Improving Software Implementation Project Timelines

DECEMBER 3, 2023

Business Case

- Our company is currently facing a critical challenge with software implementation projects not meeting contracted implementation dates
  - For the last five years, 46% of projects were implemented after the promise date (late)
  - Late delivery is having a substantial impact, incurring approximately $600,000 in additional wages, delayed revenue, and penalties each year.
  - Late delivery is having a negative impact on customer satisfaction and repeat business with customers
- In response to this, we are initiating a project with an initial goal to reduce the percentage of late projects by 50%
  - Additional Lean Six Sigma projects may be added after completion of the initial project to further reduce the percentage of late projects
- By achieving this, we anticipate annual savings of approximately $300,000 in direct costs.
  - Additionally, the more efficient project cycle may free up resources, enabling us to take on new projects within the same fiscal year, potentially generating an additional $200,000 in revenue.

Problem and Goal Statement

Y Metric: Percentage of late projects

Problem: For the last five years, the percentage of on-time performance is only 54%, with 46% of the projects classified as late

Goal: The objective for this project is to reduce the amount of late projects by half, beginning with those projects contracted in 2024*

New On-time Delivery Goal: 77%
New Maximum Late Goal: 23%
Implementation Start Date: Contracts signed on or after Jan 1, 2024

*Additional follow-on projects that aim to make further improvements to on-time performance should be considered in the future

Operational Definition

Difference in the number of days between contracted delivery date and actual delivery date (Contracted Delivery date-Actual Delivery date)

- Contracted delivery date is the date that appears in Salesforce noted as
  - "Contracted Full Implementation Date"
- Actual delivery date is the date in Salesforce noted as "Date Fully
  - Implemented"
- Excel date function transforms dates into values
  - An earlier date as a smaller value than a later date

On-Time Project

- Contracted Delivery Date – Actual Delivery Date ≤ 0

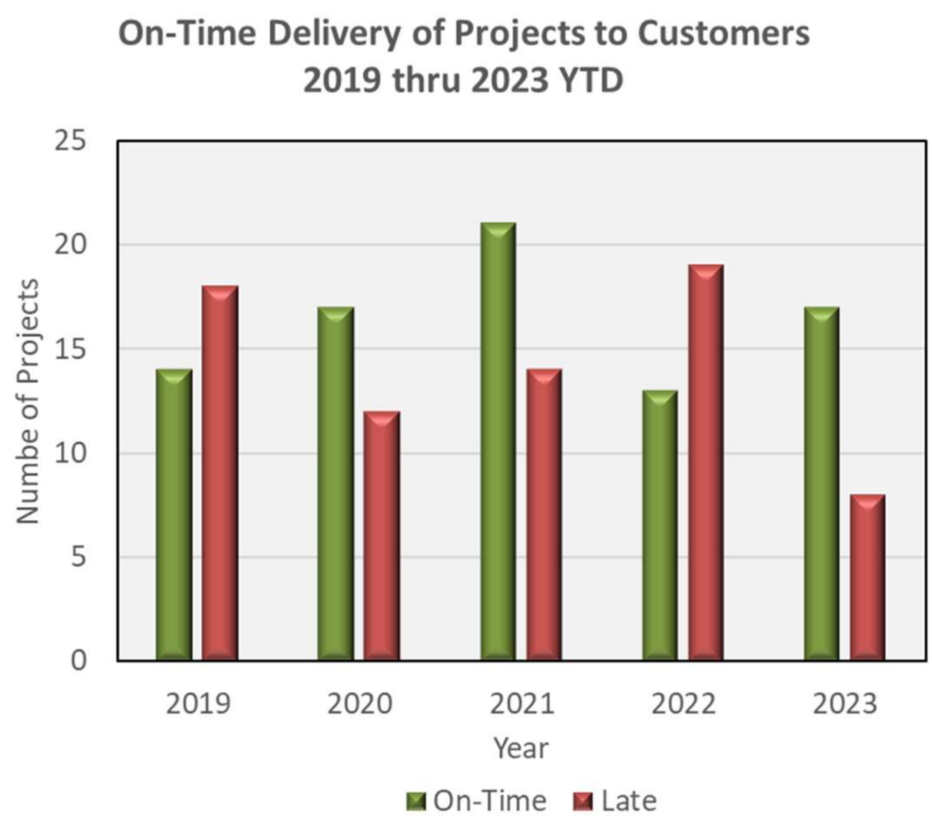
Late Project

- Contracted Delivery Date – Actual Delivery Date > 0

*Additional follow-on projects that aim to make further improvements to on-time performance should be considered in the future

