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Exploring the Benefits and Challenges of Universal Automated Methods

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How and What are we Automating?

- Universal Method;
  - Primary Sample Pipetting
  - MRDs and sample dilutions
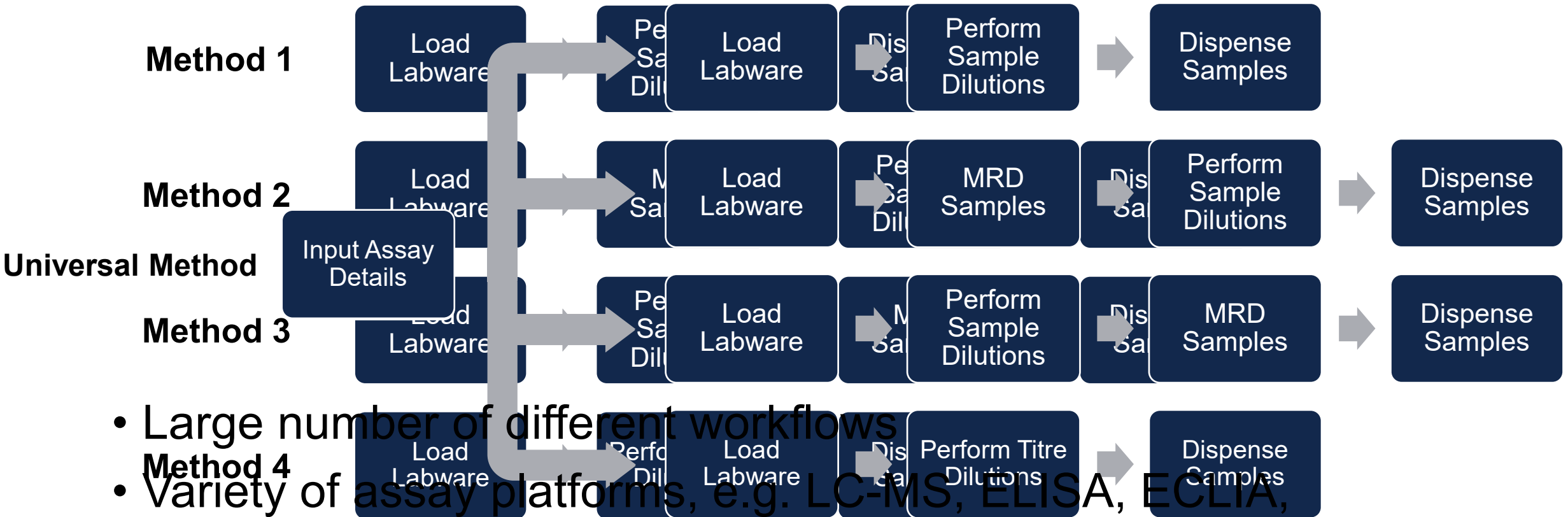 - Titre dilutions

- Platform;
  - Hamilton Microlab STAR

Image taken from www.hamiltoncompany.com

What is the Universal Automated Method?

Method 1

| Load Labware | Perform Sample Dilutions | Load Labware | Dispense Samples | Perform Sample Dilutions | Dispense Samples |

Method 2

| Load Labware | MRD Samples | Load Labware | Perform Sample Dilutions | MRD Samples | Perform Sample Dilutions | Dispense Samples |

Universal Method

Input Assay Details

Method 3

| Load Labware | Perform Sample Dilutions | Load Labware | MRD Samples | Perform Sample Dilutions | Dispense Samples | MRD Samples | Dispense Samples |

Method 4

| Load Labware | Perform Dilutions | Load Labware | Dispense Samples | Perform Titre Dilutions | Dispense Samples |

- Large number of different workflows
- Variety of assay platforms, e.g. LC-MS, ELISA, ECLIA, Gryolab, etc.
- Small tweaks needed from run-to-run

