



Introducing Strings

The Industry's First Fully-Managed Solution for
Workflow and Application Performance Management

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Introduction: The Genesis of Strings

“Do more with less.” “Leverage our investments.” “Execute the strategy.” These are the comments we hear from our clients every day.

Following a decade of extensive investment into data consolidation efforts across PACS, VNAs, EHRs, and other IT systems, healthcare providers are hyper-focused to make the most of these investments and bring their vision to reality. With a consolidated set of vendor solutions, health systems seek to drive user adoption, demonstrate their clinical value, and improve the delivery of patient care – all in alignment with a broader strategy.

The result of these efforts is emerging. Healthcare providers are consolidating clinical workflows across fewer applications, thereby reducing the number of data repositories and IT systems to maintain. However, while consolidation efforts have simplified application/system management, achieving interoperability among/across IT environments remains complex, prompting internal discussion among imaging teams around necessary skillsets and improved resource scalability. This evolution has led to an increased demand for expertise in workflow optimization across clinical, operational, and system workflows and the ability to implement the right changes as part of the broader strategy: do more with less and

leverage our investments. To deliver on the needs of our clients – achieving greater outcomes with fewer IT systems – Strings recognized that the ability to measure and monitor the impact of this transformation is critical to the success of our clients and their ability to deliver the best possible care.

Strings is a first-of-its-kind data analytics platform. Designed to aggregate, measure and monitor user and application workflows, it was created to support our clients’ needs by filling a critical gap in performance monitoring and operation analytics. Most healthcare providers have no shortage of application performance monitoring (APM) solutions, but identifying infrastructure spikes and the ability to monitor system performance counters isn’t enough. Users don’t just need to know that there was a CPU spike at a given date and time, they need to understand why it occurred in the first place and trace it back to its origin so they can act on it. Strings offers a more holistic and comprehensive approach to monitoring system health and operations. It was designed to understand both the utilization and tendencies of clinical users, the solutions they use, and the equipment that supports them, and to then correlate those data elements to system infrastructure.

To accomplish this, data needs to be pulled from across disparate systems and applications. Data analytics from a single information system, PACS, or VNA, is not enough to form a complete end-to-end picture of application and clinical workflows. When data is dynamically banded across application data elements we can begin to understand the true end-user experience and the impact an infrastructure bottleneck has on the user's ability to deliver the best possible care.

Today our clients can measure and monitor application and user workflows to clear a daily load of studies, to identify the most optimal click pattern, and to reduce burnout and improve efficiency. Our clients better understand modality utilization, the various stages of turnaround time, and can justify where investment may improve clinical access and care. Today, we are enabling our clients to do more with less, make the most of their consolidation efforts, and execute the strategies they have worked tirelessly to design. With a unique ability to extract meaningful information from a sea of data, Strings is simplifying the management of complex multi-vendor technology ecosystems and enabling an actionable approach to performance.



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The Magic of Strings

The progressive growth of utilizing data analytics solutions in healthcare settings has facilitated clinical and operational use cases. With that said, large healthcare systems still face significant challenges when trying to understand their complex multi-vendor technology networks. Although there is an abundance of application performance monitoring solutions being used in healthcare settings, there are gaps when trying to make connections between performance monitoring and monitoring system health.

Strings one-of-a-kind data analytics, Strings, is a data analytics platform that helps healthcare IT administrators to better understand the data related to their clinical workflows, the applications being used, and the equipment that supports them. By dynamically collecting and analyzing data from disparate sources, Strings can simplify the management of intricate multi-vendor technology ecosystems. From there, it can analyze and establish relationships and correlations across sources. Enrichment algorithms can be implemented to further analyze data, thereby providing increasingly valuable insights. This enriched data can also be used to make predictions on future trends which can be monitored for any inconsistencies, ultimately helping clients take a more actionable approach to optimizing system, application and clinical workflows. So, how exactly are all these unique features achieved?



Data Collection and Banding

Strings is purpose-built to monitor system health and operations. To accomplish this, Strings can pull data across disparate systems and applications, making it easier for users to obtain a more complete picture of their applications, clinical workflows, and operations. To effectively collect data across a multi-vendor healthcare system, Strings has leveraged an advanced graphing database, which applies graph theory, a mathematical structure that is used to model complex relationships between objects that belong to dynamic systems that have many moving parts.

