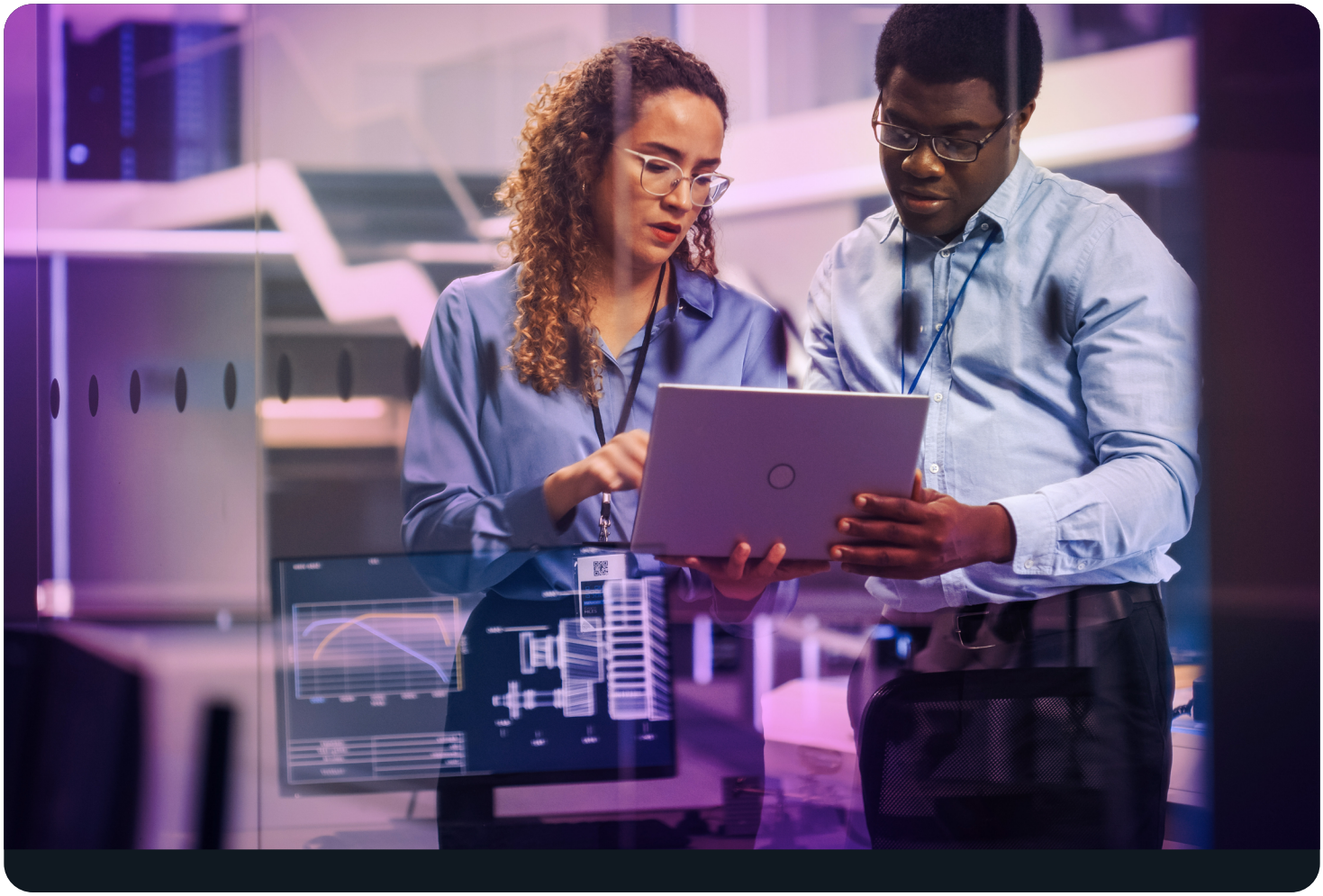
Using User Persona Stories to Identify Data Integration Needs

Whitepaper



Executive Summary

Advances in technology including single-use equipment, continuous processing unit operations and integrated material management plans have created even more levels of complexity and difficulty for the design and implementation of integrated data landscapes.

