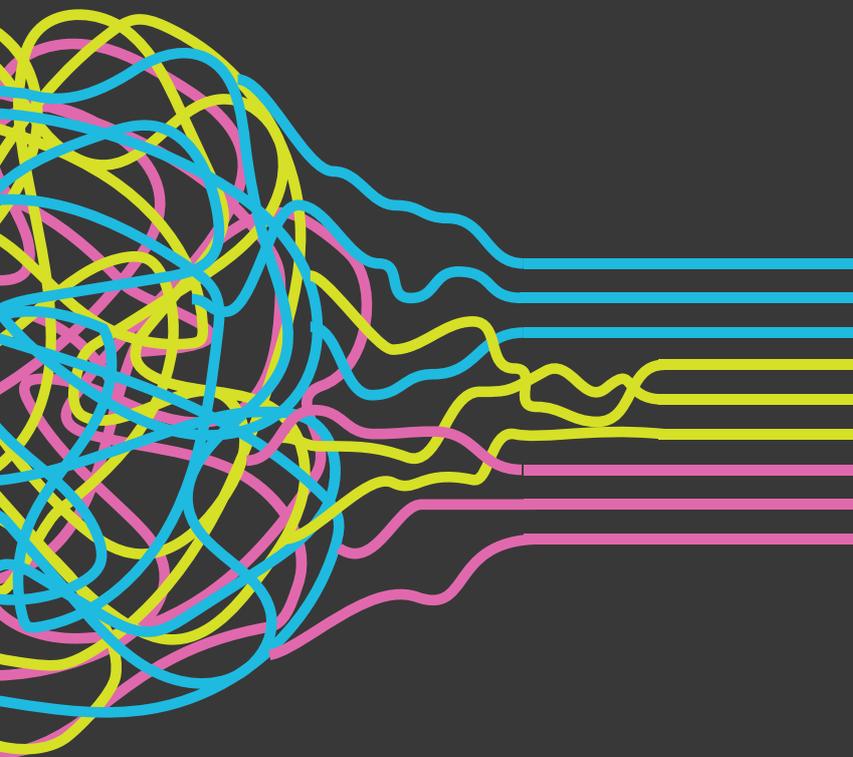


Data Science in Action

Enabling Telecom Services Provider
(TSP) Digital Transformation
Using Process Mining

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Abstract

Digital transformation has put the spotlight back on business processes. However the manual bottom up way of process discovery, modelling, conformance and enhancements, which is being traditionally followed by Telcos, is proving to be costly and time-consuming and is also vulnerable to human interpretation, subjectivity, lack of objective validation techniques.

In contrast, the data led 'process mining' initiatives can bring out the factual processes and all the variations therein and thus aid in an automated process discovery, conformance and enhancements, delivering significant benefits on coverage, accuracy, timelines, cost and Return of Investment (ROI).

Through this white paper we elaborate the evolution of process mining technique for digital transformation, its market potential, and multi-dimensional benefits that Telcos can accrue by leveraging this very powerful technique.



Introduction

Today's organizations employ a wide range of information support systems to support their business processes. Such support systems record and log an abundance of data, containing a variety of events that can be linked back to the occurrence of a task in an originating business process. These event logs are the foundation of an emerging field of process mining. These event logs facilitate extraction of operational process knowledge ("as it happens") and help to model and transform business processes. Process mining is increasingly being perceived to sit at the intersection of the fields of Business Process Management (BPM) and data mining.

Process mining is a rapidly emerging new field evolving primarily at the back of digital transformation initiatives undertaken by the organizations. Markets and Markets expects the global process mining market size to grow from USD 185.3 Million in 2018 to USD 1,421.7 Million by 2023, at a compound annual growth rate (CAGR) of 50.3% during the forecast period. The major growth factors for the market include the implementation of digital transformation that is driving users' awareness for analyzing and understanding business processes, and the advent of the algorithmic business.

