Smart Work Order

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Abstract: **Smart work order (SWO) is a technology-driven approach that utilizes augmented reality (AR) smart glasses and knowledge management data base (KMDB) to improve field services (FS). A work order (WO) is a specific job, repair, or any other FS team's physical activity. SWO leverages identified opportunities for automating operations in the field. It makes use of machine learning and artificial intelligence (ML/AI) processes to access knowledge captured in KMDB and generates options for improved hardware repair, installation management, or predictive maintenance. Consequently, the efficiency and sustainability of field services and work orders are raised due to shorter time to deliver, lower travelling costs and less rework required. SWO developed in Ericsson Nikola Tesla Group (ENTG) is configured by augmented reality technology, and machine learning algorithms supported by ITILv4 best practice framework where each SWO part creates added value in the field services chain. Additional integration with operations wisdom logging (OWL) toolset empowers FS team members with advanced knowledge in daily work. All SWO parts can access real-time data which enables FS teams to utilize knowledge management systems to determine first-time right actions. SWO automatically generates all required steps which walk FS teams through required actions, from capturing an alarm, over identifying the problem, finding a solution, and visualizing required actions to confirming the problem has been cleared up.**

Key Words: smart work order, augmented reality, knowledge management, field services, real-time data, smart technology, green technology

I. INTRODUCTION

Smart work order (SWO) has been developed in Ericsson Nikola Testa Group to enable field service operations (FSO) teams to maximize the value and efficiency of their daily work. The mission of field service operations process [1] is to leverage predictive field service management capabilities which enable delivery of field services even before a fault arises.

Field service operations process defines the execution of on-site activities related to predictive, preventive, and corrective maintenance, or deployment of new functionalities in the customers' ICT infrastructure at any of their locations. The main objective of SWO is to utilize augmented reality (AR) capability throughout the operations to empower operators by enhancing their digital efficiency, which supports operations cost reduction, enhanced productivity, and high-class customer experience.

To support smart work order functionalities the Ericsson Nikola Tesla Group's solution integrates two main platforms: augmented reality modeling support (ARMS) and information technology service management (ITSM). ARMS is a mixed reality platform developed in ENTG which uses Microsoft's HoloLens for augmented reality together with virtual reality to deliver powerful tools for daily installation engineering, hardware support, space construction work and learning. ITSM as a complete IT operations and automation tool suite that supports and enables Ericsson's IT managed services business. Ericsson's ITSM tool suit is based on ITIL [2] where ITSM is implementation and management of quality IT services that meet the needs of the business. Ericsson's ITSM uses internally developed process engine for actively moving any incident, problem, change or other request rapidly through the key process steps stipulated by the service level agreement (SLA) according to the ITILv3 best practices framework. The integration of those two platforms ensures end-to-end data and process flow, starting with collecting alarms about issues on field hosted equipment, and identifying faults via monitoring and comparison with already captured known errors. The next crucial step is to find a suitable solution for a fault where ITMS internal engines search through the knowledge database and generate a work order with specified series of steps, such as tracking down equipment location, the execution of fix actions and verifying the fault resolution.

There are two main SWO guiding principles for design: making smart AI/ML driven decisions and sticking to the green technology to reduce the human impact on the environment. SWO solution design supports multiple types of field service operations (FSO) work orders for administrative, corrective, planned or preventive activities. ML/AI concept based on predefined events and user profiles can enable synergy between SWO and Operations Wisdom Logging (OWL) [3], enabling additional value to customer experience during node or equipment maintenance. OWL toolset is based on ITIL best practices and integration with ITSM key components, such as configuration management data base (CMDB) and KMDB. All relevant information can be extracted from already available configuration, the known error and knowledge management database or provided via ARMS to field support people. Such approach is very beneficial when the customer does not have local field support nor suitable technical knowledge how to handle faults on any equipment. The major benefit is the reduction of travelling costs as with SWO delivered on HoloLens the remote support can be easily and quickly executed without the need for FSO employees to travel to the site. Since every

FSO employee's business trip includes varied means of transportation, from cars, over buses, to airplanes, SWO can be considered environmental-friendly technology as the implementation and use of SWO in the field reduces the need to travel and thus reduces carbon emissions from transportation.

