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Operational Transformation

Modernizing Field Operations

A Technical Paper prepared for SCTE•ISBE by

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Introduction

Changing market demands require MSOs to deploy and operate smart, low-touch networks which leverage the constantly evolving tools, industry training and work processes. There is an increasing need for MSOs to modernize field resource activity to efficiently operate hybrid fibre-coax (HFC) networks and 4G LTE small cell deployments— while preparing field resources for emerging technologies such as distributed access architectures (DAA) and Full-Duplex DOCSIS (FDX).

This paper/presentation outlines the potential challenges and opportunities in modernizing field operations based on insights from Shaw Communications' recent integration and deployment of single-source geographic information systems (GIS), proactive network maintenance systems (PNM), a centralized workflow system, and a field service management system under one program.

Topics discussed will include efforts to support GIS data migration and upgrades, the process of PNM operationalization, amalgamation workflow activity into a singular system, the optimization of field management services, and essential operationalization and change management considerations.

Examples of tool migration challenges, operational improvements and setbacks, training considerations, and field technician engagement will highlight the topics that must be addressed for the industry to modernize field operations.

Modern Field Operations

A solid investment in field operations is instrumental in building a modern method of deploying networks and delivering services. Amalgamation of workflow systems and optimization of field management services can lead to significant operationalization and change management challenges, specifically around tools, training and engagement. To address these challenges, organizations should focus on the simplification of operational improvements and opportunities for modernization of field activity.

1. Modernization Drivers

Emerging technologies, software systems, resourcing changes and training needs have created opportunities to enhance the customer and employee experience. Consumers are now demanding the ability to self-serve and self-manage their installation and network connectivity experiences. To meet these demands, organizations must equip employees with simplified tools, streamlined processes and training on emerging technologies. Modernization of a converged workflow system enables a customer to receive support from the right technician, with the right equipment quickly, within a low-contact environment. Modernization also allows Operations to deliver operational efficiency programs across a wide variety of employee touch points, with a focus on employee engagement and simplicity.

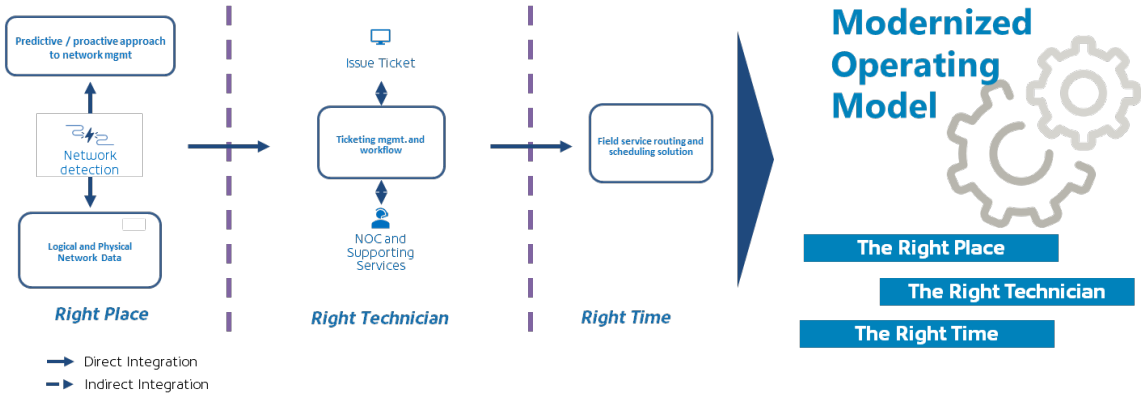

Figure 1 - Shaw Field Operations Modernization Drivers.

2. Key Metrics

Delivering operational efficiency in Field Operations can be overwhelming, especially when you consider the multitude of factors that can impact day-to-day operations. Focusing on larger stacks of measurables allows for the long-term evaluation of modernization programs. As shown in Figure 2, Shaw Communications placed focus on Cost Efficiency, Work Quality and People. Under these larger stacks, smaller metrics were formulated based on long term focus areas supporting operational efficiency. The highlighted areas are key opportunities we are focusing our efforts towards as the program matures.

