
Drag Reduction Using Pulsating Jets

NI CompactDAQ System for In-Vehicle  
Testing of Exhaust Systems



Early Detection and  
Monitoring of Tooth Decay



Proton Synchrotron: Beam Data  
Acquisition and Analysis

Microscopy System for Accurate Diagnosis  
of Fibrosis, Cancer, and Chronic Diseases