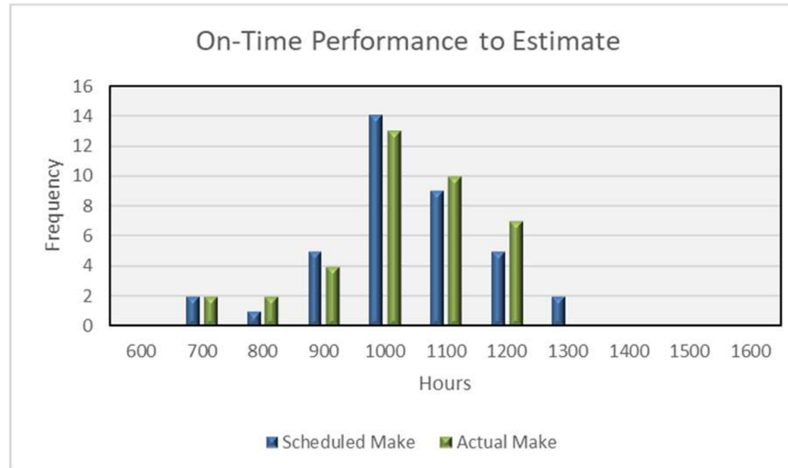
On-Time Performance for Last Five Years (Current State)

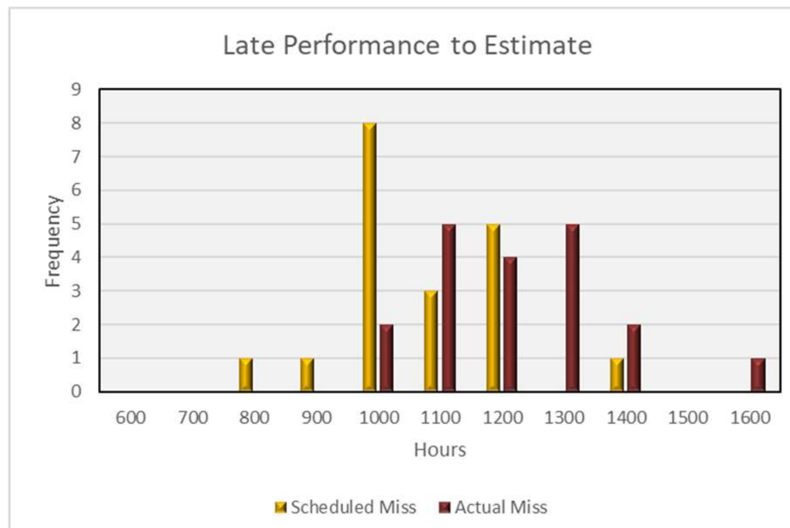
- Salesforce data was used to determine if each project finished in 2019 through 2023 YTD was on time or late
- Of 153 total projects, 71 were late, generating a DMPO of 71/153*1,000,000 = 464,052