Production Scheduling Department

The task of identifying how to acquire and use data towards the achievement of departmental goals can feel daunting and difficult. What is not difficult is the ability for personnel in any department to speak to the responsibilities, goals, and objectives of their respective department. For example:

We are responsible for:

01 Converting ERP orders to production schedules

02 Manage resource capacity for materials and equipment

03 Establishing Start and stop times of EBR activities

04 Execution of manual tasks not controlled by the ICS (Industrial Control system)

Our goals and objectives are:

01 Have real-time accurate representation of a batch status

02 Have real-time and accurate representation of each specific task for each batch

03 Complete adherence to batch schedules

The question becomes how to leverage departmental knowledge into the vision-casting, design and deployment of a data architecture which will deliver functionality, allowing goals and objectives to be met more easily and consistently. The extension of this work is the natural proliferation of inter-departmental knowledge which will occur to shape and form even better learning for each respective department.

Utilizing a "top-down" approach, structured around defined User Personas, provides a robust methodology to determine data needs throughout the entire organization. Examples of User Personas include: Tech Services Scientist, Materials Management Operator, Quality Rep, Maintenance Tech, Process Engineer, Quality Control laboratory (QCL) Rep, Production Scheduler, Operator, Shift Supervisor. Each Persona, with extracted User Stories from each participant, captures what specific needs that Persona has, with a focus on information or data needs and why that data is valuable or beneficial to them.