In comparison to traditional relational database management systems, graphing databases do not require a pre-defined schema. Data elements within them can be defined with any number of attributes. This makes it much easier to update attributes and create new relationships between data elements. This means that not only can Strings collect data from multiple systems and applications, but it can also dynamically band these data elements together to form meaningful relationships. As data elements are being banded across systems and applications, we can begin to gain a better understanding of the end-user experiences as they interact with various application systems. Additionally, data banding helps to evaluate the impact any infrastructure bottlenecks have on the end-user's ability to deliver patient care.

Data Enrichment and Discovery

Strings goes beyond simply modelling data. It has applied enrichment algorithms to help answer questions and gain insights about the complexity of multi-vendor technology ecosystems. Through these algorithms, Strings can analyze and enrich the data to understand more about the data elements themselves and how they interact with each other. For example, it can create



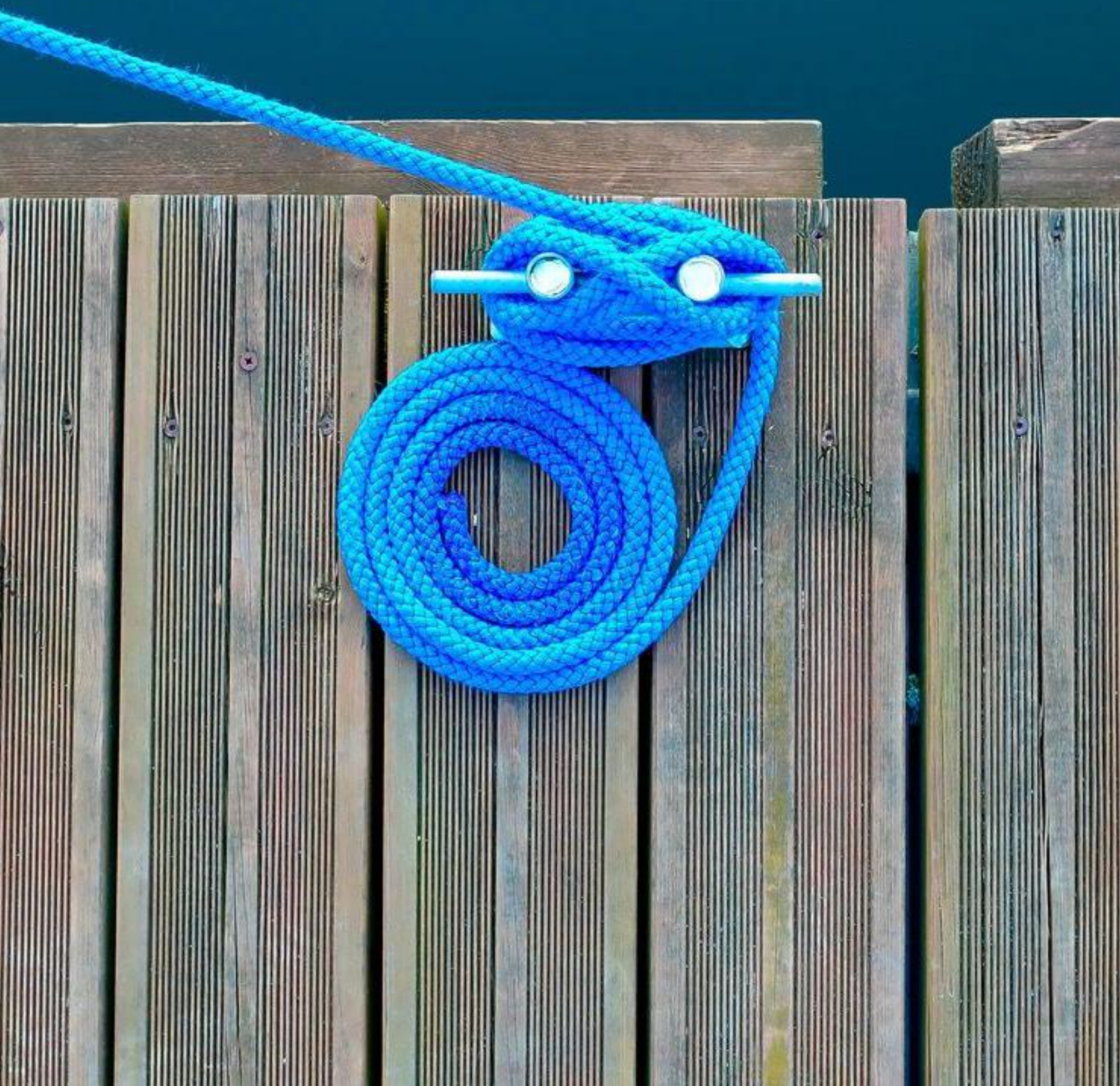
procedure attributes to enhance the monitoring of archived medical imaging studies. Various event log entries being tracked across applications and web servers can be categorized by event type and then monitored. With these new data attributes, new connections and relationships can be made. By being knowledgeable about the relationships and data structures that comprise the complex infrastructure, decision-making is greatly improved.