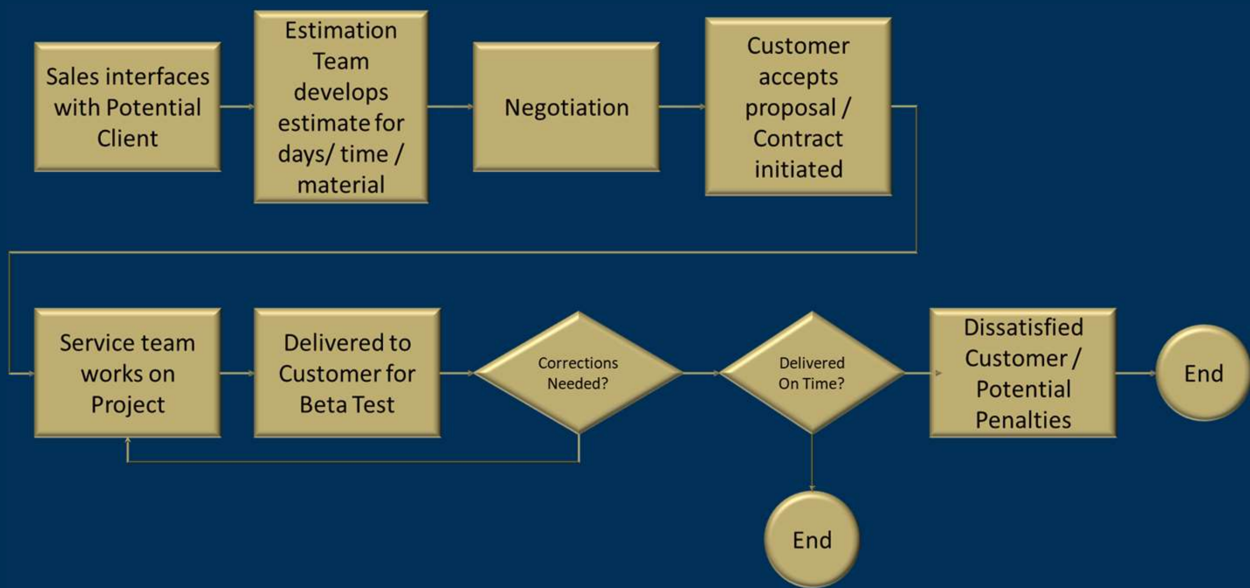
On-Time Performance for Last Five Years (Current State)

- Salesforce data was used to determine if each project finished in 2019 through 2023 YTD was on time or late
- Lateness appears to be directly related to the number of hours expended
  - No delay in delivery of finished product, but an overall miss in terms of number of hours needed to complete the project





Current Process Flow –
Sales Interface to Project Delivery

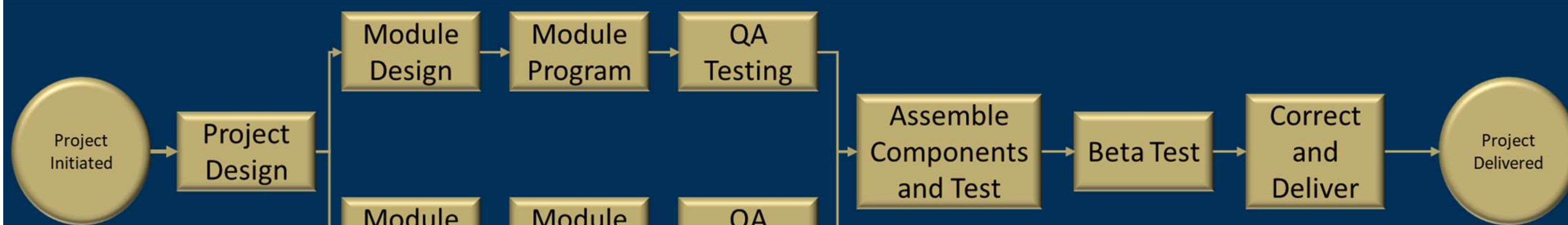


Estimation Team has technical sales consultant that provide guidance on time and materials estimates.