Traditional Approaches to Transformation

There have long been a few fundamental challenges associated with business process transformation which are at the core of digital transformation that Telecom Service Providers (TSPs) have been following. But before we get on with the specific challenges and how TSPs are attempting to effectively overcome these, let's begin at understanding the prevailing approaches for the business process transformation.

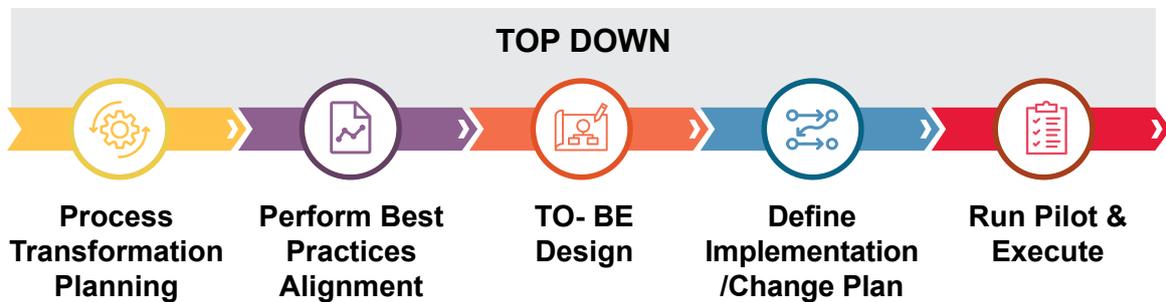
There are two competing and popular transformation approaches that telcos have been following—1) Bottom Up 2) Top-Down approach.

Traditionally the telcos have been heavily leveraging the Bottom Up approach of transformation which typically involves baselining “as-is” business processes, understanding as-is process performance, benchmarking against industry reference standards to identify the gaps and the extent of it and then re-engineering the processes to fix the identified gaps and measure the improved process performance through identified set of “to-be” performance metrics. This bottom-up approach involves a significant human touch in the sense that the “as-is” baselining is heavily dependent on the availability of process/operations related data and experts in the telco organization

Another popular approach with the telcos is that of a Top-Down process transformation, which has gained currency in the last decade or so primarily at the back of telco business process reference standards work that the industry bodies such as Tele Management Forum (TMF) have been doing. The top-down approach rests heavily on leveraging the process best practices as enshrined in industry reference standard process architecture developed by TMF, ITIL etc. and the operational benchmarking work of some of the leading consulting and analysts firms. Unlike bottom-up this approach advocates starting on a clean slate by not being entirely dependent on the “as-is” but rather taking the reference standards / Best practice processes as the starting point and then tailoring those to organizations requirements by taking inputs from the key in-house experts/practitioners. This approach as expected is relatively light approach in the sense that it doesn't impinge so much on telco stakeholder's time and other resources.

The pros and cons of each one of these approaches is listed in below table

Fig: 1 Competing approaches to transformation

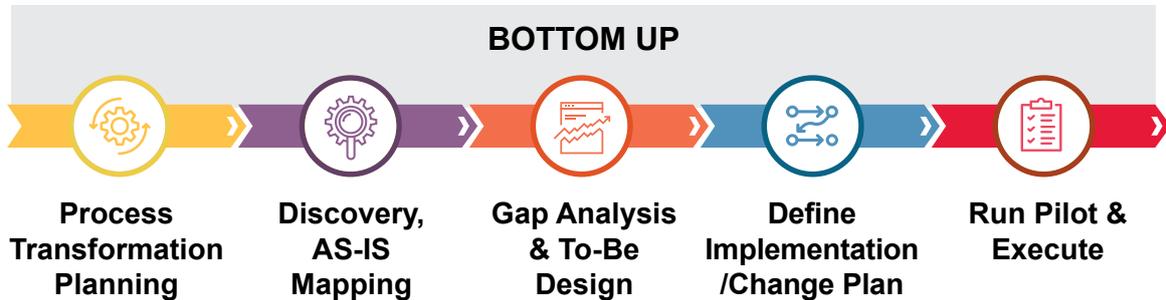


PROS

- › Shorter time to market to design, build and implement processes
- › Non intrusive (doesn't require direct & elaborate interaction with Operations on the floor but only with SMEs, Process Managers)
- › Best practice based 'outside in' approach