II. PROBLEM STATEMENTS

Work order is a specific job, repair or any other physical activity executed by a field support team. This includes all the activities required to manage and execute on-site services for end-customer. To achieve full field operation support delivery there are common communication requirements. A field support team needs to communicate frequently with subject matter experts (SME) to resolve faults or possible issues which occur on field equipment. As telco or IT equipment is specific and requires certain operations knowledge for problem resolution, any troubleshooting or resolution problem session may require one or more SMEs to travel to the site.

A frequent problem which FSO team members meet is how to organize ad-hoc travel when hardware or any other type of fault occurs on site equipment requiring manual intervention. The last-minute travel arrangements not only incur significant travelling cost, but also come with a possibility that suitable transport and accommodation are not available at the required moment. Additionally, some world countries require a visa and additional approvals which can take days.

The second issue is the time to resolve the problem which is defined by the service level agreement (SLA) and the key performance indicators (KPI) as mean time to repair (MTTR) and mean time to restore the service (MTRS) [4]. Once a fault occurs on the equipment, the time measuring starts, and every operations team needs to meet the requirements of the signed SLA. In case ad-hoc travelling arrangements cannot be organized promptly, any delays may cause missing KPI targets, which has a negative effect on operations team's efficiency.

The third issue which FSO team members may experience is lack of on-site equipment details, like the exact location, physical position in the data center and in the rack. Also, data about the type of the equipment or previous faults, errors and work orders executed by other operations teams in the past may be missing. In this case work order rejections are mainly due to insufficient information, incorrect information or wrongly created work orders, which generates significant but unnecessary operational costs.

The fourth problem, and that is the one that has the most impact on an operations team, is utilization of SME and FSO team members. While they travel, team members are not utilized as they do not have available nor appropriate working conditions to work remotely, for example during the flight, while changing transports or during any other travelling activity.

Every operations organization tries to optimize the combination of all issues with properly defined processes and measures their overall efficiency and effectiveness. The performance standards and specifications must be met by efficient delivery of services with respect to time, cost, quality, and other parameters to satisfy the customers and stakeholders. Smart work order combines tools and platforms which operations teams can use to undertake daily operations activities with a reduced risk of missing information and with operations cost reductions. SWO can be used for on-site equipment route optimization, as it helps find the fastest way to reach the target equipment, intelligently schedules preventive maintenance or real time status update, etc.

III. SWO ARCHITECTURE DESCRIPTION

SWO architecture integrates two main platforms, ARMS and ITSM which both consist of different modules exchanging data in real time. The key ARMS and ITSM components of SWO integrations are the following:

- ITSM monitoring module
- ITSM configuration management data base
- ITSM known error data base
- ITSM knowledge management data base
- ITSM Zabbix-ARMS media type connector
- ARMS message gateway
- ARMS work order.

A) *ITSM monitoring module*

ITSM monitoring module is based on Zabbix open-source solution [4]. The principal metrics from end equipment are collected via Zabbix proxy component by the means of its own Zabbix agent, or standard monitoring protocols such as simple network management protocol (SNMP) and intelligent platform management interface (IPMI).

Zabbix, an open-source enterprise grade network monitoring system solution, is integrated with ITSM tool suit as a core component. The use of Zabbix in large and distributed IT environments provides reliability, scalability, and flexibility, regardless of it being a standalone, or integrated solution.

B) *ITSM Configuration Management Data Base*

ITSM's configuration management data base (CMDB) has been build based on IT best practices according to ITILv3 Service Transition [5]. CMDB is a repository that acts as a data warehouse for information technology installations. It holds data relating to a collection of IT assets. CMDB is a series of tables used to keep track of the state of assets such as products, computers, systems, software contracts and licenses, devices on the network, facilities, and people as they exist at specific points in time, as well as the relationships between such assets. CMDB contains and records data called configuration items (CI). It also provides details about the important attributes of CIs and the relationships between them. In the context of ITILv3 standard the use of CMDBs is a part of infrastructure operations and support, defined as a set of tools and databases used to manage IT service provider's configuration data, and information about incidents, problems, known errors, changes and the release. For every CI that is created the federation process into Zabbix monitoring system is mandatory. An item is fully configured when the relation with a CMDB CI is defined, for example, when the type of the host group, IP address and similar IT CI attributes are specified. Zabbix and CMDB federation will ensure that all configured alarms and events are properly mapped to the appropriate CMDB CI, in our case study, any physical equipment hosted in the field.