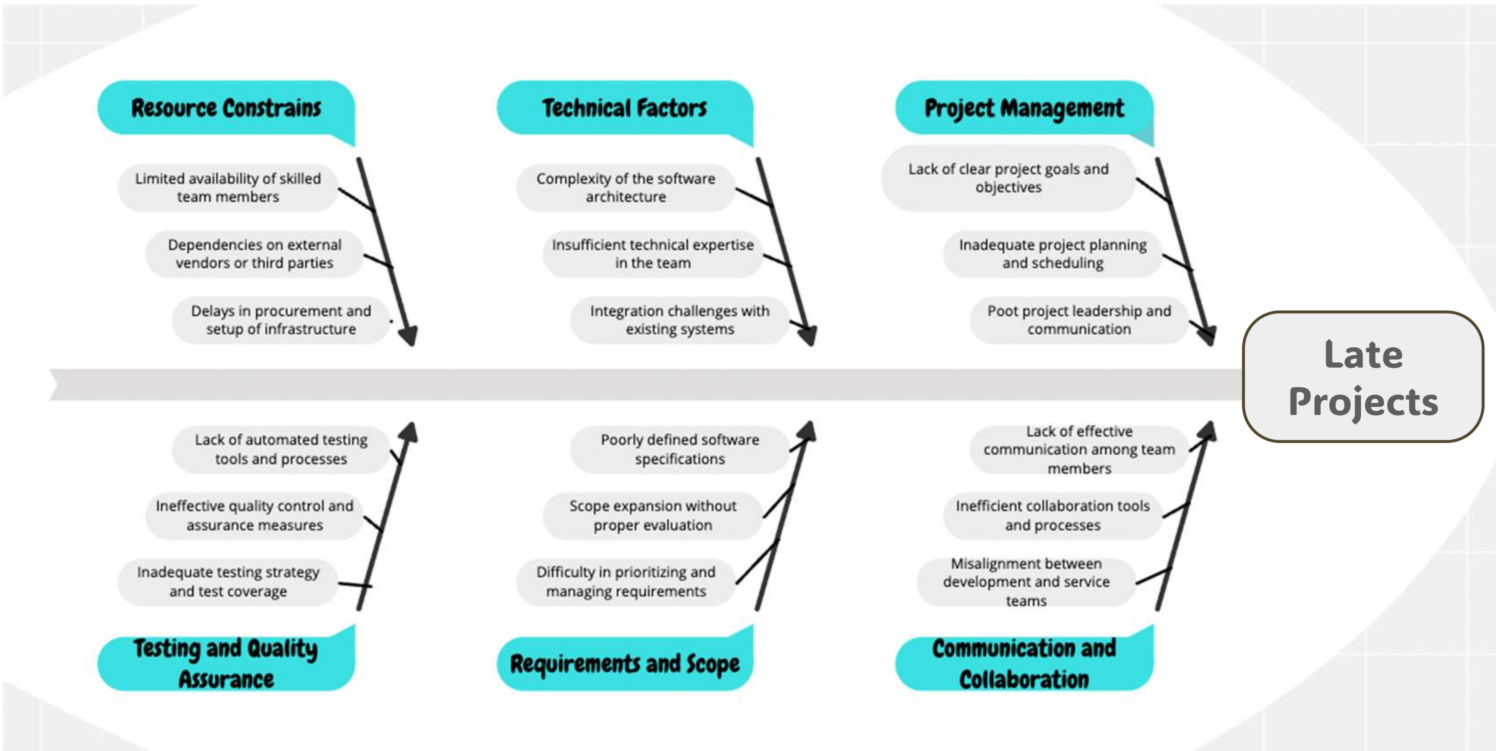
No current members of the Service Team are part of the Estimation function.

Service Team has no input into Estimation Process

Current Process Flow –
Project Design and Development



Analysis - Fishbone Diagram of Potential Causes



Analysis Methodology

- Data from 2019 to 2023 YTD used for analysis of on-time vs. late projects
- Data from 2022 to 2023 YTD used for detailed root cause analysis
  - Considered more representative of current processes than data from 2019 to 2021
- All tests were performed with Level of Significance = 0.05
- Analysis of hours needed for different parts of the process was performed using percentages so to account for differences in overall project complexity
- Excel Version 2311 used for all statistical analysis

Analysis - Are Project Misses Related to Project Complexity?

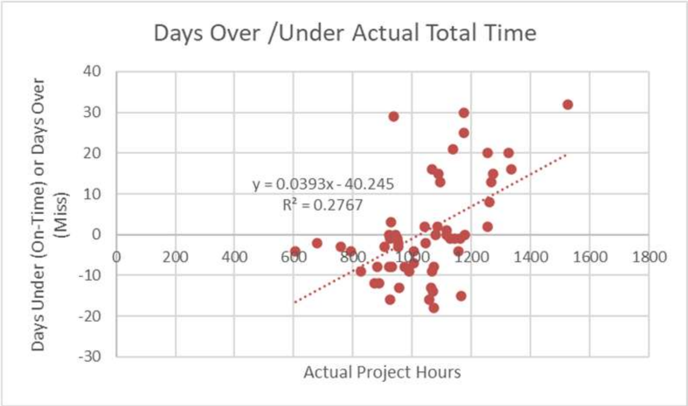
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.53
R Square	0.28
Adjusted R Square	0.26
Standard Error	10.63
Observations	57

