



White Paper

Three Steps to a Successful Migration

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Introduction

There are a variety of factors that drive healthcare organizations to either replace or upgrade existing applications. This white paper examines the basic considerations and challenges encountered in migrating data and offers solutions to ensure migrations work within your budget and are completed within your timeframe. The specific examples will be related to Hospital Information System (HIS) replacement or major upgrade. For the purpose of this white paper, replacement or upgrade will be generically referred to as “migration”. However, many challenges and solutions presented herein are not unique to HIS migration. In fact, the basic problems are likely to exist when replacing or upgrading any application that stores complex data.

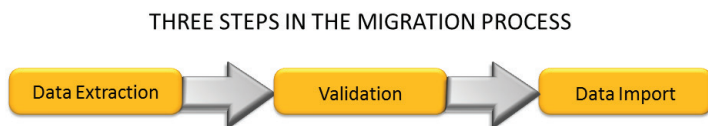
Data Matters

Healthcare data presents significant challenges to data storage and transfer. To the uninitiated, the complexity may not be readily apparent. You go or are taken to the hospital. The hospital needs to know who you are. Who will pay for your care? What are you allergic to? They need details about pre-existing health problems that would complicate your care. Examinations are performed. Tests are run. Procedures are performed and drugs are administered. At some point you leave. Then somebody pays for it all. Sounds simple, but the accurate flow of the accumulated data through many different systems and applications is far from simple.

It is beyond the scope of this white paper to detail all the data complexity involved. However, each step in the process has highly specific data requirements that include significant data dependencies. It is both the specific requirements combined with the intertwined dependencies of this data that make migration difficult. In general, the more complex the data or the workflow that generates it, the greater the likelihood that something about that data will either make it difficult to extract or difficult to import into the new system. When data does not easily extract or import, human resources are required to perform massive amounts of data entry.

A typical migration can be broken up into three steps. Each step poses unique challenges that we will discuss.

1. **Extracting** data from the original system
2. **Validating** it to confirm it is the correct data and in the correct format
3. **Importing** it into the new system



Each of these steps requires planning, an understanding of the requirements of the target system, knowledge of where the pitfalls might be and automation to ensure timelines and budgets are met.

Step One: Data Extraction

In a migration where you want to eliminate an old system, alleviating its cost, management and availability to users, its data is completely extracted and moved to a new system. While it is possible to encoun-

ter completely closed systems with no extraction capability at all, most information can be extracted via reporting tools or database queries. Discrete data is generally easier to extract from systems with these basic reporting capabilities. However, easy extraction does not mean each field will match a corresponding field in the new system. The data will be validated and may need to be formatted, translated, compared against a crosswalk or evaluated for quality. That will be Step Two, Validation.



Extraction problems often occur where the data is unstructured. Unstructured data is typically within documents, either a number of individual documents or a single massive document. This information is complex, and needs to be accessible for many years. Typical examples of unstructured data are historic patient chart data – which may

contain free text fields that will need to be translated into discrete data elements. Unstructured data is not in a form that a target system can easily accept or, more importantly, it is hard for a user of the new system to use.

A major consideration of extraction is organization. The extracted data needs to be identified for the target system. The extract may just be a collection of files with incremented file names. Or the identifier used within the file name does not match what the target system would understand. This could mean the only way to associate a document with the patient would be to read the document and name it appropriately or perform a manual indexing process. The number of documents could be in the millions, and there is no room for error.

Often, the export of the documents is not an automated function of the system. This necessitates a manual process to locate and print each document to a PDF file individually. It is also important to consider the usefulness of the data within the new system. A single massive document is likely to contain extraneous information, rendering it extremely cumbersome for users. Whereas a mass import of all discrete documents may prove to be an unwieldy experience for a care provider.

This leaves two choices: funding the maintenance of the old system’s hardware and software as well as the expertise to use it; or migrating the data into the new system. Aside from the costs, a dual system approach can pose an obvious usability problem for clinicians. They would need to access historical information on one system and update the current patient status on the other.

