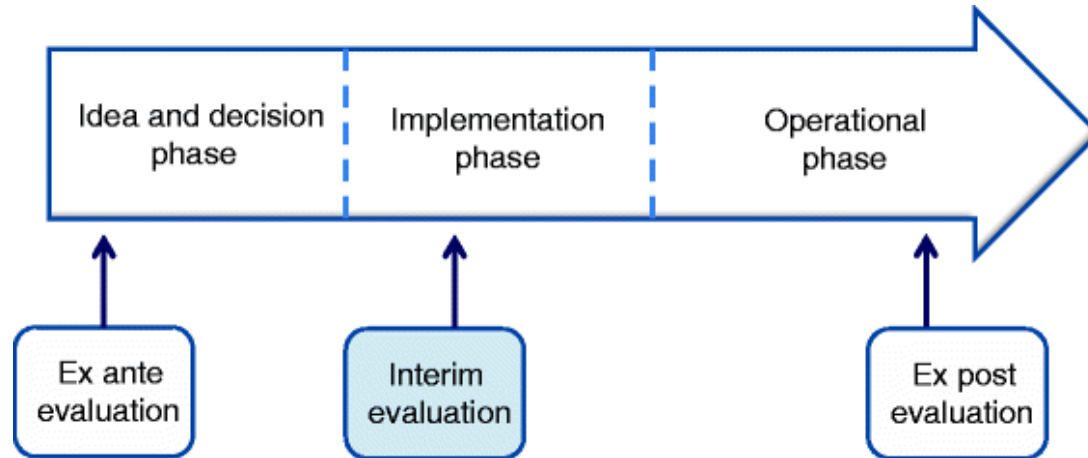


Ex-Post analysis

What is an Ex-Post analysis?

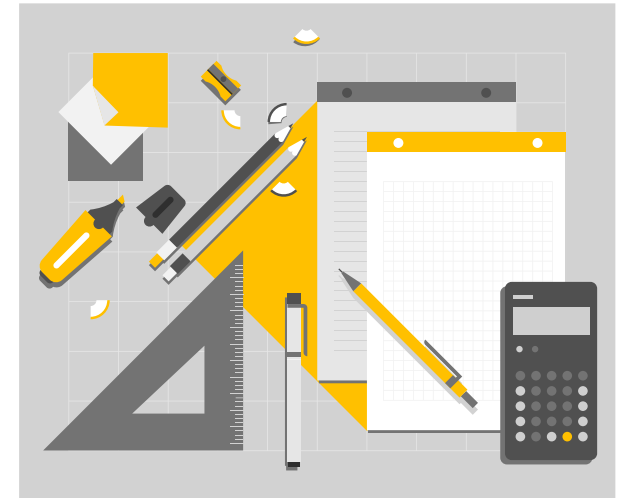


Samset, K., Christensen, T. Ex Ante Project Evaluation and the Complexity of Early Decision-Making. *Public Organiz Rev* 17, 1–17 (2017). <https://doi.org/10.1007/s11115-015-0326-y>

- End of project assesment
 - Documentation
 - Implementation
 - Functionality
- Analysis / Evaluation
 - Objectives vs. Results
 - (Overall) System (e.g. Requirements)
 - Use-Cases

- 1. Definition of Criteria
 - General
 - Definition / Fulfilment of requirements
 - Geographical coverage
 - Availability
 - System
 - Information (e.g. Real Time)
 - Quality
 - Correctness
 - Completeness
 - Timeliness
 - Repeatability
- 2. Gathering of Information
 - Documentation of changes
 - Fullfillment of requirements
 - Testing of
 - Individual Services
 - UseCases (via D.T1.2.1)
- 3. Analysis / Evaluation