Operational reduction areas to be considered when integrating a modernization program include:

1. Technical Service Representative (TSR) contacts
2. Customer Service Representative (CSR) contacts
3. MTTR (mean time to repair)
4. Tech to tech referrals and a
5. Overall service calls and truck rolls.

Key metrics should also focus on:

1. Increase in Network Design efficiencies
2. Network/ Plant Technician efficiencies
3. In-home/In-Business Technician efficiencies
4. Increase in customer self-install/healing
5. Improved capital spend efficiency

Sample | **Program Metrics**

	Metric	Description
Cost Efficiency	Cost per customer	Total ops spend / Total accounts
	Support Concentration	# of tech service related calls and tech service truck rolls per account
	Self Install %	% Self-install / Total Installs
	Self-Install Failure Rate	Failed / Total Self-installs
	Resourcing ratio	Ops employees (FTE) per 1,000 accounts
	Support interactions ratio	Total support interactions / Total accounts
	Truck roll ratio	Total truck roll / Total accounts
Work Quality	Service calls (30 days of install) ratio	Service truck rolls / Total accounts
People	Internal First - Operations	(Lateral moves + promotions) / Total Ops hires

Figure 2 - Sample Program Metrics (Source: Shaw Communications)

3. Technology and Timing

Converging technology platforms must be considered when modernizing field operations activity. Shaw Communications is focused on the integration and deployment of single source GIS, PNM, a centralized workflow system, and a field service management system under one operational program.

The first key technology deployment involved merging our legacy physical access (HFC) network records, with our logical fibre network within a geophysical information system (GIS) for our Operations teams to utilize in deploying and managing the (HFC) network. Our HFC records were managed across four systems requiring significant swivel chair activity to support the deployment and management of the HFC and Fibre Networks. Moving our HFC records into a single source of truth allows for the sunsetting of multiple platforms and legacy swivel chair processes.

The second key technology deployment involved implementing a proactive network maintenance (PNM) system. Launching a PNM program enabled Shaw to move away from a legacy preventative maintenance (PM) program that required a significant level of labor and capital intensity to support HFC health and reliability The new PNM program provides the flexibility to TSR, Network Operations Centre (NOC) and field staff to predict, and proactively correct, potential HFC network and in-home network failures while improving overall poor performance. Moving to a PNM technology provides the opportunity for Shaw to reduce multiple legacy tool platforms that field operations used to support HFC and in-home networks.

The third area of focus is a modern digital workflow system to move Field Operations work through the organization. This enables TSR'S and CSR 's to connect our customer journey with the activities of our field staff on the HFC network. The technology creates a single ticketing system with the ability to reference and link all field-related work activity to a customer experience. Allowing real-time communication between our NOC, TSR and CSR and digital experience teams and the customers they are

serving. Deploying a digital workflow system also allows Shaw to reduce and streamline hundreds of processes and administrative applications to manage work activity on the HFC Network.

The fourth area of technology is the enablement of an enterprise-wide field service management (FSM) software system. FSM technologies allow for the linkage of schedules, service routing, dispatch support, knowledge sharing, parts management and technician-to-customer communication. Advancements in FSM technologies allows field technicians and field operations support to have the most relevant information at their fingertips, while allowing customers to have insight to field technician arrival in real time.

4. Detailed Procedures

When converging technology platforms, we contemplated several critical levers to move our field operations team onto a condensed set of digital platforms. We knew it had to be simple for the field operations teams to absorb, operate and sustain. The program focused linking our GIS, PNM, Centralized digital workflow and FSM systems and Operational processes into a single field operations optimization program. This led to the development of a program with five unique work streams to support the following areas of modernization:

1. GIS Operations workstream
2. PNM Operations workstream
3. Centralized digital workflow workstream
4. Field Services Operations workstream
5. Operational Change Management workstream

Operational Change Management (OCM) was introduced to support the significant changes and impacts resulting from the four digital platforms. OCM was implemented to support the organizational training, communications, change support and best practices around people – all required to support our field operations teams.

After the workstreams were connected, formalization of the program continued with budget development, key performance indicators (KPI) development, and program cadence. Technology and Operations teams were integrated to ensure alignment on the delivery schedule for each program. This collaborative model with four work streams allowed for information sharing, developer integrations, prioritization of requirements and preparation of operational change.