String takes it a step further by applying predictive graph algorithms to discover even more. For example, algorithms can be applied to identify communities where data entities have substantial interactions that can further reveal tight node clusters or isolated node groups. More specifically, relevant interactions and behaviours made by application end-users can be grouped together to predict future behaviours and preferences. By exploring these interactions and relationships, predictions can be made about future trends. These predictive trends and data enrichments can be continuously monitored which provides our clients the ability to track system performance and take proactive measures towards preventing adverse system events before clinical workflows are negatively impacted.

Tying it All Together

With these unique features, Strings brings together data on clinical and system performance to monitor and measure the possible positive or negative impacts on

each other. Not only does Strings leverage advanced software capabilities, but Strings subject matter experts can also help evaluate the unique challenges healthcare organizations face to add more customization for Strings.



Unleashing Strings, The Power of Process

Strings subject matter experts have served healthcare industry for over 30 years and bring more than 200 years of collective experience. Working with various healthcare providers and implementation methodologies, the Strings team has identified that smooth software adoption with a focus on continuous improvement is one of the most significant gaps in the industry. In response, Strings professional services were designed to break the status quo by delivering a new, more collaborative approach to software implementation, adoption, and optimization.

Overcoming Analysis Paralysis

In an Enterprise Imaging project there may be hundreds of Key Performance Indicators (KPIs) identified; however, only a handful are deemed relevant and actionable for daily monitoring and alerting. There are known risks with analytics solution adoption when an overwhelming amount of data and reporting is flooded to the User Interface (UI), especially in the early stages. Analytics solutions are only as effective as the user's ability to comprehend the data and apply it in daily alerting/reporting. This is why seasoned Strings experts collaborate closely with key stakeholders to identify the most relevant initial KPIs and work together to expand that list as the overall solution and team matures. By ensuring each

Enterprise Imaging solution is architected correctly and the most appropriate KPIs are closely monitored, healthcare IT teams can more effectively assess application performance, data accessibility and quality, and critical operations metrics.

Avoiding Alert Fatigue

Strings implementation experts strongly value the process of collectively defining KPIs. This approach creates an organizational prioritization of what is critical in the monitoring/alerting phase and what might be more appropriate for a dashboard or regular reporting. For instance, Application Performance Monitoring (APM) could generate a broad range of alerts, but only a tiny percentage could be considered critical based on the organization's dataflow design. Strings experts work together with the customer to establish a weighted approach so that alerting is beneficial – not overwhelming to an administrator. One of the most significant risks with any analytics software is the flooding of data and reporting – where administrators find it more of a daily task versus a tool. Designing and implementing short-term and long-term KPIs could make or break the solution in the early user adoption phase.

Continuous Improvement Has No Finish Line!

Implementation and adoption of Strings is a starting point, not the finish line! Healthcare organizations are overwhelmed with various industry challenges, and analytics reporting solutions that create additional work with minimal returns are rarely successful. The primary objective of Strings services is to ensure that monitoring and alerting are constantly evaluated and measured to ensure the best possible outcomes for your Enterprise Imaging program. Using a regular, agreed upon cadence (e.g. daily, weekly, monthly) Strings experts take a collaborative approach to assessing each active KPI and fine-tune it with administrators to yield maximum results. In the early stages of adopting a new analytics tool, it is critical that end-users are not intimidated by the solution but find it helpful and regularly examine its functionality. One of the service offerings is having Strings experts generate a weekly Monitoring Summary Report capturing all triggered alerts. The report is reviewed with the customer for root cause analysis and issue resolution plan. The customer is engaged throughout the analysis cycle and is left more educated about the solution and the issue resolution path. The goal is to empower the end-user further to understand their environment and Strings as an effective tool.



The Healthcare industry is constantly changing, and data mining/analysis is becoming an absolute need for organizations to stay competitive. Strings experts are committed to optimizing Enterprise Imaging software and working together to innovate new, novel workflow solutions.