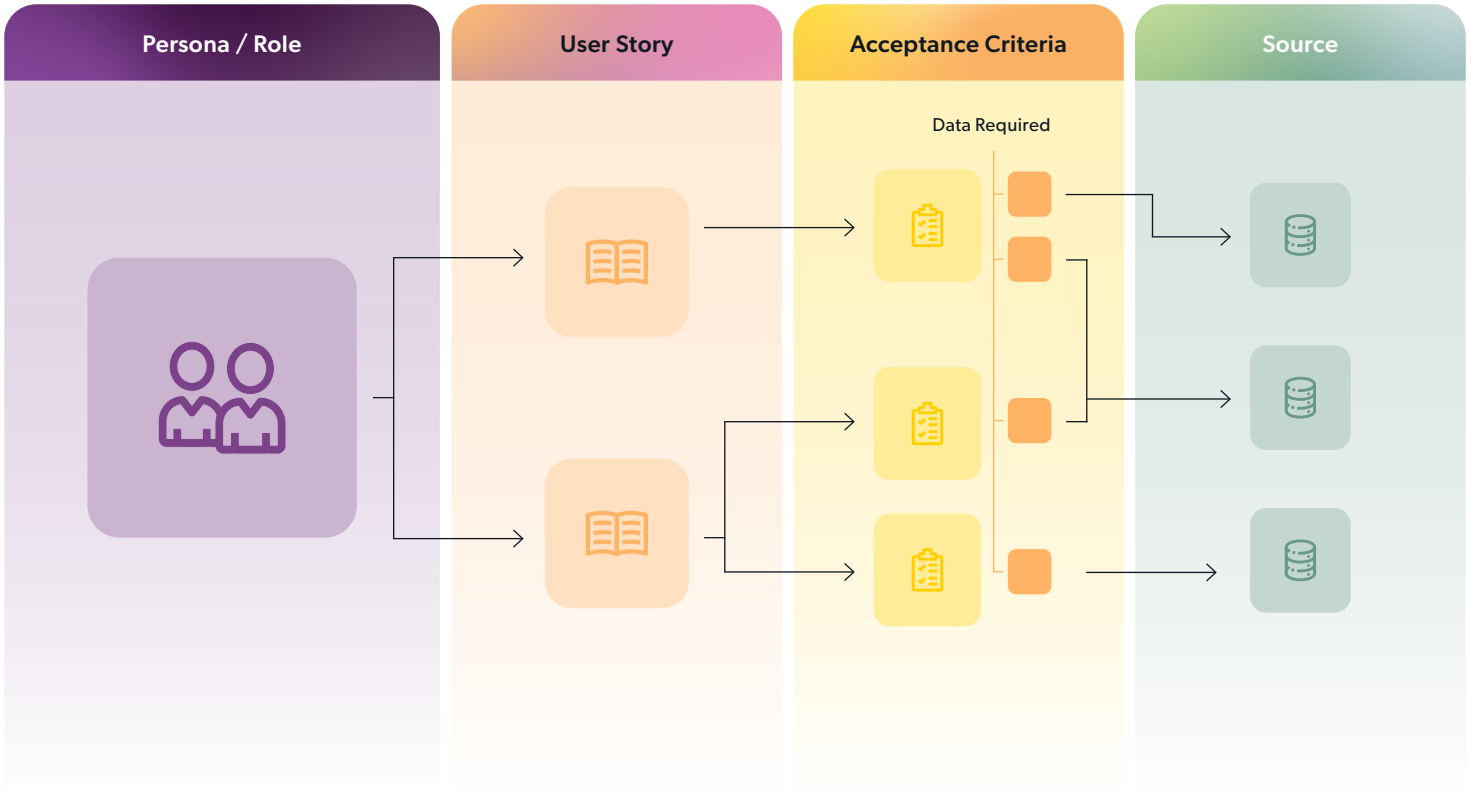


Figure 1

Persona to Information Source Flow

The figure above shows how the flow of data can be determined through User Stories interviews.

During Persona focused meetings, attendees are asked questions that will help ascertain and identify what specific pieces of data define their acceptance criteria for each user story. Acceptance criteria is analogous to general requirements (i.e., how data is presented, what specific pieces of data are needed, what is the data source, if the data is needed in real-time or if an ad-hoc query or report is sufficient). Definitions are then applied to the acceptance criteria for the information user stories.

Example questions of the Persona meetings can include:

What operational decisions do you make regularly, that are currently supported with electronic information?

How could these decisions be improved with additional information?

How often would you need that information updated?

Is it time critical? Do you need notifications? If so, when?

Figure 2

Production Scheduler User Story example

The figure below shows a sample of some User Stories including Acceptance Criteria for a Production Scheduler Persona

Theme
General

I Want	So That	Acceptance Criteria
Pending open work orders to be executed on equipment **Today** we get a maintenance person to perform a pH calibration when there is an opening, done manually **Maintenance** View	**We can** schedule maintenance in open windows of the schedule, interface with CMMS **Current state** - maintenance scheduled, permitters see this and schedule a lock out and an un-lock out **Before integration** - would get some info from maintenance and ops. Ie. agitator maintenance required communications across groups. **With integration** - 1 hour for lock out, 4 hour maintenance, 1 hour un-lock out	**Description** of work task, duration of activity, WO #, equipment impacted, invasive or non-invasive, equipment clean status, steps to return to service (CIP?), lock out requirement pre and post maintenance equipment status/availability.
Interfaces with ICS, MES, and ERP. Make it clear that an order is ready to begin **MES order** - doesn't begin until ERP order is released **For example** - for Pro A to run, scheduled by scheduler, ERP order created and released, need to manually enter order info into MES, ERP release triggers an MES order **An MES order** cannout start until ERP order is released	**Automate** release of ERP orders per RMS schedule **Remove** the need to duplicate data into RMS to keep ERP and MES aligned	**An integration** between ERP and RTPS to provide the ERP PO number and teh Batch # to RTPS **For example** RTPS vial thaw scheduled, ask ERP for an order, ERP sends order number back to RTPS and MES
For RTPS to have labor estimates and constraints **Currently** we hard limit the number of activities	**Scheduler** can adjust the available labor per day based on the staff, if someone is sick or if more people are brought on shift	**RTPS adjusts** the schedule for the day based on labor hours **To see** the labor required per day
To know if a piec of equipment has been locked out, or its clean/hold status	**So we** can automatically schedule in equipment based on status	**MES equipment** status availability, name of equipment and state: • Locked Out • In Maintenance • Clean - Ready for Use • On Hold • View