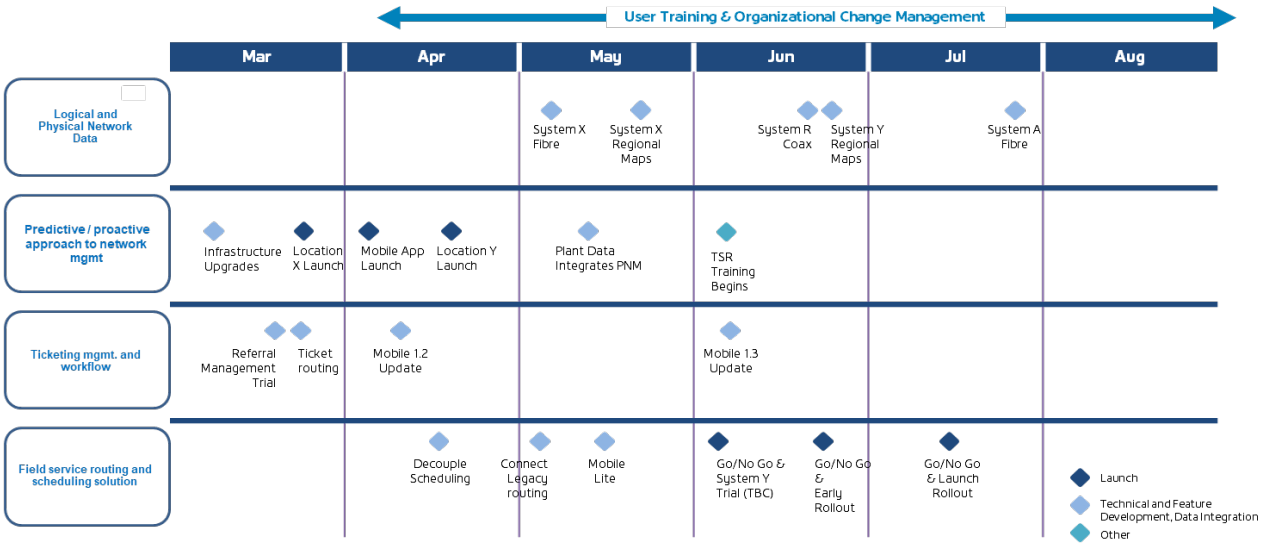

Figure 3 - Shaw Iterative Program Delivery

1. **GIS Operations workstream**. The mapping system has several data entry methods which require significant effort to manage physical network inventory. Two CAD-based drafting systems were used in tandem to support fiber design and HFC design, while an internal software suite supported fiber network management. We knew that merging these four systems into a single source of truth for the physical network inventory would be critical for supporting HFC design, management and health. Shaw has started the integration of the fiber network into a single CAD system. Alongside our partner integrator, we have tested the system's capability to migrate both the fiber record and the entire suite of HFC network records into a single CAD-based drafting system, while reducing labor requirements and long transition times. Preliminary results are favorable and show potential to migrate the physical network design and management into a single source of truth efficiently. The efficient migration sets up a key capability for our PNM Operations.