How the Method Works

Get Method Information
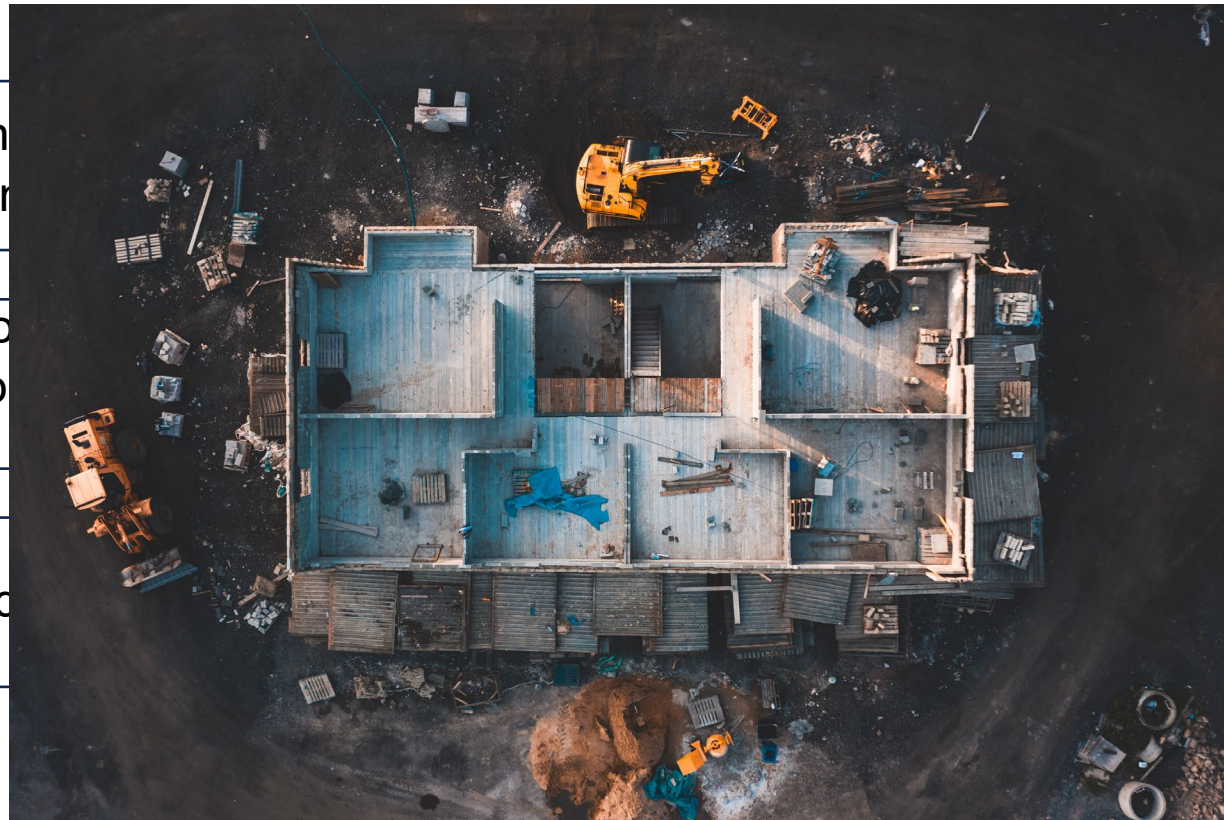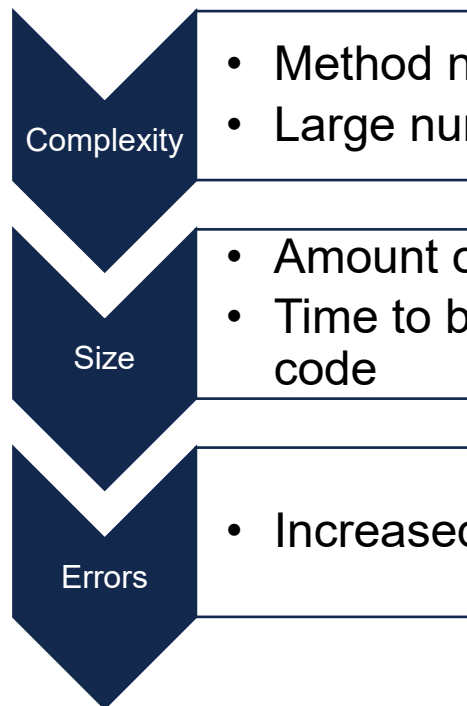
Generate Sequences