Building a Strong, Long-Term Relationship

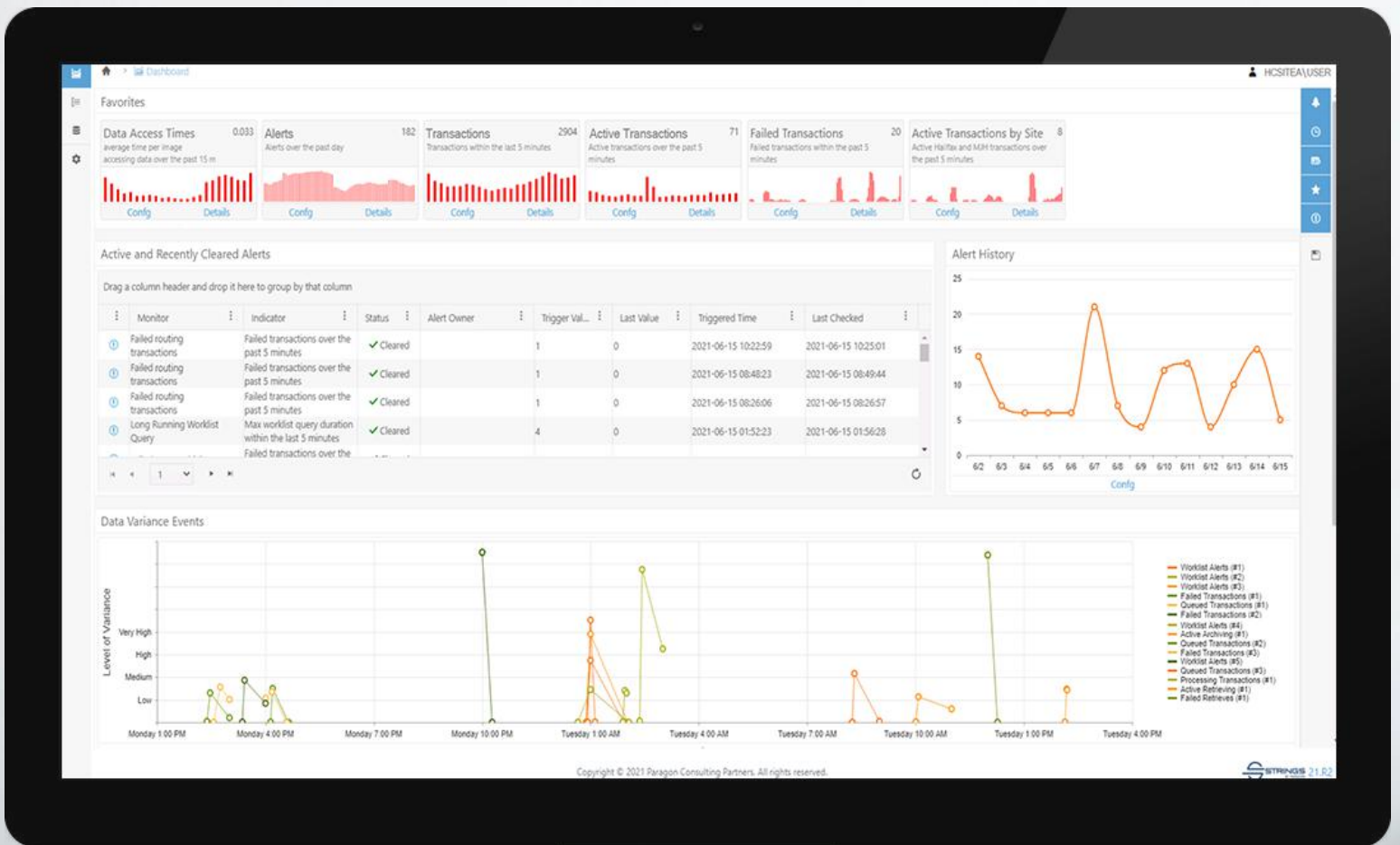
Strings takes pride in establishing a long-term relationship with its customers. Whether the customer has limited technical resources, or is a highly sophisticated user, the ultimate goal is to continue to innovate together. The Healthcare industry is constantly changing, and data mining/analysis is becoming an absolute need for organizations to stay competitive. Strings experts are committed to optimizing Enterprise Imaging software and working together to innovate new, novel workflow solutions. Establishing a long-term partnership is the key to accomplishing both objectives. The more we know about each other, the more gaps can be identified with opportunities to improve.

The Results of Strings: Outcomes Delivered

From the initiation phase, to closeout, every project brings its own unique set of challenges. Each situation is dynamic and the needs for a particular project can never be addressed by a single “one size fits all” solution.