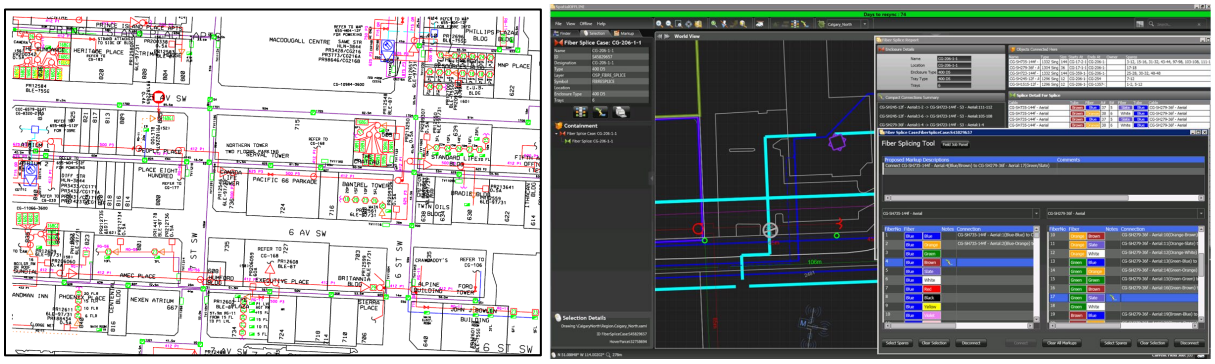

Figure 4 - Sample of multiple Shaw CAD-based HFC network record systems

2. **PNM Operations workstream**. Our Proactive Network Maintenance journey started with the operational requirement to leverage CableLabs technology for analyzing pre-equalization data in our cable modems to locate impairments in our coaxial networks. As the technology matured, demand for a PNM grew, especially for Shaw's Plant Operations Technicians, Network Operations Centers, Technical Service Representatives and In-home Technicians. The biggest

undertaking was operationalizing the technology for daily use. We designed customized training programs for each user group, leveraging what we knew about groups' abilities to triage the data on hand. Once the tool was integrated into daily Operations workflows, we began the process of overlaying our PNM data onto our GIS-based system for Operations to visualize correlation groups of modems compared to physical network assets. The collaboration of our GIS workstream and our PNM workstream is critical to achieve the targeted KPI's in MTTR and overall truck roll reductions.

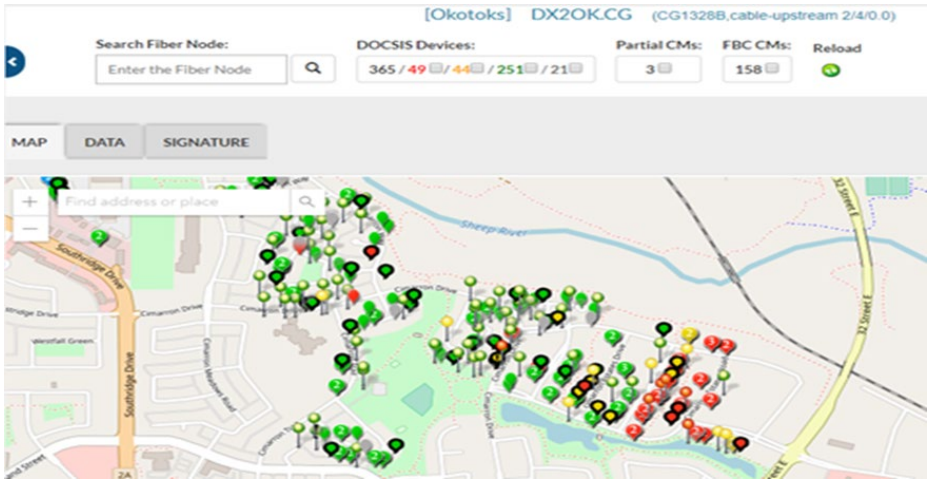

Figure 5 - Shaw Predicitive Network Maintenance coorolation group

3. **Digital Workflow and Ticket Management workstream**. A significant deep dive into workflow and process reviews was required to understand all work activity on the HFC network. To complete this, we had to adopt principles and best practices to improve operational efficiencies. Our operating ecosystem acknowledged multiple ticketing systems, process systems and work requests that did not connect activity on the HFC network to our customer experiences. The multiple workflows also compromised our ability to organize the dependencies of each system impacting our customer experience. We focused our efforts on moving all operational workflow onto a single ticketing system. The single ticket system has allowed us to prioritize activity and level of effort with overall technical integration and operational changes. The first area of focus was to provide our Plant Technicians the ability to open and close tickets automatically from the field when making changes on the HFC network. This reduced the need to call into our NOC for ticket management, and administrative assignment. The second area we focused on was creating the ability for the same Plant Technicians to self-assign tickets from our NOC, allowing the right technician with the right skillset to pick up the ticket and manage it through the process until closure based on their location and the tools and equipment they have at their disposal. The third area of focus is the operational sunsetting of several internal ticketing systems and moving our field operations onto a single platform for internal referrals. Field referrals between technicians is a significant workflow and the focus is to reduce our referral touch points into a single, traceable work request. This function allows Shaw to correlate customer impacting field referrals into a trackable workflow for our CSR agents to provide insight through to our customers.