C) ITSM known error data base

Known error database (KEDB) contains all known error records identified by operations teams in previous fault events. This database is created by problem management and used by incident and problem management. The KEDB is a part of ITSM knowledge management system and ITSM service operation problem management process [6]. The term "problem" refers to the unknown cause of one or more incidents. Problem management consists of two major processes: reactive or proactive management. Reactive problem management is generally executed as part of service operations daily business and proactive problem management is usually initiated by service operations as part of continued service improvement [7]. Smart work order leverages all existing captured knowledge and provides summarized relevant information for any problem resolution. The main intention of SWO is to recognize potential events which may become an incident as error or fault that occurred on the maintained equipment.

The problem management process starts with the event and incident management. Once the problem is detected by the local operations team or proactively, the evaluation of incident patterns and alerts takes place. Due to the event management a full historic record of incidents exists. Then the problem is moved to the next phase where it is diagnosed and investigated in detail by the operations team. Once the solution of the problem has been defined and actions to restore service are successful, the problem is considered solved. The key step before the problem is closed is to log it into the error record. In this way all relevant details about the problem will be captured and used for the future operations and maintenance support. In case of SWO the KE details will be used to identify history incidents for specific CI, explore KMDB with the existing knowledge items and map a list of actions which will be used for problem resolution. The list of action will be used by ARMS message gateway to send detail instructions via HoloLens on how to fix the problem.

In next step, integrated CMDB, KMDB, problem management with SWO and OWL [3] provide the information that answer who, what, when, where and how questions, with reference to the performed or required actions.

D) ITSM knowledge management database

Knowledge management data base (KMDB) is responsible for maintaining the total body of knowledge within the service management organization. To deliver service successfully, it is necessary that relevant knowledge is captured, organized, and made available to all with a need-to-know technical details. ITSM knowledge management supports the process of authoring, updating, searching, collecting, organizing, structuring, and sharing the knowledgebase in an IT organization. For successful KEDB and KMDB integration it is mandatory that CMDB CI are federated within ITSM platform. To ensure accurate and up-to-date knowledge about fault resolution, there are knowledge analyst and knowledge reviewer roles where users with those roles needs to align their content with operations, L3 support teams or any other members who have worked on the problem resolution. Clear fault resolution instructions for each CI form a key prerequisite for successful SWO creation. Fault resolution instructions come in the form of a list of actions which are already verified and confirmed as a problem solution, and they will be sent to ARMS message gateway. Complete SWO process depends on accuracy of all CMDB and KMDB data as they will end up as instructions on HoloLens screen and be used by FSO engineer during the fault resolution action.

E) ITSM Zabbix-ARMS media type connector

Owing to Zabbix Media Type facility plug-in system, and configurable actions, alert and recovery operations messages can be distributed according to company defined rules among different responsible departments - network, systems infrastructure, applications, security.

The purpose of the media type connector is to route all events of hardware type which demand field engineer intervention on ARMS message gateway.

The plugin written in Python is defined in Zabbix as ARMS message gateway media type. This media type is bounded to HoloLens action type which uses groups of hosts and portable operating system interface.2 (POSIX.2) regular expressions to cover all hardware events. Zabbix is feeding Python based plugin with all relevant parameters about the location, equipment, IP address and other attributes during the new event processing phase and instructing it to deliver this message as JavaScript object notation (JSON) structure to ARMS message gateway for further data enrichment in KMDB and a work order creation.

With this approach, the monitoring component of the ITSM triggers recovery and fix procedure of the problem as a smart work order creation.

F) ARMS message gateway

The ARMS message gateway is an integral component of the SWO, and it serves as the API endpoint for data transfer between Zabbix and KMDB hosted in ITSM and ARMS work order. The ARMS message gateway is implemented using the C# programming language and

.NET 6. ARMS message gateway is using the standard hypertext transfer protocol (HTTP/HTTPS protocol) for its own message management. ITSM Zabbix-ARMS media type connector is therefore implemented as HTTP(S) client for the event and alarm message delivery. The ARMS message gateway is a centralized repository of information that contains all the information related to issues and their resolution, including the issue name, location, description, status, and steps required to resolve it.

The ARMS message gateway operates through a set of defined flows. When ITSM signals an event, the ARMS message gateway merges the event with the resolution data from the KMDB and stores the information in the ARMS database called ARMS open SWO queue (AOSQ). When ARMS work order requests information on a specific event, the ARMS message gateway retrieves the event and its resolution data from AOSQ database, enriches the original JSON structure received from ITSM Zabbix-ARMS media type connector with KMDB resolution and returns it to the client in the same session.