The experience of several Strings

projects, working with clients from start to finish, has offered the opportunity to obtain a different perspective into the future of the implementation approach. As expected, each client and project yielded a variety of experiences and feedback, enabling the overall solution and delivery to be further optimized and innovated for future initiatives.



Problem Statement (The Why)

With fiscal challenges and competing initiatives continuing to put pressure on budgets, the cost-benefit analysis into any new purchase of Enterprise Imaging solutions is now more important than ever. As previously mentioned, the motto “do more with less” is the consistent tune sung by the vast majority of our clients. Understanding this, Strings implementations have ensured that every problem statement produces a measurable outcome, and has also opened new avenues for advanced application and workflow monitoring and operational reporting.

Our clients begin with a common list of gaps, some, or all of which you may be familiar with like:

- Application issues that are identified too late
- Questions like "why do we need to work with the vendor to identify the root cause?"
- Having too many different vendors, and none of them are working together
- An inability to access real-time or proactive reports/alerts to assist in organizational planning and troubleshooting
- A general lack of understanding of how integrated applications work together from both a technical and workflow perspective

These gaps are exacerbated when coupled with the challenge of understaffed teams juggling and prioritizing their already double-booked schedules. Outside the main duties, managing support and project responsibilities are causing an increase in application administrator burn-out, which is an ever increasing strain on the mental well being of employees and a frequent contributor to high turnover rates. So, how can we combat this?



The Process of Strings Engagement (The How)

Enterprise Imaging application administrators need tools that are intuitive and practical. Tools that will reduce their initial learning curve, and simplify their ongoing utilization. Strings offers immediate resolution to these common use cases and problem statements. The combined experience of technical, clinical, and operational experts creates fluid discovery and design sessions focusing on the immediate success factors. The goal is to ensure that system administrators find Strings as useful and easy to use as their phones in the early stages. As they become more sophisticated users, we want to keep administrators engaged with the application by expanding its functionality to proactively mitigate risks with their complex portfolio of applications. This is accomplished through:

- **Emphasizing the importance of capturing relevant KPIs** and implementing practical alerting and reporting: The main objective is to focus on KPIs that will deliver immediate results and create valuable outcomes. In addition, the implementation phase is focused on empowering administrative users to understand their complex environments on a deeper level by leveraging Strings to become an informed strategist within the organization. Understanding organization data, and having informed system administrators, places the power back on the organization and all systems at the highest level of performance.

- **Working collaboratively with client administrators to define and refine KPIs and alerts:** As the core KPIs are defined and implemented, there is a significant focus on the period evaluation of KPIs, alerts, and respective reporting. Organizations are constantly undergoing change, and applications with respective monitoring should be aligned accordingly. As such, Strings experts work together with the client administrators to ensure that KPIs, alerts, and reporting are tweaked on a regular basis. In addition, there are weekly collaboration sessions with the client to review alerts and establish an actionable plan to identify root cause and rectify any issues. These measures ensure the optimal value is being delivered to, and realized by the client.
- **Operationalizing performance monitoring so that it becomes a valuable and ingrained routine:** The general philosophy with implementation is to establish Strings as an integral daily tool for application performance monitoring issues, and real-time operational reporting. From years of application implementation experience, it's been proven that if a tool is not used on a regular basis, it loses its value and becomes another maintenance task in the already busy schedule, rather than alleviating some of these constraints through streamlined efficiency.

Post-Strings Results/Outcomes (The What)

To maximize the services that Strings has to offer, customers and Strings subject matter experts are continually identifying and fine-tuning Key Performance Indicators (KPIs). Through daily use, and establishing a weekly reporting cadence with customers, the services that Strings offers are maximized.

For example, as data is continually being collected, analyzed, and banded, operational end-users can accurately identify why application performance indicators are not maximizing their clinical workflow needs. More specifically, technical teams can better understand what services are being under or over utilized. From there, proactive decisions can be made to prioritize one application over another.

With that knowledge, users can proactively engage in conversations to strategize how long-term improvements can be made. Strings helps clinical support teams to identify how their software applications consume hardware resources that they run on. With the valuable data that Strings delivers, the relevant management teams can communicate to the necessary technology teams on why and how performance values calculated by Strings are not fully supporting the various clinical workflow needs.

All in all, customers that have fully adopted Strings have indicated that they are now able to identify, understand root causes, and troubleshoot problems before their clinical workflows are negatively impacted. In addition, proactive measures can be made to improve departmental productivity and efficiency.