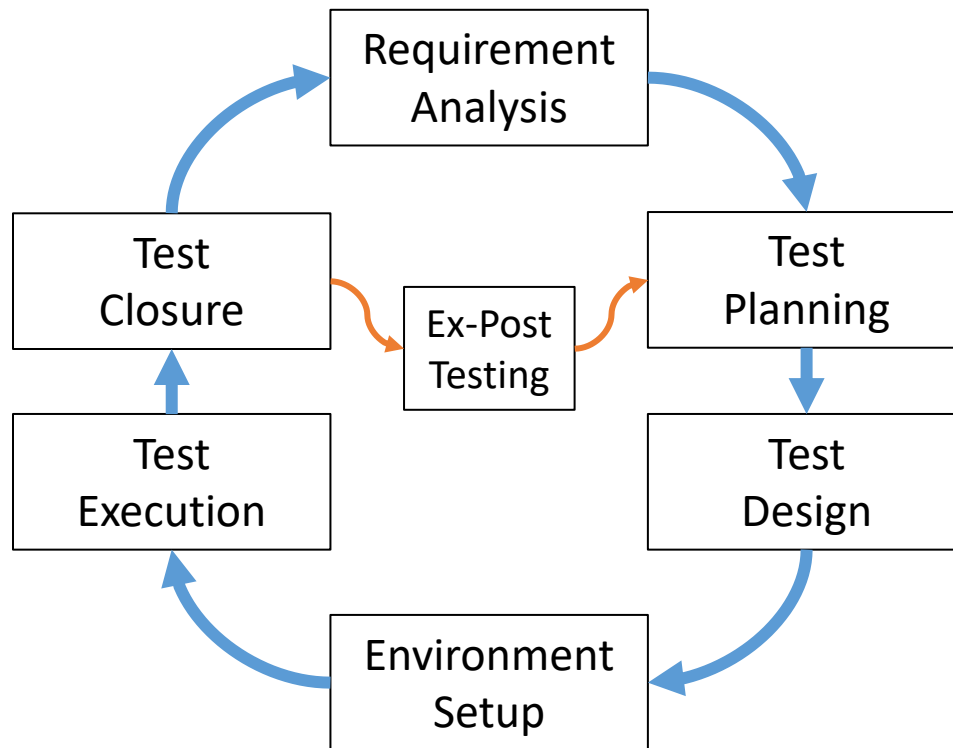
- Documentation of Changes
 - Overall System Implementation: no changes
 - Active Systems: yes, no active system from VAO
 - Passive Systems: no changes
 - OJP
 - Implemented Services: no changes
 - Profile: no changes
 - Version: no changes, discussion of updatepath-process



- Fullfillment of Requirements
 - Requirements List
 - Defined set of rules / features for Active & Passive Systems
 - Covers various aspects
 - API
 - Authorization
 - Data Exchange
 - Quality Criteria

“All participating systems (active and passive) providing an OJP services compliant to these requirements shall offer those services via HTTPS using current, state-of-the-art encryption (HTTPS with TLS 1.3 as defined in 09/2020). ”

Software Testing Life Cycle



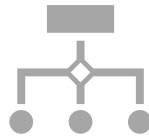
• Ex-Post Testing Goals

- Little additional workload
- Embedded into individual system testing
 - Possible automation
- „Testing Add-On“ for evaluation purposes, not a replacement

- Task: Testing of Services & Use-Cases

- Definition of tests (by AS/PS)

- per OJP Service / Use-Case
 - per system (AS & PS)
 - per combination



- Repeated testing (by AS/PS)

- Criteria

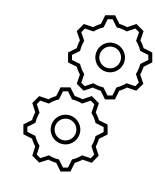
- Completeness (results cover all search-parameters)
 - Correctness (results match search)
 - Timeliness
 - Availability
 - Repeatability

Problem: Implementation challenges / delays also influence(d) Ex-Post analysis

Method (Services, Example)