G) ARMS work order

The ARMS work order is a comprehensive solution that leverages both augmented reality (AR) technology and knowledge management (KM) to streamline the issue resolution process for Ericsson field services. The solution was designed specifically to assist field service engineers on site, providing them with an intuitive and interactive AR interface to resolve issues quickly and efficiently. Utilizing the latest AR technology, the solution seamlessly integrates virtual and real-world elements, providing a unique and engaging experience for the engineers.

The ARMS work order solution is developed using the C# programming language and the Unity3D engine, which is a leading game engine and platform for creating 3D and 2D interactive experiences. The solution has been developed using the Unity3D engine due to its versatility, scalability, and ability to create high-quality AR experiences, making it the perfect fit for the ARMS work order solution.

The solution runs on the Microsoft HoloLens 2 device, providing field service engineers with a hands-free AR interface to interact with. One of the key benefits of AR HoloLens device is that it leaves field engineers with free hands to access faulty equipment, for example to climb to different heights and then to execute any manual work on the equipment. The workflow starts with a field engineer scanning a QR code v2 placed in a physical room. QR code v2 is about 7,000 alphanumeric characters which is sufficient to store all relevant information about the room. QR code retrieves the related issues from the ARMS message gateway. After the successful QR canning, a virtual space is then calculated where ARMS work order solution contains a 1 to 1 copy of each physical room's layout recorded in digital format. This digital representation of each physical room enables the solution to accurately detect the location of the engineer and presents the required steps to resolve the issue in AR view.

As the engineer moves to the area near the issue, the solution detects their presence and begins to present the steps on HoloLens as AR windows required to resolve the issue. The engineer can mark each step as finished, and in the end, signal the ARMS message gateway to resolve the issue.

IV. SWO USER EXPERIENCE

The target audience for smart work order are teams working within field service operations. Based on the scope of FSO teams there are different types of work orders, such as:

- administrative and site engineering maintenance as site surveys, audits, inspections.
- corrective and preventive maintenance with changes on the equipment due to the identified faults, equipment installation, acceptance of services.
- planned maintenance activities which are required to be scheduled in advance as hardware replacement.

This chapter will cover HoloLens user experience for administrative maintenance during the site engineering and corrective maintenance actions. Site engineering is the process of installing new hardware equipment in a field which can be any remote location in a different town or country. The role of the subject matter expert is the most important during this process. He is responsible for every part of the equipment installation. SME is required to create the site installation documentation that contains all blueprints related to the installation. During the creation of the documentation, it is important to include the equipment installation in the cabinets, the connections between the equipment, the power supply, and the cooling of the room. All these inputs need to be documented and stored in CMDB as CI to fully understand the relationship among them.

To start working on the documentation, SME previously had to visit the site location to get an insight into all aspects of the installation issues. Now, owing to HoloLens we can do a site survey remotely. Instead of sending SME to the remote location HoloLens can be used by any FSO or non-FSO personnel located at a remote site. During the site survey, SME, who is located at the central service delivery spot, communicates with the FSO team member who is on the site via HoloLens using the ARMS application. ARMS allows SME to see the situation at the location in real time and to get the necessary information that will help him in creating the documentation.

Both, SME and FSO team member can make a complete analysis that will later be used for the creation of the documentation and CIs in CMDB. Using the ARMS application, which measures the dimensions of the room, SME is receiving information about where to place equipment cabinets, cooling systems, power supply and how much cable length is needed. With all the above information, they are ready to create the documentation and prepare CI attributes for CMDB update. CMDB data accuracy is key for any future maintenance and operations.

After the installation of the hardware equipment has been completed, SME is responsible to perform the final part of the site survey: they will check whether everything has been done correctly as specified in the documentation. At this moment HoloLens will be used by FSO under remote SME surveillance. During this activity, SME is using the ARMS application implemented inside the HoloLens and can see in the real time whether all equipment installation actions have been done correctly according to the documentation. At the end, through the communication with the FSO team member using the ARMS application SME can get all the answers he needs related to the site survey.

There are many major benefits of ARMS usage identified by end users: significantly reduced travelling cost, reduced MTTR and MTRS times, increased customer delivery and operations satisfaction and very promising return of investment (RoI).