Determine Sequence Order

Pipette

Generate Output

Building the Method

- High level of flexibility required

Complexity
- Method n
- Large nur

Size
- Amount o
- Time to b
  code

Errors
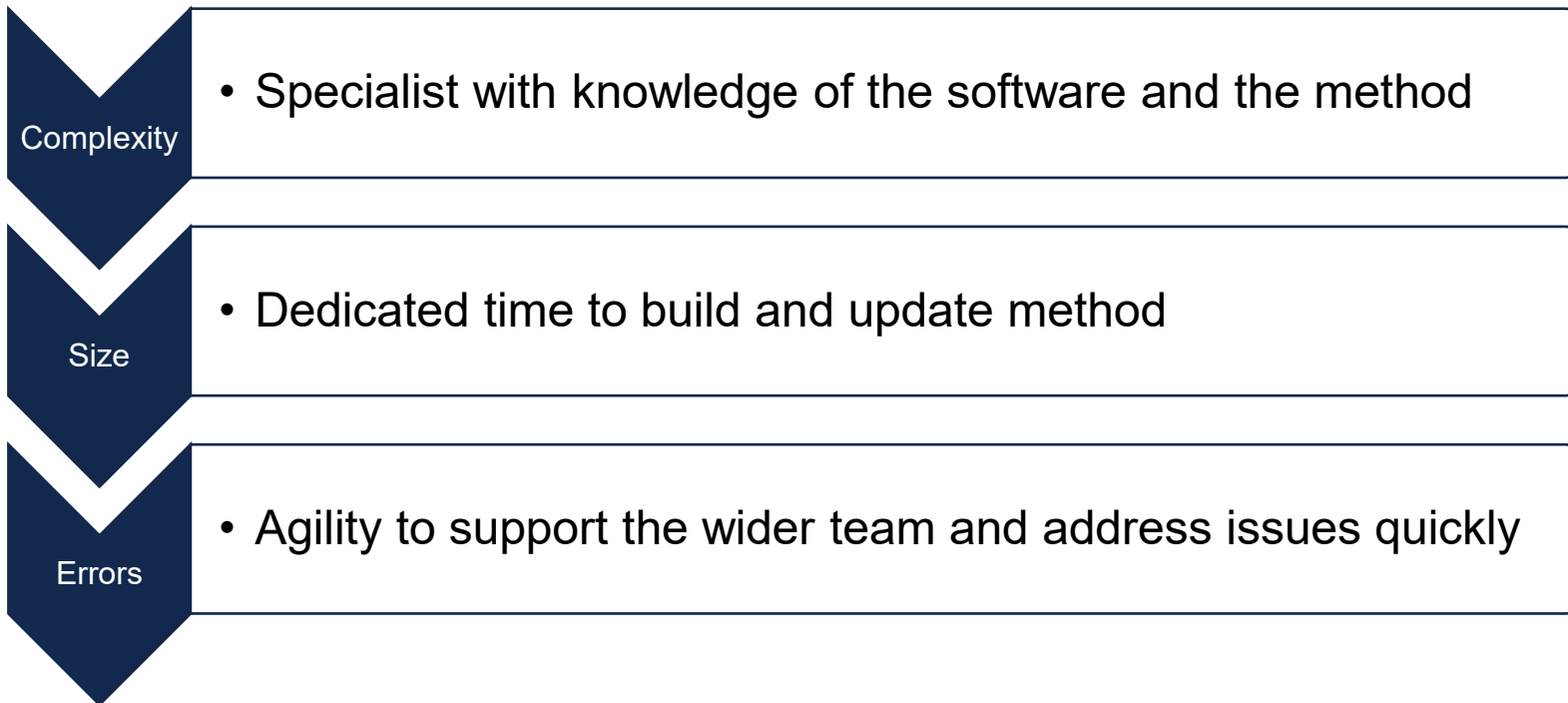- Increased

What Happens When it's Built Wrong?