Testing Documentation

Test Definition								
Operat.	ID	Name	Goal	OJP Service	Parameter	Filter	AS	PS
Example	LIR_001	Example	Give an example how this is suggested	LocationInformation	NumberOfResults: 50;Includ	None	N/A	LUR
CMTO	LIR_001	Initial Input	Provide all LocationName	LocationInformation	-	None	N/A	CMTO/5T
CMTO	LIR_002	Mode and resul limit	Provide PtMode and limit results nur	LocationInformation	NumberOfResults=50 and P	None	N/A	CMTO/5T
CMTO	LIR_003	PtMode and ContinueAt	Provide PtMode and additional parar	LocationInformation	NumberOfResults=50, Conti	type=stop	N/A	CMTO/5T
CMTO	EPR_001	Exchange point	Provide the list of EP	ExchangePoints	NumberOfResults=50, Conti	None	N/A	CMTO/5T
CMTO	TR_001	Trip request basic	Provide the trip giving an origin and c	Trip	-	None	N/A	CMTO/5T
CMTO	TR_002	Trip request with PtMode	Provide the trip giving an origin and c	Trip	PtModeFilter, NumberOfRes	PtMode=bus	N/A	CMTO/5T
CMTO	TR_003	Trip request with transfer leg	Provide the trip giving transfer leg in	Trip	IncludeTrackSections=true, I	None	N/A	CMTO/5T
CMTO	TR_004	Trip request with linkProjection	Provide the trip giving link projection	Trip	NumberOfResults=50, Includ	None	N/A	CMTO/5T
CMTO	TR_005	Trip request with intermediate stops	Provide the trip giving intermediate s	Trip	NumberOfResults=1, Includ	None	N/A	CMTO/5T
CMTO	SE_001	Stop Event basic	Providing timetable on selected stop:	StopEvent	NumberOfResults=5, StopEv	None	N/A	CMTO/5T
CMTO	SE_002	Stop Event with onward calls	Providing timetable on selected stop:	StopEvent	NumberOfResults=5, StopEv	None	N/A	CMTO/5T
CMTO	SE_003	Stop Event with previous calls	Providing timetable on selected stop:	StopEvent	NumberOfResults=5, StopEv	None	N/A	CMTO/5T
CMTO	SE_004	Stop Event with PtMode filter	Providing timetable on selected stop:	StopEvent	PtModeFilter, NumberOfRes	PtMode=tr	N/A	CMTO/5T
CMTO	MP_001	MultiPointTrip request	Providing multiPointTrip	MultiPointTrip	NumberOfResults=1	None	N/A	CMTO/5T
STA	LIR_001	test-OJPLocationInformationRequest-Text-STA	Test each location to check whether i	LocationInformation	NumberOfResults: 300Inclu	None	N/A	STA
STA	LIR_002	test-OJPLocationInformationRequest-Text-STA	Test each location to check whether i	LocationInformation	NumberOfResults: 300Inclu	None	N/A	STA
STA	LIR_003	test-OJPLocationInformationRequest-Text-STA	Test each location to check whether i	LocationInformation	NumberOfResults: 300Inclu	None	N/A	STA
STA	LIR_004	test-OJPLocationInformationRequest-Text-STA	Test each location to check whether i	LocationInformation	NumberOfResults: 300Inclu	None	STA	N/A
STA	LIR_005	test-OJPLocationInformationRequest-Text-STA	Test each location to check whether i	LocationInformation	NumberOfResults: 300Inclu	None	STA	N/A
STA	LIR_006	test-OJPLocationInformationRequest-Text-STA	Test each location to check whether i	LocationInformation	NumberOfResults: 300Inclu	None	STA	N/A
STA	LIR_007	test-OJPLocationInformationRequest-Text-STA	Test each location to check whether i	LocationInformation	NumberOfResults: 300Inclu	None	STA	N/A
STA	LIR_008	test-OJPLocationInformationRequest-Text-STA	Test each location to check whether i	LocationInformation	NumberOfResults: 300Inclu	None	STA	N/A
STA	LIR_009	test-OJPLocationInformationRequest-Text-STA	Test each location to check whether i	LocationInformation	NumberOfResults: 300Inclu	None	STA	N/A
STA	LIR_010	test-OJPLocationInformationRequest-Text-STA	Test each location to check whether i	LocationInformation	NumberOfResults: 300Inclu	None	STA	N/A
STA	LIR_011	test-OJPLocationInformationRequest-Text-STA	Test each location to check whether i	LocationInformation	NumberOfResults: 300Inclu	None	STA	N/A
STA	LIR_012	test-OJPLocationInformationRequest-Text-STA	Test each location to check whether i	LocationInformation	NumberOfResults: 300Inclu	None	STA	N/A
STA	LIR_013	test-OJPLocationInformationRequest-Text-STA	Test each location to check whether i	LocationInformation	NumberOfResults: 300Inclu	None	STA	N/A




Results

Test Result											
General Result-ID	Date Tested	Time Tested	Test-Def-ID	Overall Status	Response		Service Available	Time [ms]	Complete	Correct	Comments / Notes
					Date Requested	Time Requested					
E0001	13.04.2022	09:05	LIR_001	Error	26.04.2022	11:15	yes	123	yes	no	number of returned Locations (17) did i
E0002	13.04.2022	10:05	LIR_001	OK	26.04.2022	11:15	yes	123	yes	yes	
E0165	10.08.2022	10:07:12	LIR_023	ERROR	10.08.2022	12:07:25	yes	3597	yes	no	with position [46.70306, 11.64627] and r
E0166	10.08.2022	10:09:16	LIR_024	ERROR	10.08.2022	12:09:20	yes	3603	yes	no	with position [46.46704, 11.32415] and r
E0167	10.08.2022	10:09:16	LIR_025	ERROR	10.08.2022	12:09:24	yes	3688	yes	no	with position [46.65082, 11.15541] and r
E0168	10.08.2022	10:09:16	LIR_026	ERROR	10.08.2022	12:09:29	yes	3846	yes	no	with position [46.70306, 11.64627] and r
E0169	10.08.2022	10:14:28	EPR_001	ERROR	10.08.2022	12:14:32	yes	3882	yes	no	expected Exchange Points Mals; Bahnh
E0170											with position Mals, Bahnhof/Malles, st; the ID is being tested (found 0 not in ra min=1);
	10.08.2022	10:14:54	EPR_002	ERROR	10.08.2022	12:14:57	yes	3738	yes	no	with position Mals, Bahnhof/Malles, st; the PlaceName is being tested (found range min=1);
E0171	10.08.2022	10:14:54	EPR_003	OK	10.08.2022	12:14:57	yes	3738	yes	yes	
E0172	10.08.2022	10:14:54	EPR_004	OK	10.08.2022	12:14:57	yes	3738	yes	yes	
E0173	10.08.2022	10:14:54	EPR_005	OK	10.08.2022	12:14:57	yes	3738	yes	yes	
E0174											with position Graun (I), See the PlaceN being tested (found 0 not in range mir
E0175	10.08.2022	10:14:54	EPR_007	OK	10.08.2022	12:14:57	yes	3738	yes	yes	
E0176	10.08.2022	10:14:54	EPR_008	OK	10.08.2022	12:14:57	yes	3738	yes	yes	
E0177											with position VERONA, Stazione Porta I the PlaceName is being tested (found