   The key driver of the Ticket Management workstream is now focusing on moving all customer requests and operational requests into the same ticketing platform, connecting customer needs

and network management onto a digital platform, and routing through our field services management system.

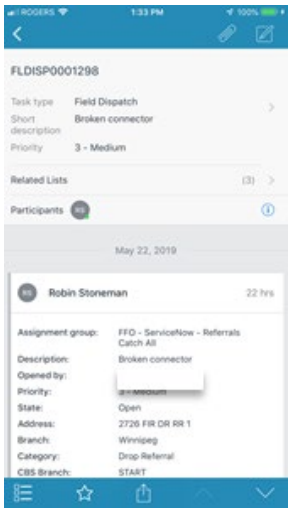

Figure 6 - Sample of Shaw work ticket

4. **Field Service Management workstream**. The ability to tactically move our field operations teams through the customer and plant ecosystem presented several unique operational challenges. Our in-home technicians were routed to customer appointments through older technologies, limiting our ability to support customer needs efficiently. Those limitation also extended to same day support from CSR, customer appointment notification, and the flexibility in customer changes. Network, plant and construction resources were supported through manual processes, with multiple tools being used to support employees, contractor movement and communication. Moving to a single Field Services platform allows the ability to support all field staff scheduling, workflow support, tech-to-tech communication, knowledge and inventory management. The platform allows for a new routing engine that uses traffic analytics, guiding the right technician to the right location as efficiently as possible. The integration work that is currently underway allows Shaw to move all tickets into our FSM system for routing or workforce management needs.

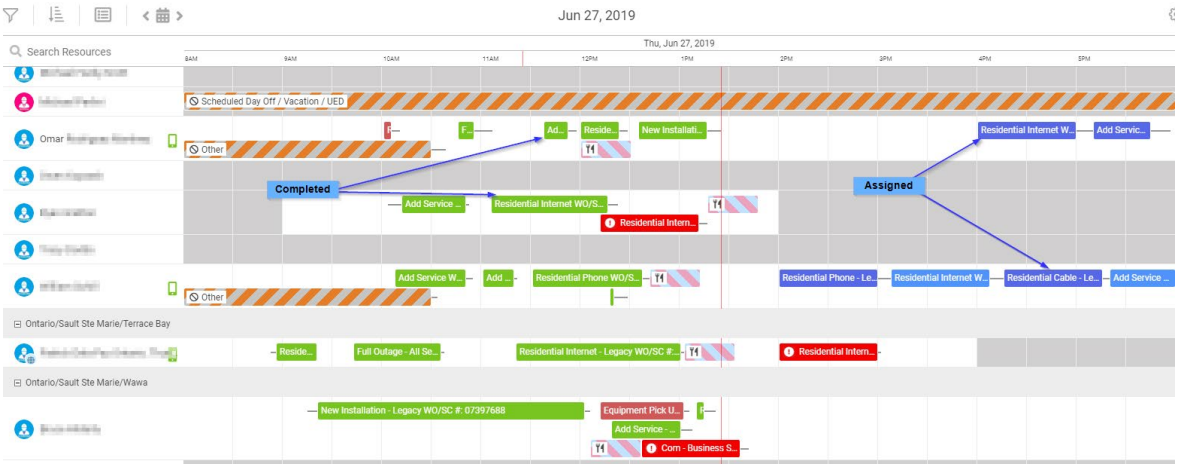

Figure 7 - Sample view of Shaw scheduler for field technicians

5. **Operational Change Management (OCM) workstream.** Significant focus was placed on the role operational change plays in the lift of tool sets and process changes. Linking four large programs together under one umbrella drives significant organizational alignment, communication, training and change support. When modernizing operations and tool sets, our initial focus was driven by the ability to operationalize the tool and ensure associated integration work between each tool set. As we matured the program integrations, we acknowledged quickly the need to frame up operational change support for employees. Our first leverage point was employee enrolment on tool selection. We enrolled field operations employees to participate in vendor selection committees. The participation in those committees allowed for a deeper understanding for the purpose of the tool, and how it would impact their day-to--day activity.