CONS

- › Clean slate approach. Tends to overlook 'As-Is'
- › Might require greater amount of organizational change management efforts due to quantum of changes involved



PROS

- › More participative 'inside out' approach
- › Current way of working is given due weightage in deciding future mode of operations
- › Change management efforts could be relatively less

CONS

- › Longer time to market to design, build and implement
- › Intrusive (requires deeper interaction with Operations, people on floor for discovery)
- › TO-BE process likely influenced by As-Is
- › Likely to be incremental in improvement approach
- › Direct interactions with Ops teams could be politically sensitive

Need For Process Mining Technique for “As-Is” Baselineing

Traditionally the telos have followed three different techniques to generate “as-is” mapping as well as gain insights on the business process operations. These are i) insights drawn from the documentation of processes, business rules, policies etc. ii) Stakeholders know how—involves interviewing key experts/practitioners to gain a practical understanding of the processes –all variants, happy and unhappy path iii) Process performance evaluation and continuous improvement through assessment of historical Key Performance Indicator (KPI) data.

However these techniques have their own set of limitations and are not fool proof in terms of being able to present a correct picture of the as-is working. Below table compares three “as-is” baselining techniques on the parameters such as coverage and accuracy, time to complete and Cost/ROI

Fig: 2 Comparison of process mapping techniques

Comparison Parameters	“As-Is” Process Baselineing Techniques		
	Process Documentation	Stakeholders Interview	Process Performance KPI Assessment
Coverage & Accuracy	Would be low if the documentation is outdated & incomplete especially around all variants and scenarios	Very subjective and entirely dependent on stakeholders knowledge and expertise of the processes.	Depends on the right kind of measures being deployed with “as-is” processes to gauge the process performance
Time to Complete Mapping of “As-Is”	Extra time would be needed if all the as-is scenarios are not fully documented	Could be longer time to complete if the key stakeholders are not available	Could be quick provided all the right KPIs are being measured in the “as-is” processes. If not new KPI definition & implementation could take longer
Cost/ROI	Cost would be low if the documentation is up to date else the cost would be higher to document as-is with minimal ROI	Cost would be higher to organize interviews with individual stakeholders over a period of time	Cost would be least of the data is in order else setting up the data and KPIs could escalate the cost and delay ROI

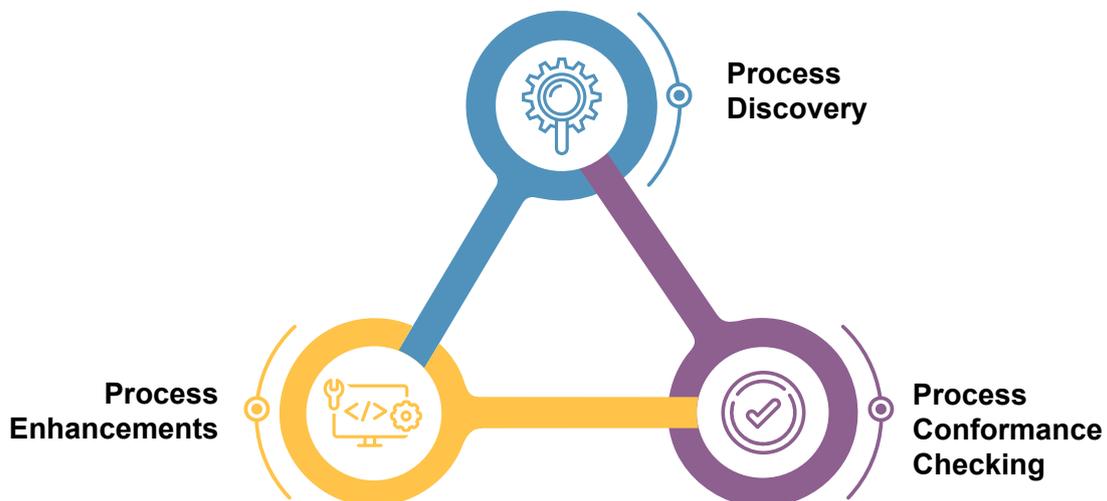
As can be seen from the table, these techniques with their inherent limitations pose serious practical challenges (coverage/accuracy, time to complete, cost/ROI) which could hamper “as-is” process baselining activity leading to serious consequences in terms of efficacy and effectiveness of process transformation.