ANOVA

	df	SS	MS	F	Significance F
Regression	1	2375.96	2375.96	21.04	0.00
Residual	55	6210.07	112.91		
Total	56	8586.04			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	-40.245	9.052	-4.446	0.000	-58.385	-22.105
Actual Total Time	0.039	0.009	4.587	0.000	0.022	0.056

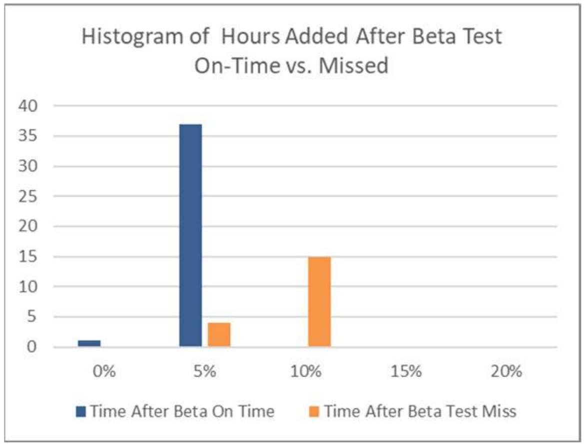


- Project complexity is equated to the total scheduled hours, with more hours meaning more complex
    - t-test is significant for Slope, and R Square shows hours explains 28% of Days over / under
- There is a relationship between scheduled numbers of hours and number of days over or under scheduled completion date
- More care should be given to projects that take longer
- Short-term corrective action – consider adding a number of buffer days for projects over 1000 hours
    - No additional hours – but additional days for delivery

Analysis - Are Late Projects Due to Corrections After Beta Test?

For Percentage Hours Added After Beta Test		
F-Test Two-Sample for Variances		
	On Time	*Late*
Mean	0.019144906	0.06521445
Variance	0.000105548	0.00041045
Observations	38	19
df	37	18
F	0.257151473	
P(F<=f) one-tail	0.000232342	
F Critical one-tail	0.528992016	

For Percentage Hours Added After Beta Test		
t-Test: Two-Sample Assuming Unequal Variances		
	On Time	*Late*
Mean	0.019144906	0.06521445
Variance	0.000105548	0.000410451
Observations	38	19
Hypothesized Mean I	0	
df	23	
t Stat	-9.330283833	
P(T<=t) one-tail	1.39042E-09	
t Critical one-tail	1.713871528	
P(T<=t) two-tail	2.78084E-09	
t Critical two-tail	2.06865761	

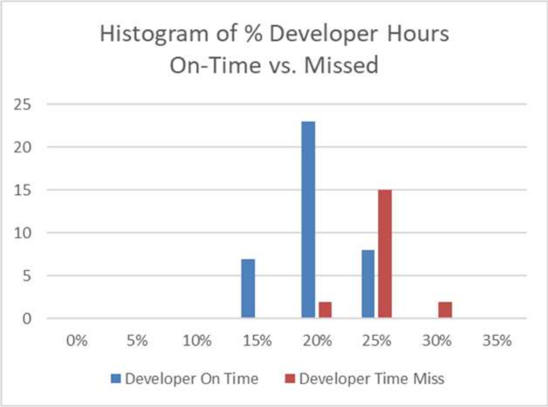


- No current budget for hours needed after beta test to satisfy customer
- Late projects added approximately 6.5% to the number of scheduled hours, where projects that were on-time added only 1.9% to the number of scheduled hours
- Follow up project to determine if hours are due to inadequate understanding of customer requirement or from scope creep.
- Short-term corrective action – budget hours for Hours Added after Test at 4% of normal schedule

Analysis - Are there Differences between Percentages of Hours Needed by Area - Design