   Our next step was to interview a cross- section of field teams for feedback on how this tool could improve their day-to-day activity and what process changes would be necessary to accommodate the tool set. This process helped build a foundation for initial adoption and drove field staff involvement and excitement surrounding the modernization of field operations. Instead of hiring traditional OCM resources, we focused internally within our field resource pool. Highly engaged team members from across our field operations footprint enrolled themselves to be our change management team. We divided the pool of resources across each workstream and these teams drove peer-to-peer OCM delivery for understanding, acceptance, commitment and adoption of each tool set and work process change (as shown in Figure 8).

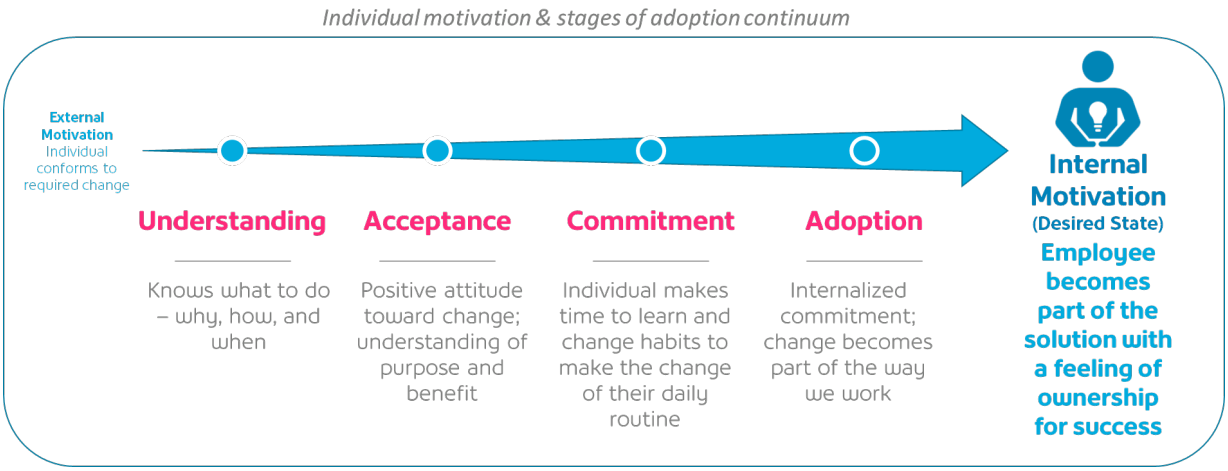

Figure 8 - Sample focus on change support and people first practices

Other Initiatives. The program has recently absorbed the network monitoring program into the iterative delivery process. Adding network monitoring into the digital workflow, creates additional workflow improvements for technical teams when managing incidents and outages. A clear opportunity to reduce MTTR KPI's. The program also has a clear mandate to ensure all tool sets having the ability to be accessed from mobile devices, where field teams can easily access their work and associated tools remotely, with ease.

5. Results

Results of the modernization program are preliminary, however very promising. Connecting four very strategic programs has allowed us to start the preliminary measurement of KPI's as we move into our next fiscal cycle. Immediately, we see favorable results in technician engagement, technician efficiency, customer access improvements, and network troubleshooting efficiencies.

1. **Engagement.** The ability to leverage our people in decision making was critical outcome. Enrolling our people early in the program and having their input in vendor selection, tool integration, process changes, peer-to-peer communication, training development and operationalization has proven to be a winning formula for transformational modernization.
2. **Time Savings.** Early results indicate a cumulative time savings of up to 25% per week for our technical teams as we enable new technologies and their associated work processes. These initial time savings are driven from less time triaging customer issues, locating HFC issues, technician drive time, administrative activity, automated access to knowledge while on site, and the automation or elimination of legacy work processes. A simple change in ticket self-assignment saved over 16,000-man hours a year.
3. **Same day support.** The initial launch of our field services routing engine has allowed us to route the closest technician to meet customer needs in real time. The ability to support customer needs same day with the appropriate skillset allows for capacity efficiencies and the ability to reduce lost sales opportunities and reduce churn due to delayed technical support.
4. **HFC Troubleshooting**. Immediate ability to locate and correct HFC impairments on the wireline network and in the home. Our PNM suite is only in soft launch; however, the technical teams have begun to leverage its ability to sort through coloration groups and start correcting HFC impairments directly, with a significant reduction in troubleshooting time.