In summary, Telcos have always been looking for an effective and efficient option to baseline “as-is” processes without involving too many of their operational stakeholders and process experts in the process and also ensuring optimum coverage, accuracy, time to market, cost and ROI.

Enter Process Mining

Process Mining is an automated process discovery and analysis technique that aims to discover, monitor and improve real processes (vis-a-vis assumed) by extracting knowledge easily from available event logs in the systems of current information of an organization. Automated process discovery, process conformance check and process enhancements are the three key use cases of process mining. The conformance checking is about an organization wanting to validate how closely the real-life execution of the process conforms to a documented model. This technique can be applied to a variety of model types including organizational models, business rules and procedures. The key objective of process enhancements is to enrich an existing model by adding extra information about bottlenecks, deviations, throughput times, etc.

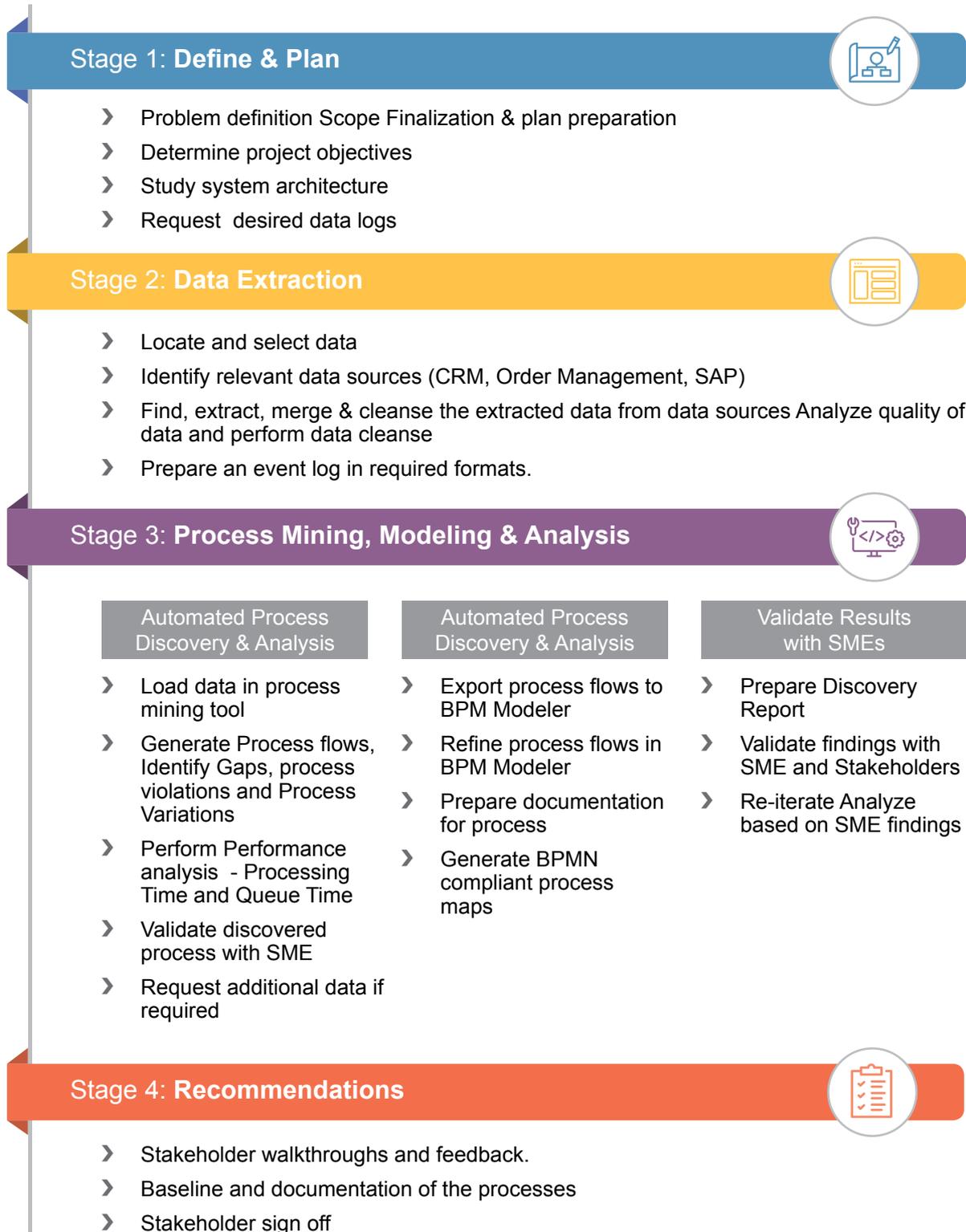
Fig: 3 Key use cases of process mining



At a conceptual level process mining is really about bridging the gap between traditional process model analyses involving simulation, verification etc. and data oriented analysis using the real data and consisting of data mining, machine learning etc.

The critical differentiator between traditional process mapping and automated process discovery based on data mining technology is the distinction between 'subjectivity' associated with the traditional process mapping and objectivity in visualizing factual processes using process mining techniques. Process Mining uses automation to extract process models from organizational databases. It is exclusively concerned with verifiable data logs, providing an accurate picture of how processes factually perform. The methodology for process mining led automated process discovery, conformance and enhancements (using predictive analytics) is as depicted below

Fig: 4 Process mining, modelling methodology



The key data requirements for process mining led process discovery are as below:

Case ID, Activity, and Timestamp. These three elements allow you to take a process perspective on the data



Case ID:

A case is a specific instance of your process. What precisely the meaning of a case is in your situation depends on your process. For example: In a purchasing process, the handling of one purchase order is one case



Activity:

An activity forms one step in your process. For example, a document authoring process may consist of the steps 'Create', 'Update', 'Submit', 'Approve', 'Request rework', 'Revise', 'Publish', 'Discard' (performed by different people such as authors and editors).



Timestamp:

The third important prerequisite for process mining is to have at least one timestamp column that indicates when each of the activities took place.

- A start and a complete timestamp for each activity in the process. It allows to analyze the processing time of an activity and waiting time between two activities.
- Just one timestamp then only the time between two process steps can be analyzed, but will not be able to see how long each of the activities took



Other Columns:

Additional columns may be available to be included for the process in consideration. Such additional attributes provide context and can be used in the analysis as well. Which attributes are relevant for you depends on your domain and use case. For Example: What kind of product the service request in a call center was about (or the order in a sales or repair process). Include this attribute if you want to compare the performance for different product categories.