For Percentage Hours Design		
F-Test Two-Sample for Variances		
	On Time	*Late*
Mean	0.176115	0.22126
Variance	0.000712	0.000589
Observations	38	19
df	37	18
F	1.209598	
P(F<=f) one-tail	0.340396	
F Critical one-tail	2.073823	

For Percentage Hours Design		
t-Test: Two-Sample Assuming Equal Variances		
	On Time	*Late*
Mean	0.176115	0.22126
Variance	0.000712	0.000589
Observations	38	19
Pooled Variance	0.000672	
Hypothesized Mea	0	
df	55	
t Stat	-6.19774	
P(T<=t) one-tail	3.85E-08	
t Critical one-tail	1.673034	
P(T<=t) two-tail	7.7E-08	
t Critical two-tail	2.004045	

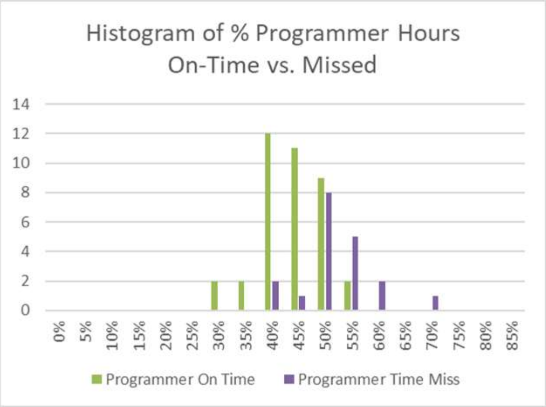


- Design accounts for an average of 20% of the project hours
- Late projects added approximately 5% to the number of scheduled hours vs projects that were on-time
- Discussion with Service Team Designers indicated that complex projects should have a higher percentage of design time. They knew they needed more time, but the project had already been contracted.
- Service team needs input to the Estimation process

Analysis -Are there Differences between Percentages of Hours Needed by Area - Programming

For Percentage Hours Programming		
F-Test Two-Sample for Variances		
	On Time	*Late*
Mean	0.416813	0.503225
Variance	0.003202	0.004189
Observations	38	19
df	37	18
F	0.76421	
P(F<=f) one-tail	0.238305	
F Critical one-tail	0.528992	

For Percentage Hours Programming		
t-Test: Two-Sample Programming		
	On Time	*Late*
Mean	0.416813	0.503225
Variance	0.003202	0.004189
Observations	38	19
Pooled Variance	0.003525	
Hypothesized Mean	0	
df	55	
t Stat	-5.18005	
P(T<=t) one-tail	1.63E-06	
t Critical one-tail	1.673034	
P(T<=t) two-tail	3.25E-06	
t Critical two-tail	2.004045	

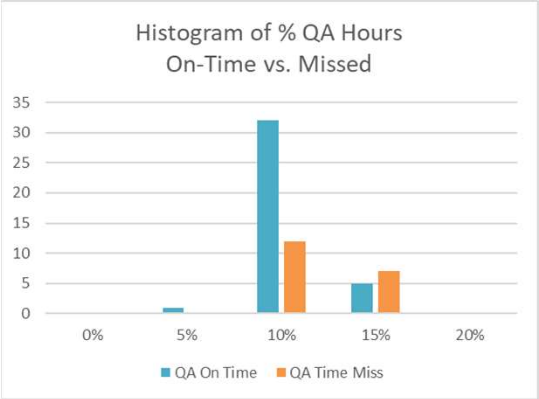


- Programming accounts for an average of 45% of the project hours
- Late projects added approximately 8% to the number of scheduled hours vs projects that were on-time
  - On-time projects used less than 45%, and late projects used more than 45%
- Discussion with Service Team Designers indicated that complex projects should have a higher percentage of programming time. They knew they needed more time, but the project had already been contracted.
- Service team needs input to the Estimation process

Analysis - Are there Differences between Percentages of Hours Needed by Area – QA Testing

For Percentage Hours QA		
F-Test Two-Sample for Variances		
	On Time	*Late*
Mean	0.084044	0.098273
Variance	0.000176	0.0003
Observations	38	19
df	37	18
F	0.586131	
P(F<=f) one-tail	0.083391	
F Critical one-tail	0.528992	