- Initial setup;
  - Mix volume set to 70% of diluent volume
  - Tested and working on large dilutions
  - Issues with smaller dilutions

- Solution;
  - Mix volume set to 70% of total volume
  - Tested and working on all dilutions

Method Troubleshooting
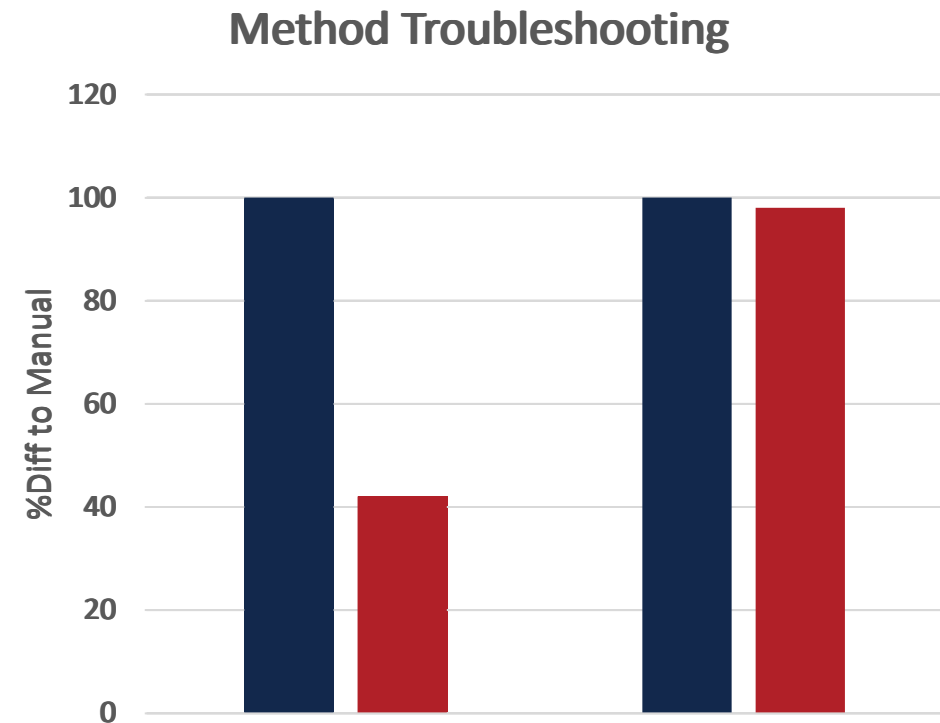
Addressing the Building Problem

- Large complex method unavoidable
- Dedicated role established, Automation Specialist

Complexity
- Specialist with knowledge of the software and the method

Size
- Dedicated time to build and update method

Errors
- Agility to support the wider team and address issues quickly

Teaching the Method

- Method needs to know what settings to apply

- User input is essential

Quantity
- Requires

Ease-of-use
- Input me

Versatility
- Needs to

Addressing the Teaching Problem

- Input Files for bulk information
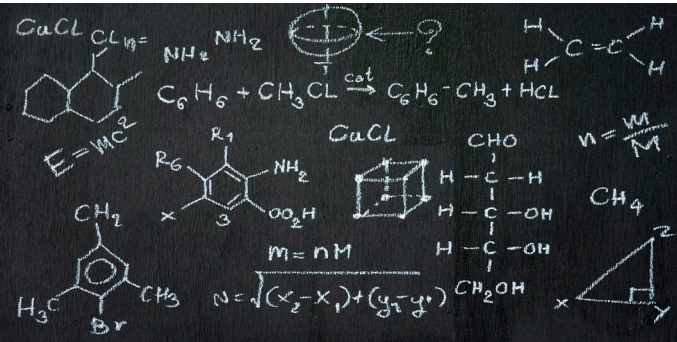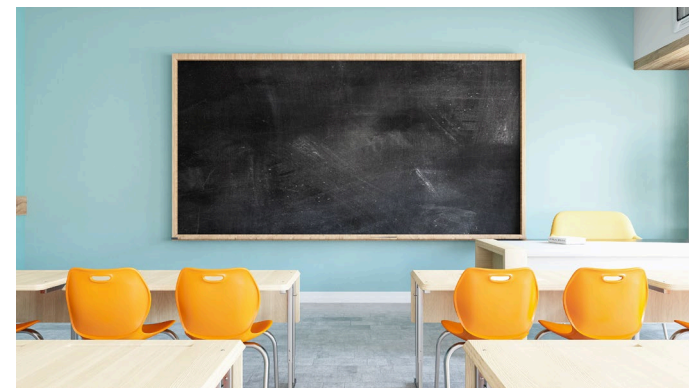- User dialogs for run specific information

Quantity
- Most information contained within two input files

Ease-of-use
- Forms used to genera
- Inputs are locked afte

Versatility
- Different options available depending on assay type
- Additional variables generated from user dialogs

Did we build and teach it right?