A Typical event log example for purchasing process is depicted below with every row of the table being an event

Fig: 5 Typical event log example

Case ID	Start Timestamp	Complete Timestamp	Activity	Resource	Role
339	16-02-2011 14:31	16-02-2011 15:23	Create Purchase Requisition	Nico Ojenbeer	Requester
339	17-02-2011 09:34	17-02-2011 09:40	Analyze Purchase Requisition	Maris Freeman	Requester Manager
339	17-02-2011 21:29	17-02-2011 21:52	Amend Purchase Requisition	Elvira Lores	Requester
339	18-02-2011 17:24	18-02-2011 17:30	Analyze Purchase Requisition	Heinz Gutschmidt	Requester Manager
339	18-02-2011 17:36	18-02-2011 17:38	Create Request for Quotation	Francis Odell	Requester Manager
339	22-02-2011 09:34	22-02-2011 09:58	Analyze Request for Quotation	Magdalena Predutta	Purchasing Agent
339	22-02-2011 10:50	22-02-2011 11:03	Amend Request for Quotation	Penn Osterwalder	Requester Manager
339	28-02-2011 08:10	28-02-2011 08:34	Analyze Request for Quotation	Francois de Perrier	Purchasing Agent
940	17-05-2011 06:31	17-05-2011 07:08	Create Purchase Requisition	Immanuel Karagianni	Requester
940	17-05-2011 09:58	17-05-2011 10:06	Create Request for Quotation	Esmana Liubiata	Requester
940	18-05-2011 19:30	18-05-2011 19:56	Analyze Request for Quotation	Francois de Perrier	Purchasing Agent
940	18-05-2011 23:46	18-05-2011 23:59	Send Request for Quotation to Supplier	Magdalena Predutta	Purchasing Agent
940	19-05-2011 03:44	19-05-2011 08:31	Create Quotation comparison Map	Francois de Perrier	Purchasing Agent
940	19-05-2011 15:38	19-05-2011 15:52	Analyze Quotation comparison Map	Kim Passa	Requester
940	19-05-2011 15:52	19-05-2011 15:52	Choose best option	Anna Kaufmann	Requester
940	20-05-2011 23:31	21-05-2011 09:22	Settle conditions with supplier	Magdalena Predutta	Purchasing Agent
940	21-05-2011 18:48	21-05-2011 18:59	Create Purchase Order	Francois de Perrier	Purchasing Agent
940	22-05-2011 11:33	22-05-2011 11:44	Confirm Purchase Order	Esmeralda Clay	Supplier
940	23-05-2011 05:32	24-05-2011 13:46	Deliver Goods Services	Esmeralda Clay	Supplier
940	24-05-2011 20:59	24-05-2011 21:00	Release Purchase Order	Kim Passa	Requester
940	26-05-2011 07:41	26-05-2011 07:42	Approve Purchase Order for payment	Karel de Groot	Purchasing Agent