For Percentage Hours QA		
t-Test: Two-Sample Assuming Equal Variances		
	On Time	*Late*
Mean	0.084044	0.098273
Variance	0.000176	0.0003
Observations	38	19
Pooled Variance	0.000216	
Hypothesized Mean	0	
df	55	
t Stat	-3.44384	
P(T<=t) one-tail	0.000552	
t Critical one-tail	1.673034	
P(T<=t) two-tail	0.001104	
t Critical two-tail	2.004045	

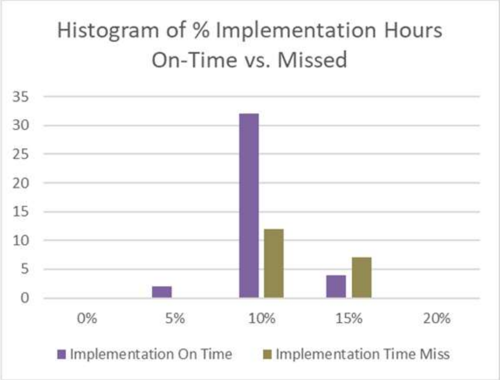


- QA Testing, while statistically significant, has little practical significance between on-time and late projects
- QA Testing should have an initial budget of 9% of the scheduled hours
- Follow-up project should be considered to determine if more through QA testing could reduce added time after Beta testing to address customer concerns and software issues

Analysis - Are there Differences between Percentages of Hours Needed by Area- Implementation

For Percentage Hours Implementation		
F-Test Two-Sample for Variances		
	On Time	*Late*
Mean	0.078924818	0.091597889
Variance	0.000264727	0.000313119
Observations	38	19
df	37	18
F	0.845453737	
P(F<=f) one-tail	0.322774259	
F Critical one-tail	0.528992016	

For Percentage Hours Implementation		
t-Test: Two-Sample Assuming Equal Variances		
	On Time	*Late*
Mean	0.078924818	0.091597889
Variance	0.000264727	0.000313119
Observations	38	19
Pooled Variance	0.000280564	
Hypothesized Mean [	0	
df	55	
t Stat	-2.692754316	
P(T<=t) one-tail	0.00468682	
t Critical one-tail	1.673033965	
P(T<=t) two-tail	0.00937364	
t Critical two-tail	2.004044783	

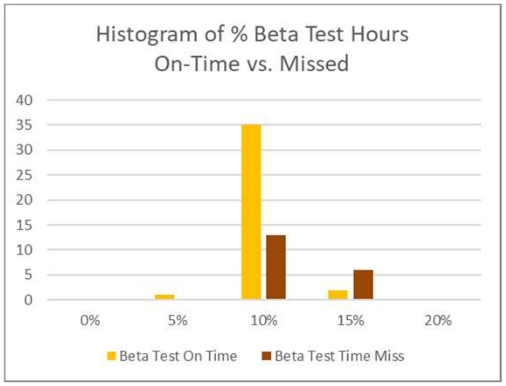


- Implementation is the first part of the process where all modules are combined and then tested end-to-end
- Like QA testing, little practical difference between On Time and Late projects
- Follow-up project to be considered to determine if the Implementation process is finding all bugs and software defects

Analysis - Are there Differences between Percentages of Hours Needed by Area – Beta Testing

For Percentage Hours Beta Test		
F-Test Two-Sample for Variances		
	On Time	*Late*
Mean	0.080277815	0.091778289
Variance	0.000194805	0.0001856
Observations	38	19
df	37	18
F	1.049598843	
P(F<=f) one-tail	0.47186603	
F Critical one-tail	2.07382309	

For Percentage Hours Beta Test		
t-Test: Two-Sample Assuming Equal Variances		
	On Time	*Late*
Mean	0.080277815	0.091778289
Variance	0.000194805	0.0001856
Observations	38	19
Pooled Variance	0.000191792	
Hypothesized Mean	0	
df	55	
t Stat	-2.955501364	
P(T<=t) one-tail	0.002294645	
t Critical one-tail	1.673033965	
P(T<=t) two-tail	0.004589291	
t Critical two-tail	2.004044783	