- Standard output file is generated by the instrument

- Easy-to-Read
  - Output needs to be easily readable

- Comprehensive
  - All information relevant to the run needs to be included

How to Find the Proof?

Hamilton Method Details
Method: Universal Sample Pipetting Method
User: George.Walters

2022-10-28 11:26:32> Microlab® STARlet : 1000ul Channel Tip Pick Up (Single Step) - start;
2022-10-28 11:26:45> Microlab® STARlet : 1000ul Channel Tip Pick Up (Single Step) - complete; > channel 1: TIP_50ul_L_0003, 12 > channel 2: TIP_50ul_L_0003, 13 > channel 3: TIP_50ul_L_0003, 14 > channel 4: TIP_50ul_L_0003, 15 > channel 5: TIP_50ul_L_0003, 16 > channel 6: TIP_50ul_L_0003, 17 > channel 7: TIP_50ul_L_0003, 18 > channel 8: TIP_50ul_L_0003, 19
2022-10-28 11:26:45> Microlab® STARlet : 1000ul Channel Aspirate (Single Step) - start;
2022-10-28 11:27:07> Microlab® STARlet : 1000ul Channel Aspirate (Single Step) - complete; > channel 1: SMP_CAR_32_2ml_cryo_0001, 6, 12.5 uL > channel 2: SMP_CAR_32_2ml_cryo_0001, 7, 12.5 uL > channel 3: SMP_CAR_32_2ml_cryo_0001, 8, 12.5 uL > channel 4: SMP_CAR_32_2ml_cryo_0001, 9, 12.5 uL > channel 5: SMP_CAR_32_2ml_cryo_0001, 10, 12.5 uL > channel 6: Plate_Source_1, F1, 12.5 uL > channel 7: SMP_CAR_32_2ml_cryo_0001, 12, 12.5 uL > channel 8: SMP_CAR_32_2ml_cryo_0001, 13, 12.5 uL
2022-10-28 11:27:07> Microlab® STARlet : 1000ul Channel Dispense (Single Step) - start;
2022-10-28 11:28:25> Microlab® STARlet : 1000ul Channel Dispense (Single Step) - complete; > channel 1: Plate_Source_1, A1, 12.5 uL > channel 2: Plate_Source_1, A1, 12.5 uL > channel 3: Plate_Source_1, A1, 12.5 uL > channel 4: Plate_Source_1, A1, 12.5 uL > channel 5: Plate_Source_1, A1, 12.5 uL > channel 6: Plate_Source_1, A1, 12.5 uL > channel 7: Plate_Source_1, A1, 12.5 uL > channel 8: Plate_Source_1, A1, 12.5 uL
2022-10-28 11:28:25> Microlab® STARlet : 1000ul Channel Tip Eject (Single Step) - start;
2022-10-28 11:28:33> Microlab® STARlet : 1000ul Channel Tip Eject (Single Step) - complete; > channel 1: Waste, > channel 2: Waste, > channel 3: Waste, > channel 4: Waste, > channel 5: Waste, > channel 6: Waste, > channel 7: Waste, > channel 8: Waste,
2022-10-28 11:28:39> Microlab® STARlet : 1000ul Channel Tip Pick Up (Single Step) - start;
2022-10-28 11:28:53> Microlab® STARlet : 1000ul Channel Tip Pick Up (Single Step) - complete; > channel 1: TIP_50ul_L_0003, 20 > channel 2: TIP_50ul_L_0003, 21 > channel 3: TIP_50ul_L_0003, 22 > channel 4: TIP_50ul_L_0003, 23 > channel 5: TIP_50ul_L_0003, 24 > channel 6: TIP_50ul_L_0003, 25 > channel 7: TIP_50ul_L_0003, 26 > channel 8: TIP_50ul_L_0003, 27
2022-10-28 11:28:53> Microlab® STARlet : 1000ul Channel Aspirate (Single Step) - start;
2022-10-28 11:29:26> Microlab® STARlet : 1000ul Channel Aspirate (Single Step) - complete; > channel 1: SMP_CAR_32_2ml_cryo_0001, 14, 5 uL > channel 2: SMP_CAR_32_2ml_cryo_0001, 15, 12.5 uL > channel 3: SMP_CAR_32_2ml_cryo_0001, 16, 12.5 uL > channel 4: SMP_CAR_32_2ml_cryo_0001, 17, 6.25 uL > channel 5: SMP_CAR_32_2ml_cryo_0001, 8, 12.5 uL > channel 6: SMP_CAR_32_2ml_cryo_0001, 9, 12.5 uL > channel 7: SMP_CAR_32_2ml_cryo_0001, 18, 6.25 uL > channel 8: Plate_Source_1, G1, 12.5 uL
2022-10-28 11:29:26> Microlab® STARlet : 1000ul Channel Dispense (Single Step) - start;
2022-10-28 11:30:34> Microlab® STARlet : 1000ul Channel Dispense (Single Step) - complete; > channel 1: Plate_Source_1, A1, 5 uL > channel 2: Plate_Source_1, A1, 12.5 uL > channel 3: Plate_Source_1, B1, 12.5 uL > channel 4: Plate_Source_1, B1, 6.25 uL > channel 5: Plate_Source_1, B1, 12.5 uL > channel 6: Plate_Source_1, B1, 12.5 uL > channel 7: Plate_Source_1, B1, 6.25 uL > channel 8: Plate_Source_1, B1, 12.5 uL
2022-10-28 11:30:34> Microlab® STARlet : 1000ul Channel Tip Eject (Single Step) - start;
2022-10-28 11:30:43> Microlab® STARlet : 1000ul Channel Tip Eject (Single Step) - complete; > channel 1: Waste, > channel 2: Waste, > channel 3: Waste, > channel 4: Waste, > channel 5: Waste, > channel 6: Waste, > channel 7: Waste, > channel 8: Waste,
2022-10-28 11:30:48> Microlab® STARlet : 1000ul Channel Tip Pick Up (Single Step) - start;