●
Case ID

●
Timestamp

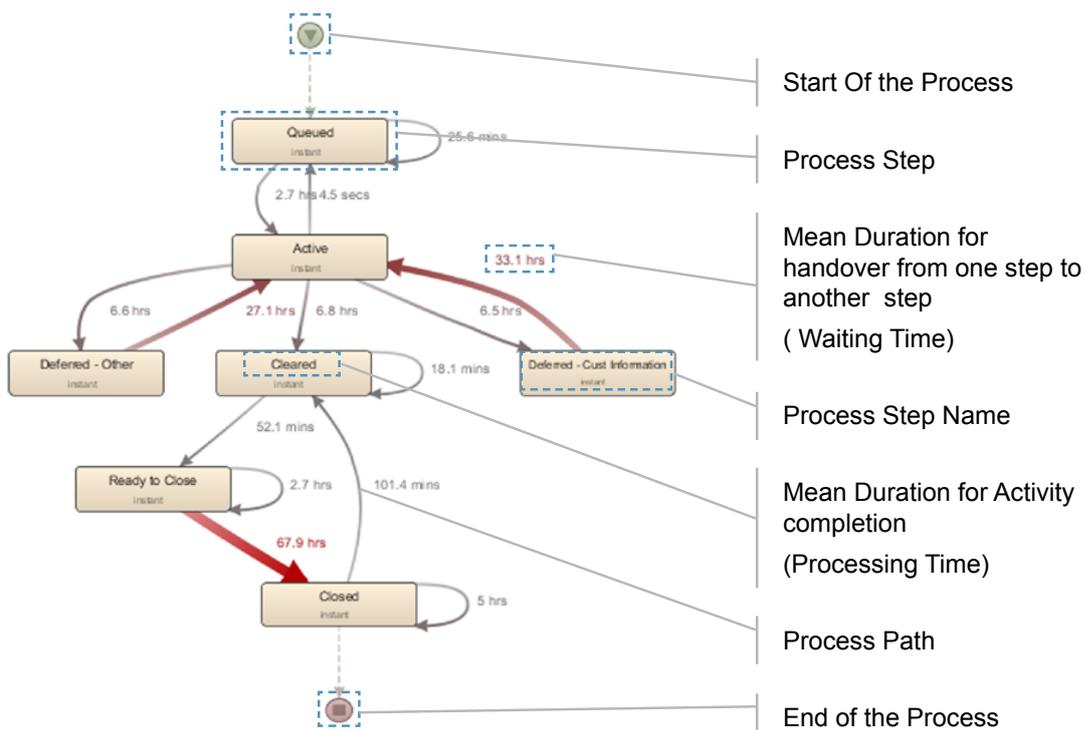
●
Activity Name

Below diagram illustrates how to decipher a typical process diagram generated through process mining technique

Automated process discovery can help generate three different types of process views: end to end process model view, the performance view and the organisation view.