(first) Results

Requirements List (Active Systems)

Fullfillment	STA	SBB	Both
Yes	78	80	77
Partial	5	0	4+25
No	23	26	



Reason	Count
Wrong Assumption	1
Different Implementation	10
Implementation Planned / in Progress	5
Not Implemented	7
Other (e.g. performance)	6


- 106 Requirements
- Focus on initial working systems
 - Current fullfillment: 81%

(first) Results

Requirements List (Passive Systems)

Fullfill-ment	ARIA	CMTO	LUR	STA	SBB	VAO	ALL
Yes	47	43	49	44	45	53	29
Partial	0	0	7	3	0	1	28
No	10	14	1	10	12	3	0

Reason	Count
Not Implemented by all	10
Optional Requirement	7
Implementation Planned / in Progress	5
Wrong Assumption	1
Performance	5



- 57 Requirements
- Focus on initial working systems
 - Current fullfillment: 72,5%

(first) Results - Services

Number of defined tests

	LIR	TR	SER	EPR	MPTR
ARIA	4	4	2	2	0
CMTO	3	5	4	1	1
LUR	14	11	0	13	11
STA	26	6	17	22	1
SBB	n/a	n/a	n/a	n/a	n/a
VAO	17	12	1	3	2
Σ	64	38	24	41	15

Conducted tests

	LIR	TR	SER	EPR	MPTR	Σ
ARIA	4	6	4	2	0	16
CMTO	6	10	8	2	2	28
LUR	14	11	0	13	11	49
STA	312	54	46	256	8	676
SBB	n/a	n/a	n/a	n/a	n/a	n/a
VAO	17	13	1	3	2	36
Σ	353	94	59	276	23	805

LIR: LocationInformation; TR: Trip; SER: StopEvent; EPR: ExchangePoint; MPTR: MultiPointTrip

(first) Results - Services

LIR

	Avail-ability	Complete-ness	Correct-ness	Timeli-ness
ARIA	100%	100%	100%	5357,3ms
CMTO	100%	67%	67%	314,2ms
LUR	100%	100%	100%	n/a
STA	100%	100%	62%	4092,0ms
SBB	n/a	n/a	n/a	n/a
VAO	94%	100%	100%	225,6ms

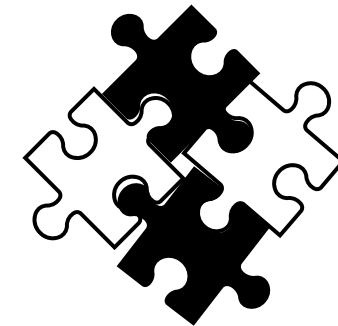
TR

	Avail-ability	Complete-ness	Correct-ness	Timeli-ness
ARIA	100%	100%	100%	382,4ms
CMTO	100%	70%	100%	1119,4ms
LUR	100%	100%	100%	n/a
STA	100%	100%	100%	12655,6ms
SBB	n/a	n/a	n/a	n/a
VAO	100%	100%	100%	644,5ms

LIR: LocationInformation; TR: Trip; SER: StopEvent; EPR: ExchangePoint; MPTR: MultiPointTrip

(first) Conclusion

- Distributed Journey Planning
 - It works, but there is still work to do
 - Implementation delays
 - Fully distributed approach
- Challenges on multiple levels
 - Data quality / availability
 - Complexity of the OJP standard / Implementation
 - Further development of the OJP standard



Thank you for your attention

BLIC

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