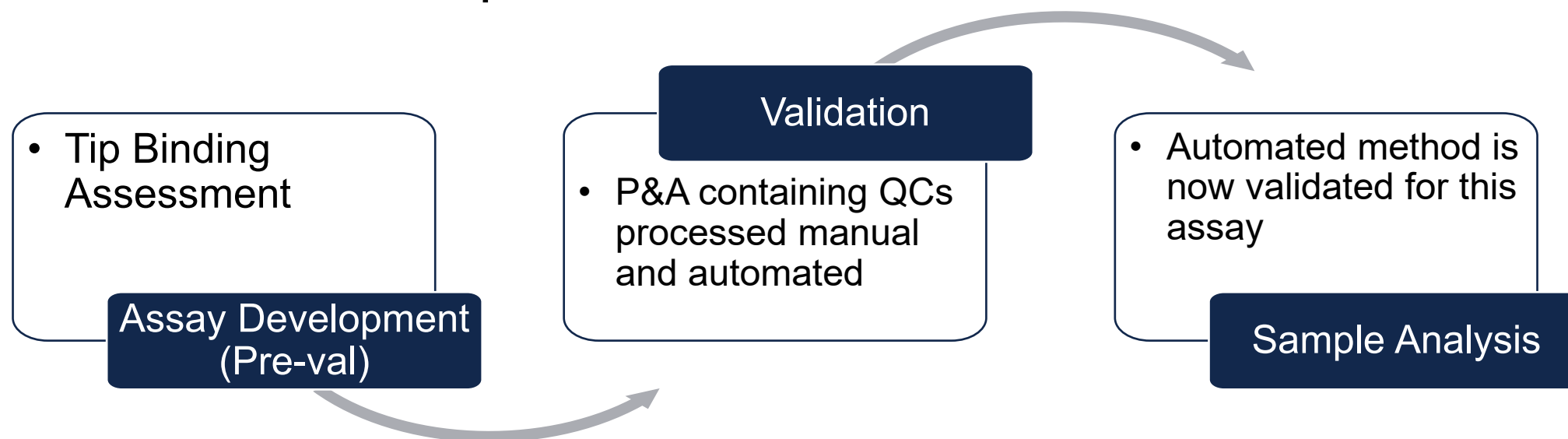|								
Sample 5	Plate_Source_1	B4	Plate_Destination_1	E1	10	50uL_Matrix	OK	OK
Sample 6	Plate_Source_1	C4	Plate_Destination_1	F1	10	50uL_Matrix	OK	OK

Validating the Method

- Impossible to fully validate every iteration
- Method is validated for each assay
- Current validation procedure;