Performance View focusses on long running processes, taking longer than stipulated time to complete and focusing on the bottlenecks to find where and what is delaying the process

Fig: 6 Performance View of Mined Processes



Enhancing the discovered process

Discovered process can be enhanced based on following sample questions—

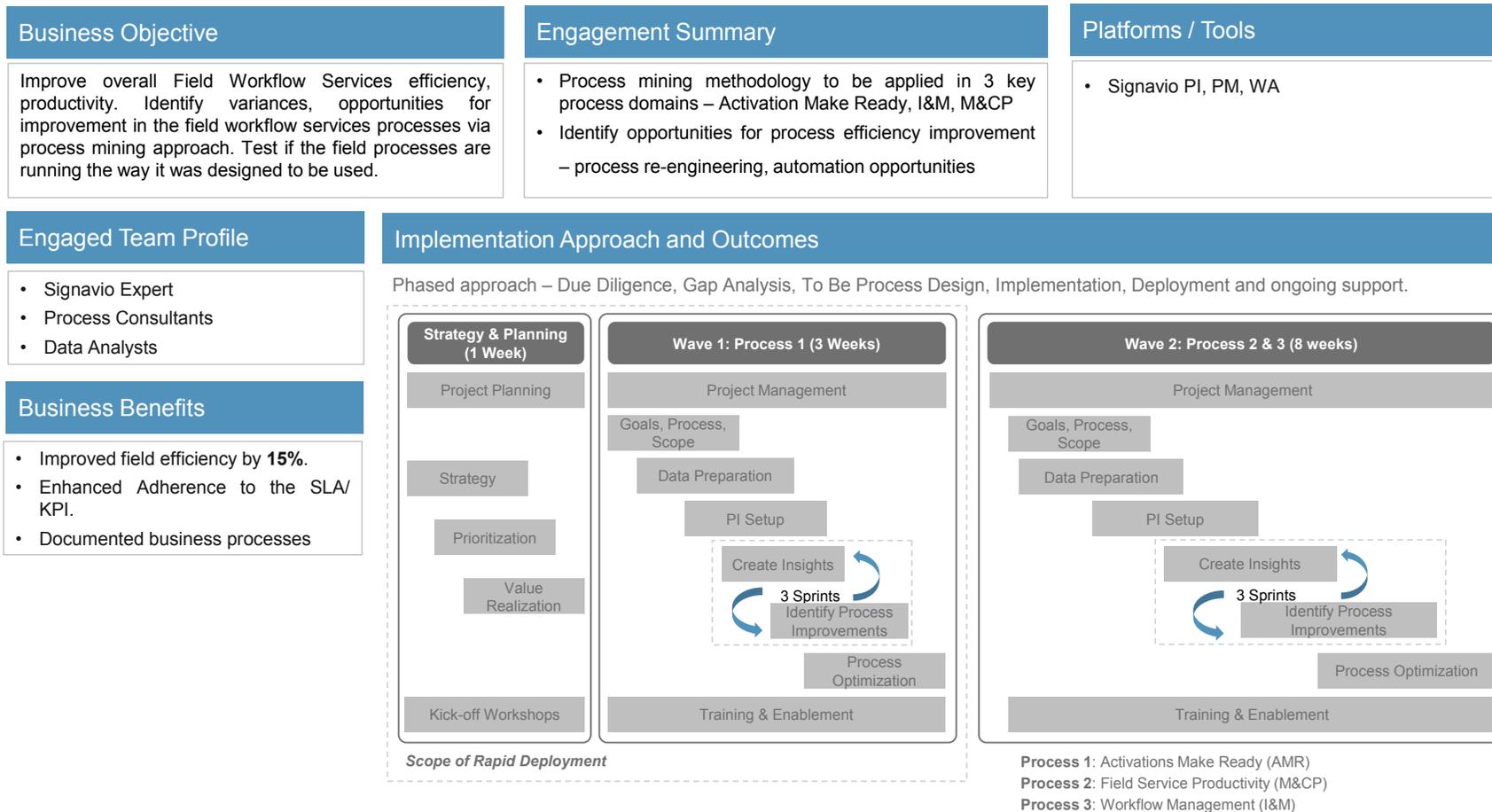
What is the most common happy path process?