5. **Tool efficiency.** We are actively reducing our suite of tools for supporting customer experience and network connectivity. We are looking at reducing our operational tool needs by 50% over a three-year period. The reduction has a direct positive impact on our teams supporting the legacy tools and reduces potential operational costs to support tools field teams are not using.

The results mentioned above are the immediate wins within a new program. As we mature the modernization program, our field and technical teams see significant opportunities to layer in new deployment architecture and the potential operational efficiencies realized by the program.

6. Challenges and Opportunties

There are challenges when integrating four large projects under one modernization program. The most significant entails merging the project as an integration of technologies and workflow. We had started the integration of technologies early in the process; however, we were late on the operationalization of workflow needed for the field technician or the customer to realize the benefit of the technology transformation. Connecting technology teams and operations teams was challenging due to a barrier in understanding "technical jargon and operational process". Once overcome, other areas of focus became critical for success.

1. **Program Integration**. Ensuring the projects within our modernization program had the integration visibility required to properly deliver each tool or process. It was imperative we had a clear line of site on what integrations were needed before committing to the deliverables. This activity could become challenging, and not having enough resource to support the integrations can slow the delivery of the program. `
2. **Collision of Activity.** Collision of activity continues to be one of our larger focus areas. A program like modernization can have a significant amount of change associated with the program. Ensuring we don't have change exhaustion or collision within the program or alongside other programs can be difficult, and we have had to shuffle deliverables to ensure experiences are kept as optimum as possible.
3. **Connecting Leaders.** Enrolling leaders at all levels can be overwhelming. Adding modernization programs to the existing workload of day-to-day operations should be examined very closely to ensure programs don't not get diminished in their importance. Encourage program leads to enroll leaders at all levels early in the program. This allows for the socialization with their teams earlier in the process and starts the change process very early.
4. **Communications and Training.** We paired communications and training together within Shaw's modernization program. We found the challenges in delivering communications and training activity similar, due to the volume of information our technical teams would need access to. We have started using modern means to communicate program cadence and provide the ability for simple access to knowledge or training for each program. Allowing field operations to self-serve information and training on the program they are interested in provides an immediate human efficiency and unclogs traditional means of communications.

Conclusion

A solid investment in field operations is instrumental in building a modern method of deploying networks and delivering services. Several areas within operations can benefit from process automation and modernized tool sets deployed in tandem with strong change support. At Shaw Communications, we focused our efforts on integrating the repository for physical network data, the PNM system, the ticketing system, and our field services management system into one workflow program. This has allowed us to be very clear on our ability to move work through field operations with a committed impact on our key metrics over a three-year plan.

Key metrics for field operations modernization:

1. Increase in Network Design
2. Network/ Plant Technician efficiencies
3. In-home/In-Business Technician efficiencies
4. Increase in customer self-install/healing
5. Improved capital spend efficiency

Through this modernization process we encountered integration and operational challenges which have impacted our ability to simplify activity as first described. The challenges in amalgamating workflow systems can be complex, specifically the change management needs and potential to disengage field staff. A solid partnership between OCM and any automation process is critical and should be treated as a key component of any modernization program.

The key ingredients for a successful modernization program include:

1. Engaging field operations and industry leaders to help define the tools and process they need to support positive customer experiences for the future;
2. Merging technical and operations teams together to work though integration and deployment challenges; and
3. Integrating OCM early into the modernization program.

Once the program is operationalized, field teams can quickly absorb the required architectures, technologies and customer requests with simple tools and processes.

Abbreviations

DAA	distributed access architecture
FDX	full duplex docsis
GIS	Geographic information system
HFC	hybrid fiber-coax
PNM	proactive network maintenance
TSR	Technical Service Representative
CSR	Customer Service Representative
MTTR	mean time to repair
KPI	key performance indicators
FSM	field service management
OCM	operational change management

Bibliography & References

All information sources and references are from Shaw Communications.

Cable lab doc CM-GL-PNMP-V02-110623 Proactive Network Maintenance Using Pre-equalization doc