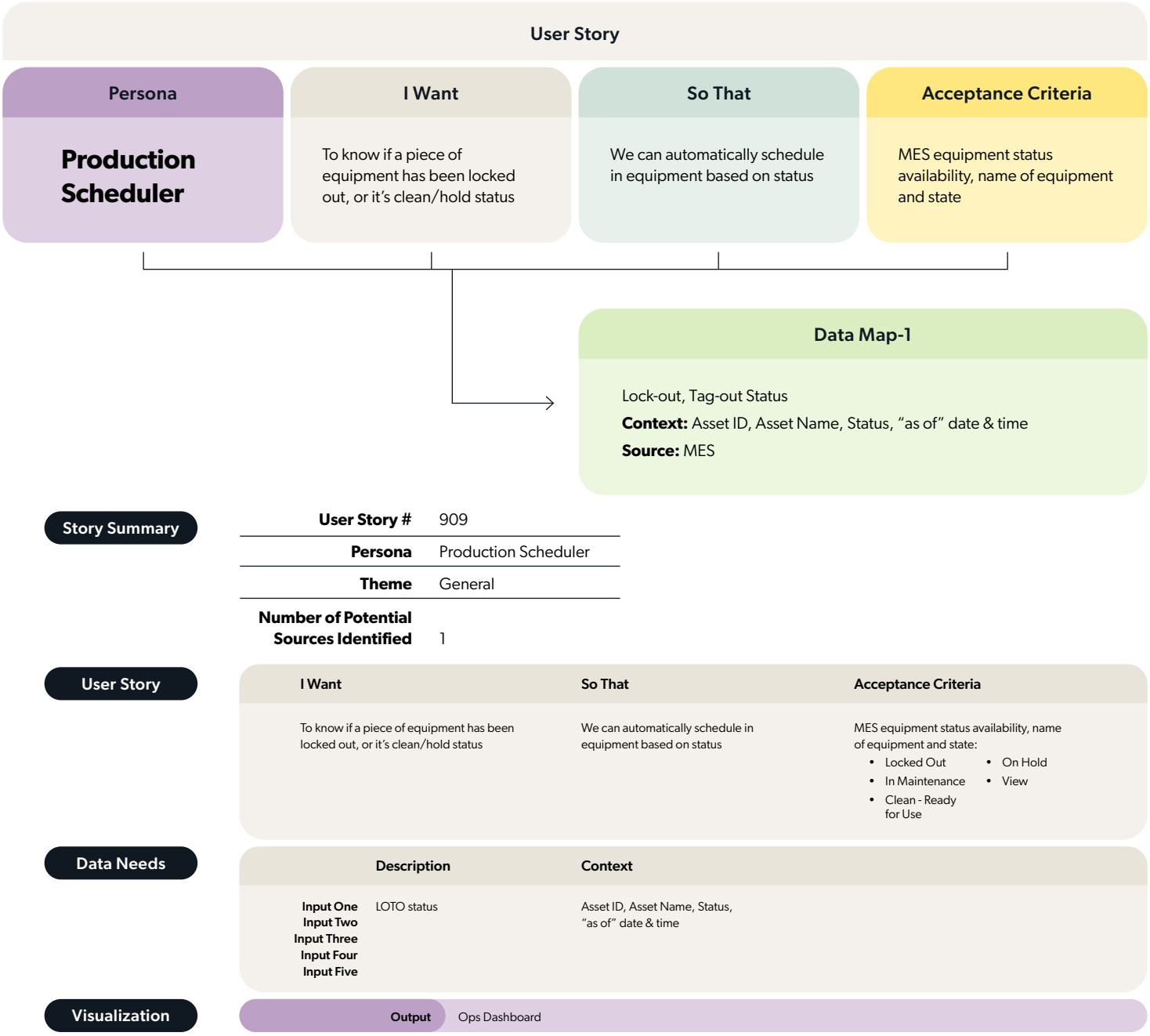


Figure 3

Example User Story and Data Map Results

Once Persona meetings are complete and common themes are identified, a data map can be constructed. The data map holds the information requirements including references back to specific user stories, where the data output should reside, what context should be applied with the data and the data source system.

From building the data map, common themes across the personas and users stories begin to emerge. These themes are applied across the user stories so the data map can be used to filter down from the user stories to specific themes. Examples of common emerging themes can include:

01 Visibility and integration of production schedules

02 Process analytics

03 Integration of equipment and maintenance records

04 Batch reporting and release efficiencies

From each identified theme, the following can be determined/developed:

01 Summary of Persona and User Stories for the theme

02 Specific needs from the User Stories

03 Data sources based on the User Stories

04 Information Flow and Integration Diagrams explaining what systems are needed and how they should be connected to access the required data

05 A Data Construction Plan showing the source system, recommended data context and the target system for where that data and context will reside

06 Presentation layer recommendations

Using a Production Scheduling Theme as an example of this methodology in action

Summary of Persona and User Stories for the theme

Once all the user stories are categorized into major themes, a cross reference can be created which ties each specific Persona's user story to each of the themes. This provides vision into how each Persona identified a need to be informed by Production Scheduling:

Tech Services Scientist	Materials Management Operator
User Story **115**	User Stories **204, 206 & 222**
Process Engineer	**QCL Rep**
User Story **513**	User Story **605**
Environmental Scientist (Micro)	**Operator**
User Story **708**	User Stories **802, 804, 805, 809, 821 & 826**
Production Scheduler	**Shift Supervisor**
User Stories **901 & 903**	User Stories **1001, 1002, 1005, 1006, 1007, 1008 & 1009**

Specific Needs from the User Stories

The categorization of the Persona User Stories by Theme identifies the specific departmental needs. Once identified they can be consolidated and summarized. (Production Scheduling Theme example continues)

01 Ensure that the right resources are available (people, equipment, and material) to meet the schedule[1]

02 Know what (automated or manual) manufacturing activities should be prioritized / executed next[2]

03 Understand expected duration of activities[3]

04 Know status of a batch step (on time vs. delayed) to be able to mitigate or ameliorate problems as they arise[4]

05 Be able to schedule Work Orders within the Ops Scheduling tool[5]

06 See which maintenance activities to be scheduled require Lockout/tagout[6]

07 Dock Scheduling for Warehouse[7]

Data Sources Based on the User Stories

Having identified the specific data needs, the specific data points can be referenced as to their source (database it resides in) along with the context of the data.

Description	Context	Source
Date, time, PO of upcoming unit ops	Product ID, Batch ID, Area, Unit Op, Date & Time scheduled	Ops Scheduling
Cycle Time, Down Time, Planned, Actual	Site, Area, Unit Op, Product ID, Batch ID, Planned, Actual	DCS / MES
Schedule of Samples Required	Batch ID, Sample Number, Test Needed, Unit Op	MES / DCS
Current Process Step for each active batch	Active Status or next Activity Scheduled, Batch ID, Area, Unit Op	Ops Scheduling
Upcoming Automated Process Steps - Dependencies	Material Number, Material Description, Material Lot ID, Quantity, Location, Batch ID	MES / DCS
Current Batch IDs in Ops, by unit Op	Batch ID, Sample Number, Test Needed, Unit Op	Ops Scheduling
Demand Signals on Manual Tasks, with Parallel rules	Area, Unit Op, Batch ID, Asset ID, Date & Time Scheduled, Parallel Viable, Approved Parallel Tasks	Ops Scheduling
Available white space, Expected Duration, pre / post tasks (e.g. lockout, CIP)	Asset ID, Date, Time, Duration, Status	Ops Scheduling
Current Process Step for each active batch	Area, Unit Op, Batch ID, Asset ID, Activity, Phase, Status	Ops Scheduling
Date, time, PO of upcoming unit ops	Product ID, Batch ID, Area, Unit Op, Date & Time Scheduled	Ops Scheduling
BOM for each Unit Op	Order #, Material Number, Material Description, Material Lot ID, RElease Status, Inventory, Location	ERP
Material Quantity in specific areas (close proximity to W&D)	Material Number, Material Description, Material Lot ID, Batch ID, Area	ERP
Cause / Category of delay	Asset ID, Category Description	Batch Operation:
Location of Samples in Freezers, Status of Tests	Sample ID, Location, Sample Status "as of"	LIMS
Material Release Status	Material Number, Material Description, Material Lot ID, Release Status	ERP
Open Work Orders	Asset ID, Asset Name, Task, Work Order #, Invasive? LOTO? Post Activities?	CMMS
PO Status of MES Order	Batch ID, Status	ERP
Equipment Status (e.g. clean)	Asset ID, Status	DCS / MES

[1]User Stories: 206, 605, 708, 805, 1005, 1006
[2]User Stories: 115, 802, 804, 821, 1001
[3]User Story: 1008
[4]User Stories: 513, 809, 826, 1007, 903
[5]User Stories: 901, 1002
[6]User Story: 1009
[7]User Stories: 204, 222