What are the unhappy paths (variants) taken by the process?

What is the level of automation (vis-à-vis manual handling) in the process?

Where are the bottlenecks in the process causing delays, quality, cost and compliance etc.?

Illustration with telco process



Summary

The benefits of using process mining are manifold. Some of them are as listed below

- Understanding the real process as it is actually performed (complete overview, objective picture, more focused and evidence-based discussions) in real-life.
- Improving the process flow by knowing the actual flows, frequencies, and delays in the process (this real-life information helps in decreasing variance and increasing efficiency; understanding where the bottlenecks are).
- Employee productivity improvement and non-value add reductions leading to cost savings.
- Risks mitigation by better role authorizations.
- Reducing overhead and improving the service level target for the overall process completion time.
- Better Management, tracking and control of outsourced processes to understand what is happening there with the outsourcing partner.
- Harmonizing processes in different regions (understand how people work in different ways to see what the best practices are and to align processes).
- Increasing the level of maturity in a process to enable outsourcing for further cost savings and improvements.
- Improving the quality and increasing the efficiency of auditing by verifying that prescribed processes are followed.
- Verifying that implemented process changes have had the expected effect by comparing the old process to the new process (objective comparison to see whether new is actually better, avoid that people slip back into old patterns).

Given its potential and current popularity, many experts believe Process Mining techniques will soon replace Business Process Management (BPM) tools and techniques. Our considered view is process mining indeed emerging as a serious threat to BPM, upending BPM is unlikely to happen in the near term for two reasons. While the existing tools like Celonis, Disco, and Signavio etc. are still in infancy, and invested in adding to their capabilities, the established BPM players like Software AG are enhancing process mining capabilities of their tools thus posing a serious challenge to the new entrants. By making BPM more data-driven, the existing BPM players are becoming more responsive to operator needs today, and are taking serious strides in terms of identifying and remedying process issues for their customers. The second impediment is about the lack of understanding of Process Mining and availability of the right data science skills within most organizations. The skills and knowledge required for embedding Process Mining within BPM are not readily available within teams that would usually be tasked with delivery process improvement.

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