- Beta testing is conducted at the customer
- Beta testing is supported by a customer technician, not by the Service Team
- Little practical difference in time needed for On Time projects vs. Late Projects
- No other follow-up needed at this time

Recommendations

ONE:
Add a Service Team member to the Estimation Process by no later than Jan 1, 2024

TWO:
Formally revise the Estimation Process to include Service Team sign-off by no later than Jan 1, 2024

THREE:
Add 4% more time for "hours required after beta test" to properly account for current conditions by no later than Jan 1, 2024

FOUR:
Consider follow up projects to understand reasons for design and programming hours that exceed estimate

FIVE:
Projects requiring more than 1000 hours need to have special estimation scrutiny to ensure estimation is feasible

SIX:
Consider role of commissioned sales team in low hours and short number of days – is drive for commission a factor?

Appendix A – Data Collected for On-Time Performance (Salesforce 2019 – 2023 YTD

Use Salesforce to generate historical data for Contract Delivery Date and Actual Delivery Date. Include Project Number to obtain Project Year (Year Projected for Implementation) and Project Type (Claim or Policy) Other information can be calculated using these fields.

Proj Number	Contract Delivery Date	Actual Delivery Date	Days Over /Under	On Time / Late	Year	Proj Type
2019PGMC02	1/16/2019	1/24/2019	8	Late	2019	P
2019PBSN02	1/19/2019	2/6/2019	18	Late	2019	P
2019PCAN03	1/24/2019	1/29/2019	5	Late	2019	P
2019CKEI01	1/26/2019	1/19/2019	-7	On Time	2019	C
2019CNAT02	2/1/2019	1/27/2019	-5	On Time	2019	C
2019CGMC01	2/17/2019	2/13/2019	-4	On Time	2019	C
2019CAMI02	2/24/2019	2/14/2019	-10	On Time	2019	C
2019CAIG03	3/5/2019	2/25/2019	-8	On Time	2019	C
2019CKEI03	3/10/2019	2/27/2019	-11	On Time	2019	C
2019CSTF02	3/13/2019	3/9/2019	-4	On Time	2019	C

Appendix B: Detailed Charge Data from Salesforce for Projects from 2022- 2023 YTD

Use Salesforce to generate historical data for Contract Delivery Date and Actual Delivery Date, Project Number, Estimated Hours for Completion (Scheduled Time), Actual Hours for Completion (Actual Total Time), and Actual Hours for different phases of the project – Development, Programming, QA, Implementation, Beta Test, and Hours to correct issues found in Beta Test (Actual Time After Beta Test)

Proj Number	Contract Delivery Date	Actual Delivery Date	Days Over /Under	OnTime / Late	Year	Proj Type	Scheduled Time	Actual Total Time	Actual Developer Time	Actual Programmer Time	Actual QA Time	Actual Implementation Time	Actual Beta Test Time	Actual Time After Beta Test
2022PNAT03	1/14/2022	2/12/2022	29	Late	2022	P	735	937	212	463	91	76	92	110
2022PPRO03	1/20/2022	2/14/2022	25	Late	2022	P	968	1175	244	581	125	101	121	104
2022PKEI02	1/28/2022	1/26/2022	-2	On Time	2022	P	959	952	212	472	95	76	94	34
2022PALL02	2/5/2022	2/21/2022	16	Late	2022	P	910	1066	240	542	95	80	107	84
2022CAIG01	2/20/2022	2/16/2022	-4	On Time	2022	C	623	606	138	305	47	57	57	27
2022PPRO01	4/4/2022	4/3/2022	-1	On Time	2022	P	912	951	213	460	101	74	100	36
2022PPRO02	4/21/2022	5/23/2022	32	Late	2022	P	1314	1526	324	783	159	122	136	112
2022CSTA02	4/28/2022	4/27/2022	-1	On Time	2022	C	1141	1130	242	575	90	110	112	35
2022PPRD01	5/1/2022	5/3/2022	2	Late	2022	P	964	1085	249	543	115	86	91	50
2022CCAN01	5/4/2022	5/3/2022	-1	On Time	2022	C	1121	1162	250	561	124	126	98	35

Thank You