SME's trip to the remote location in the field includes increased costs caused by travel and accommodation. Usually, a person travelling to the location generally spends 80-90% time on the trip. By using the ARMS HoloLens solution, the mentioned disadvantages are eliminated. Travelling cost and time reduction may vary from case to case, depending on the field support service KPI and agreement. Many cases can be identified; however, we will describe three different characteristic scenarios to review travelling cost and resolution time reduction. All cost defined in below scenarios are illustrative to support cost calculation examples.

Scenario 1

The remote site with equipment is in the same county but geographically dislocated from FSO or SME's central location. Once a problem on the equipment occurs and work order is created SME needs to travel by public transport or car to remote location between two and five hours.

TABLE I. Scenario 1

SME Activities	Related cost	Time/average
From SME office to remote location by car	40 €	3,5 hours
Problem resolution – men/hour rate	100 €	1 hour
From remote location to SME office/home	40 €	3,5 hours
Total	180 €	8 hours

Local person activities	Related cost	Time/average
SME remote assistance/optional – m/h	100 €	1 hour
Problem resolution by local person – m/h	40 €	1 hour
Total	40-140 €	1 hour

Table 1. shows the list of SME activities where they need to travel around 3,5 hours to the remote location by car. After arrival, they will spend 1 hour to resolve the problem and return to the office or home. During the scenario 1 activities, which last one working day, SME will not be utilized 87,5% of his working time as during the traveling time they cannot be used for any other business activity. In this case, MTRS is around 4,5 hours after the info about the problem has been received and a work order created. The alternative way is to use SWO where the list of problem resolution activities will be sent to ARMS HoloLens and performed by local staff in the field with the hosted equipment. In this scenario, the local staff requires only HoloLens and does not need to be SME or equipment domain knowledge expert to resolve the problem as SWO will provide the list of required actions to fix the problem. Usually, local staff men/hour (m/h) rate cost is significantly lower than SME m/h rate. This way SME can be optionally used to support the local person and SME will not have any gaps in utilization. MTRS time is within 1 hour after the info about the problem has been received.

Scenario 2

The remote site with equipment is in different country from FSO or SME's central location. SME requires a suitable transport to reach the remote location as soon as possible to meet service KPI. The transport includes taxi and plane with one connection flight. SME's business trip includes one night in the hotel and travel allowance.

TABLE II. Scenario 2

SME Activities	Related cost	Time/average
From SME office to the airport by taxi	30 €	1 hour
Connection flight 1	210 €	2 hours
Connection flight 2	190 €	2 hours
From airport to remote location by taxi	40 €	1 hour
Problem resolution – men/hour rate	100 €	1 hour
Hotel accommodation – 1 night	100 €	12 hours
From hotel to airport by taxi	30 €	1 hour
Return connection flight 1	190 €	2 hours
Return connection flight 2	210 €	2 hours
From the airport by taxi to SME office	30 €	1 hour
Total	1130 €	25 hours

Local person activities	Related cost	Time/average
SME remote assistance/optional – m/h	100 €	1 hour
Problem resolution by local person – m/h	40 €	1 hour
Total	40/140 €	1 hour

Table 2. shows the list of SME activities where they need to travel to a different country by taxi and plane to reach the remote location as soon as possible. During this travel they will have connection flights as direct flight may not be available. After the arrival they will spend 1 hour to resolve the problem and return to the hotel for one night as there are no available return flights. During scenario 2 activities, which last 2 working days, SME will not be available most of his working time as travelling time cannot be used for any other business activity. In this case, MTRS time is minimum 6 hours, depending on public traffic and airport conditions after the info about the problem has been received and a work order created. The major factor in scenario 2 is a significant cost increase due to SME's travel activities. The alternative is to use SWO where a list of problem resolution activities will be sent to ARMS HoloLens and performed by the local staff in the field with the hosted equipment. This option is the same as in scenario 1 where MTRS time is within 1 hour after the info about the problem has been received without loss of SME working time utilization.

Scenario 3

The remote site with equipment is in a different country which has restricted entering country process and includes visa approval. Visa application and approval at the embassy may last minimally 1-2 days, depending on the country and emergency visa process.