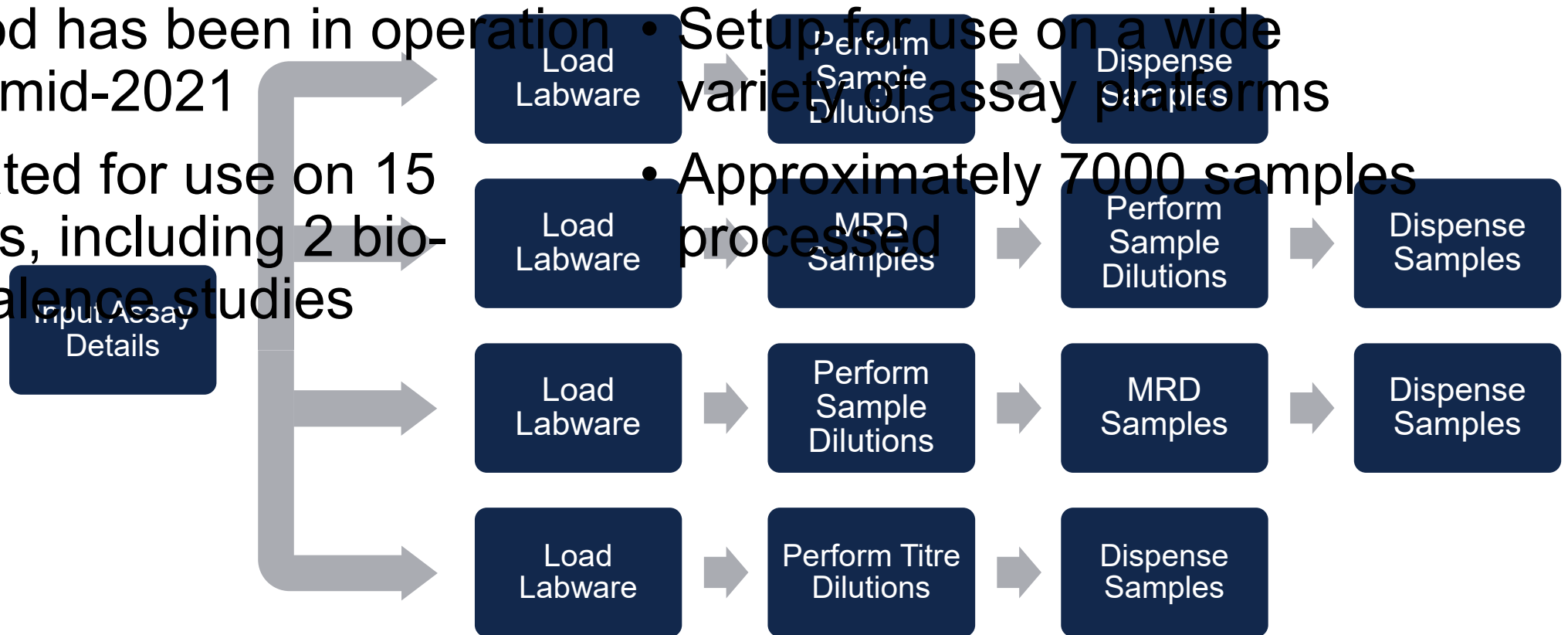- Tip Binding Assessment

Assay Development (Pre-val)

Validation

- P&A containing QCs processed manual and automated

- Automated method is now validated for this assay

Sample Analysis

Is the Method Universal?

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- Method has been in operation since mid-2021
- Validated for use on 15 assays, including 2 bio-equivalence studies

- Setup for use on a wide variety of assay platforms
- Approximately 7000 samples processed

Universal Method

Input Assay Details

| Load Labware | → | Perform Sample Dilutions | → | Dispense Samples |

| Load Labware | → | MRD Samples | → | Perform Sample Dilutions | → | Dispense Samples |

| Load Labware | → | Perform Sample Dilutions | → | MRD Samples | → | Dispense Samples |

| Load Labware | → | Perform Titre Dilutions | → | Dispense Samples |

Conclusions

- The use of a universal method can prove a valuable tool for any bioanalytical lab

- A large and complex method is unavoidable

- For a method to be universal it needs to be teachable

- Proof that the method has performed as intended is recommended

- Dedicated resource is essential to establish a universal method

Thank you for your attention

Any further questions?

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