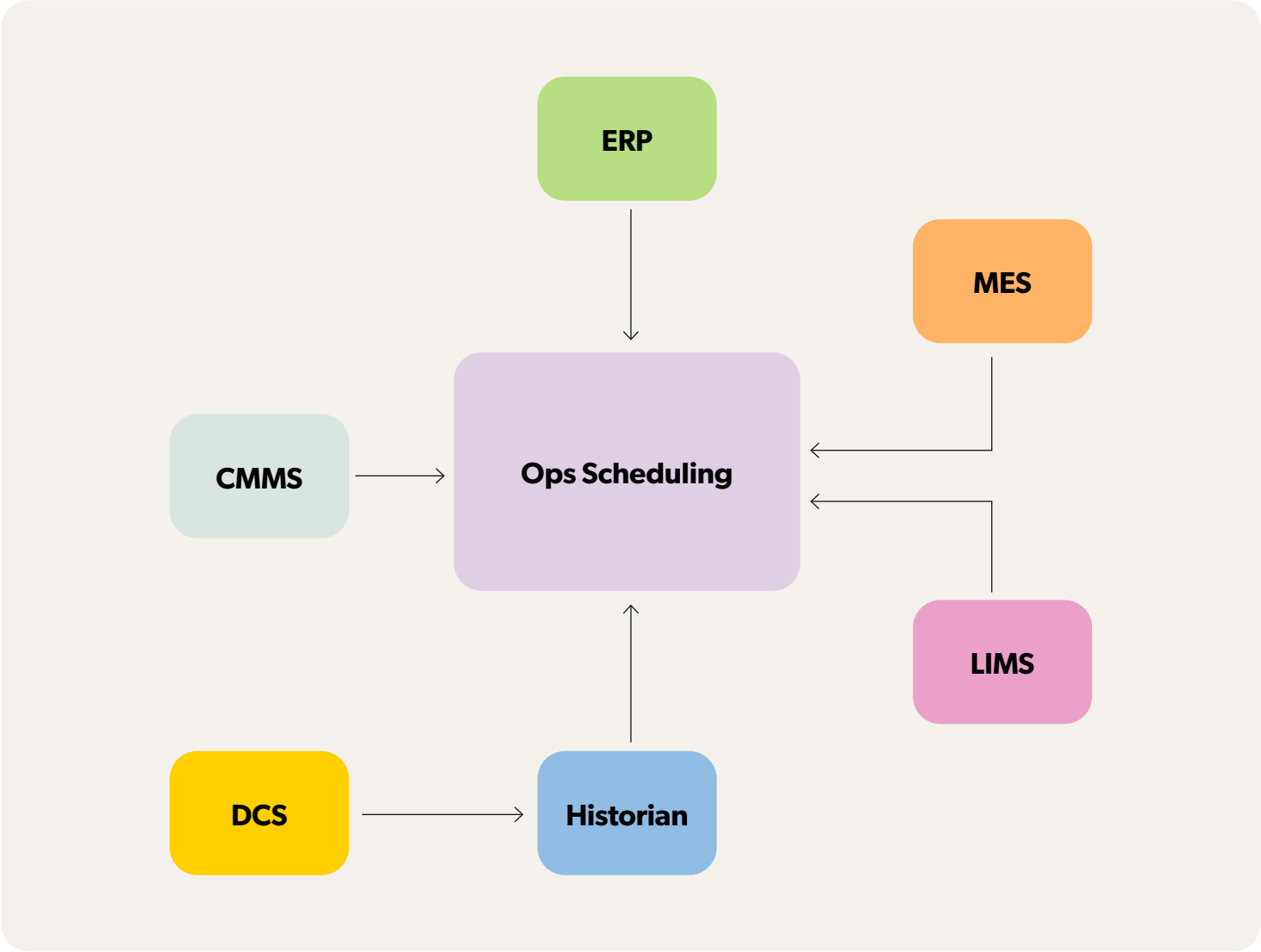


Figure 4

Improving Ops Scheduling with Integrations

Improving Operation Scheduling with Integrations

Having identified the contextualized data parameters with each respective database source, an architecture map can be drawn, showing the relevant database with each connector required.