TABLE III. Scenario 3

SME Activities	Related cost	Time/average
Embassy visa application process	100 €	24 hours
From SME office to the airport by taxi	30 €	1 hour
Connection flight 1	210 €	2 hours
Connection flight 2	190 €	2 hours
From airport to remote location by taxi	40 €	1 hour
Problem resolution – men/hour rate	100 €	1 hour
Hotel accommodation – 1 night	100 €	12 hours
From hotel to airport by taxi	30 €	1 hour
Return connection flight 1	190 €	2 hours
Return connection flight 2	210 €	2 hours
From the airport by taxi to SME office	30 €	1 hour
Total	1230 €	49 hours

Local person activities	Related cost	Time/average
SME remote assistance/optional – m/h	100 €	1 hour
Problem resolution by local person – m/h	40 €	1 hour
Total	40/140 €	1 hour

Table 3. shows the list of SME activities where they need to travel to a different country which has restrictive entering process. In this case, travelling preparation starts with a visit to the embassy to apply for a visa. The visa approval process may vary from country to country and is an uncertain process where the visa may not be approved. During the scenario 3 activities which take 3 working days minimally SME will not be utilized most of his working time as during travelling arrangement actions they cannot be used for any other business activity. In this case, MTRS time is minimum 30 hours, depending on the visa approval process after the info about the problem has been received and a work order created. The travelling cost is additionally increased. The alternative to SME activities is the same as in the scenarios 1 and 2 where local staff can give support via HoloLens and where MTRS time is within 1 hour after the info about the problem has been received without any loss of SME working time utilization.

All three scenarios show that MTRS time and SME or local staff support costs are quite flat. On the other hand, SME travelling cost can vary from case to case, which has an impact on MTRS. The average cost of one Microsoft's HoloLens 2 device is around 3,500 EUR. As HoloLens cost is comparable to a couple of travelling arrangement cost, ARMS SWO solution becomes the first choice for every company that wants to reduce operational costs. For full RoI calculation SME working hours utilization and MTRS KPIs need to be taken into consideration as they come with additional cost.

V. GREEN TECHNOLOGY

As environmental-friendly technology has strong effect on the environment, the carbon footprint can be measured for each performed activity. The carbon footprint is total amount of greenhouse gases that are generated by the human actions, in this case human traveling activities.

Table 4. shows carbon emissions calculation for travelling scenario 2 and 3 as they include different means of transport. The calculation is based on carbon emissions calculator [8] where connection flights are withing 2 hours of flight distance inside Europe. If SME travel to the remote site, their carbon footprint in one way trip would be 0,55 MT (metric tons of CO_2). With the return trip the carbon footprint would increase, and their travelling activities would produce 1,1 MT of carbon emissions.

TABLE IV. Carbon emissions calculation

Travel routes	Carbon footprint
From SME office to the airport by taxi	0,01 MT
Connection flight 1	0,13 MT
Connection flight 2	0,40 MT
From airport to remote location by taxi	0,01 MT
Total	0,55 MT

After all those considerations we can say that SWO certainly is an environmental-friendly technology. By using SWO, SME can easily communicate remotely with FSO team member who is in the field without having to go to the site location. This eventually leads to the reduced emission of greenhouse gases.

The additional component which reduces the carbon footprint and travelling cost is “the first-time-right” (FTR) approach. FTR concept finds its origins in Six Sigma and it is defined as a principle where all actions will be performed correctly the first time, thereby eliminating the need of any rework. Thus, FTR minimizes the operational cost and optimizes FSO and other supporting organization’s efficiency. SWO, as many technology layers driven approach, offers multiple tools, controls, and a mindset to maintain FTR concept.

VI. CONCLUSION

In conclusion, the augmented reality modeling support (ARMS) work order solution is a cutting-edge technology that streamlines the issue resolution process for Ericsson field services, providing several benefits over traditional manual processes. Its innovative approach, intuitive interface, and seamless integration of virtual and real-world elements make it an efficient and effective solution for Ericsson engineers and field service operations teams. When it comes to the user experience of the HoloLens smart work order, we need to look at both ends of the process: end customers have their equipment maintained according to the signed service-level agreements while FSO teams have the benefit of reduced delivery time and lower operations costs with “the first time right” concept in place. The key contributors for successful implementation of SWO FTR are the following: properly defined CI within CMDB, federation and relationship with KEDB and KMDB where product development teams, SMEs and operations must work together to ensure the most accurate data and instructions for SWO content. As physical field operations activities are very delicate and require full field staff’s concentration on the execution of problem resolving actions, SWO offers smart instruction checks and real-time resolution confirmation to avoid any potential rework. An additional benefit of SWO is related to preventive actions which are prepared through advanced equipment monitoring logs analysis and recognition of potential events which may turn into incidents and problems. With ARMS HoloLens smart work orders can be prepared for each site so that local staff can perform preventive actions, which makes travelling for problem resolution obsolete.

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