Table 1

Improving Ops Scheduling with Integrations

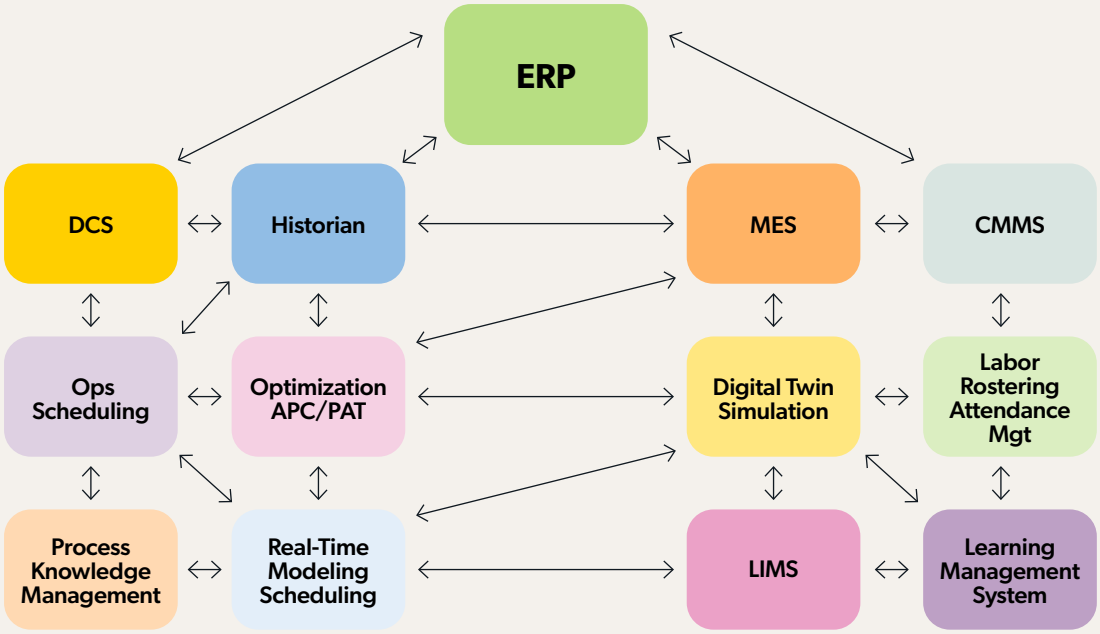
Source	Data
MES	Start and Stop times of EBR activities, primarily for manual tasks or those not otherwise controlled by the DCS. Context should include Batch # and Activity Name to match the configuration of the Activity within the Ops Scheduling tool.
Historian / DCS	Start and Stop times of automated activities. Context should include Batch # and Activity Name to match the configuration of the Activity within the Ops Scheduling tool.
LIMS	Completed status of QCL tests, with Batch #, Test Name and Completed time. Where tests are repeated within a batch, each test should be named separately to match the configuration of the activity within the Ops Scheduling tool.
CMMS	A list of required maintenance work orders with information on whether that task requires a lockout/tagout. LOTO information could also be stored in the Ops Scheduling activity information though this configuration is less desirable.
ERP	The ERP tool will provide Ops Scheduling with Order release status, including Batch #.

By using our example case focused on just one theme and just a handful of needs, the resulting integrated architecture doesn't look daunting or difficult. In this specific example there are a few data points, but it must be remembered that each connector will need to be created with an allowable data highway mechanism (transferring the data information from one database to another) and each data point register must be mapped, connected and then managed.

As the number of Personas, Themes and needs increases, the subsequent data mapping architecture will have an unwieldy and daunting look to it:

Figure 5

Improving Ops Scheduling with Integrations



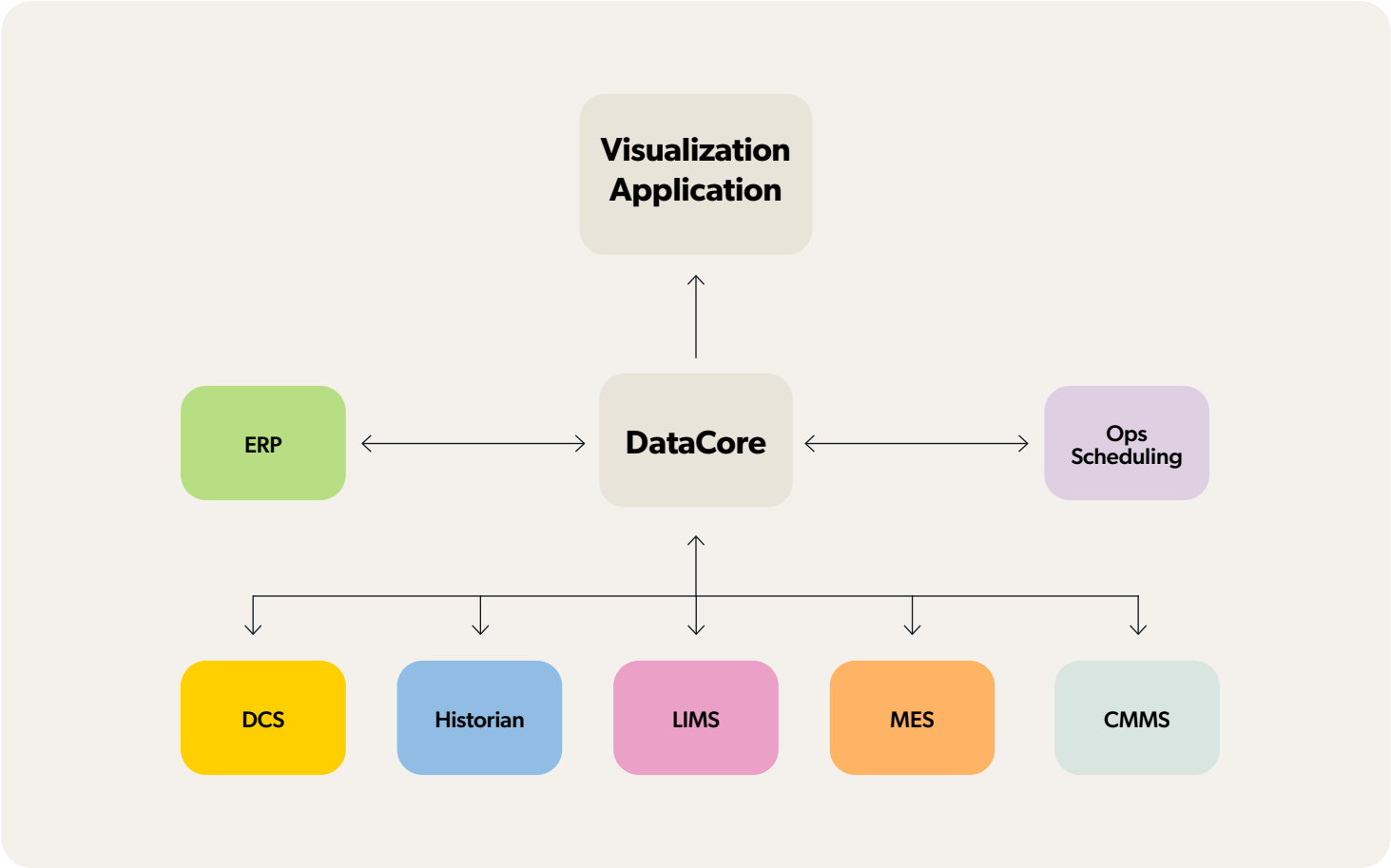
Once identifying the numerous systems that will provide input data to synthesized reports and dashboards for presentation. This data and context should be collected in a common location, the Data Integration Layer (Data Core). Consolidating data from multiple sources into a single location is beneficial because of the simplified access management process, and the ease to ensure Data Integrity. Utilization of a Data Core platform also allows for the simplification of firewall management by reducing the number of port traversals between layers, encapsulating all layer-to-layer traffic into a single stream. This can reduce the burden of ownership and minimize "holes" needed in the firewall.

Having an Automation Integration Layer (Data Core) is much better than trying to stitch applications together and visualizations per application for every persona. The use of a Data Integration Layer allows for the creation of dashboards for each Persona based on their specific needs.

Each Persona can get what they want out of visualization and those visualizations all come from one spot. A properly deployed Data Core can take inputs from various, disparate systems and aggregate them into contextual models. This context can be utilized regardless of whether the data is stored within the Data Core or pulled

Figure 6

Presentation Layer Data Flow



real-time from another database. A well-suited Data Core application can provide dashboarding and reporting (through a Visual Application), allowing users to "click into" more detail with limited setup required.

In conclusion, a formal and robust User Persona methodology provides a mechanism to identify specific data needs for an organization. The understanding and identification of user data needs will show the system architecture required to make all the necessary connections between systems/platforms. An organization will be able to create a "roadmap" which will allow them to optimize their current architecture, while showing how their system landscape will have to expand to accommodate the data needs for Users. Modern system architectures have the capabilities (e.g., Data Core) to simplify the passing of data between systems and to create a simple, easy, and powerful interface for each respective Persona/User.