Step Two: Validation

Data validation is a key step in the migration process. As the old saying goes: “Garbage In - Garbage Out”. Simply put, data validation keeps the garbage from entering the new system. A direct to database load requires all information be validated before loading. This is very difficult to accomplish because essentially, someone needs to perfectly predict how the system will behave once the data is inside its databases.

You are working from a specification and perhaps vendor-provided utilities, not the actual system. If the specification is not followed exactly or if the spec is not exactly accurate, then the system will behave in unpredictable ways. This means many hours of after-the-fact validation testing becomes necessary. The complexity involved in getting data specifications and import utilities right is why only a subset of all possible migration data will ever be “one shot load” compatible.

2. TYPICAL FORMS OF VALIDATION



Validation means assuring accuracy, either structurally or logically. Structural validation is the easiest to program since it is identifying patterns and rearranging them. It is also the easiest area to make mistakes. Something as simple as commas inside free text data could easily break a comma delimited data structure. The validation requirements may be a simple thing like date

element formats, but may also encompass complex data parsing and recognition required to tease out structured information from unstructured documents or free text fields. A simple change from a flat file to Excel, for example, could easily introduce changes to the data. One way to deal with structural validation is pick a direction, stick with it and be very detail-oriented.

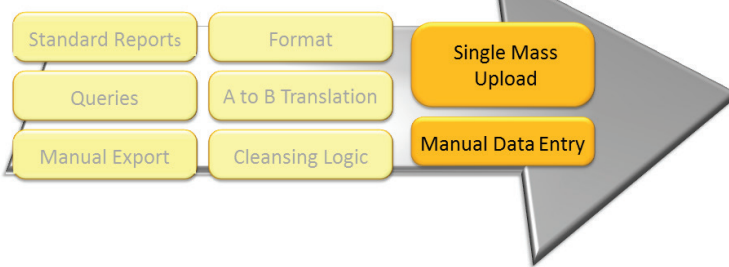
Logical validation requires humans to be part of the process. Here the value of the data itself needs to be modified before it goes into the new system. Codes or mnemonics of all sorts are a common need for logical validation and translation - some examples include providers, diagnosis, vaccines, and appointment types. Typically crosswalks are used. A crosswalk is simply a listing of the old code and its equivalent in the new system provided in an easily editable format such as Excel. Creating and verifying the accuracy of a given crosswalk is a meticulous process, and is a common area for delays or last minute project halts.

Data validation encompasses several different challenges from both a technical and business standpoint – and in many cases a combination of both. The intersection of technical and business issues is the most common area where delays in the migration process can occur. This intersection is often the result of simple miscommunications between stakeholders. It is highly recommended that project managers obtain a clear understanding from all constituents what the processes entail and get consensus on all data requirements before validation begins.

Step Three: Data Import

Generally, it is in the interest of a new system vendor to assure customers that their migration will be as painless as possible. The discussions between you and the vendor will likely gravitate towards the vendor providing import services and you may be led to believe they can handle the whole project. But you will find all vendors have gaps in their ability to provide a mass importing of data. It should be noted that there is no bait and switch involved here. Database level importing is an extraordinarily difficult technological and human challenge; one that exists in an environment where the customer-vendor relationship

3. TYPICAL FORMS OF IMPORT



is still very new. There are two areas where these gaps are likely to arise:

1. The data simply cannot be loaded and must be typed
2. The data was loaded but must be cleaned up.

Specific situations will fall into both of these areas. For example, loading

historical patient data may require both manual updates of information and clean up. Of the two types of gaps, the first is the easiest to identify. In this case the vendor is likely to recommend using people. Common types of data that must be dealt with manually include historical patient data like allergies, immunizations, medical/surgical history, medications, vaccines, vitals. In addition, there is usually a need to move data related to transitioning from one system to another, for example various types of appointments, orders and registrations. Along with the historical data and transitional data are system table builds like codes, facilities, physicians, users.

How Automation Technology Works

Thousands of hospitals around the world are using automation technologies such as Boston WorkStation® to reliably automate thousands of tasks. Our automation platforms eliminate the need for redundant data entry and free your personnel to focus on what they do best. Boston WorkStation is found in use throughout healthcare organizations to speed revenue and reduce costs. Essentially, Boston WorkStation does exactly what a person does, only significantly faster and with 100% accuracy.

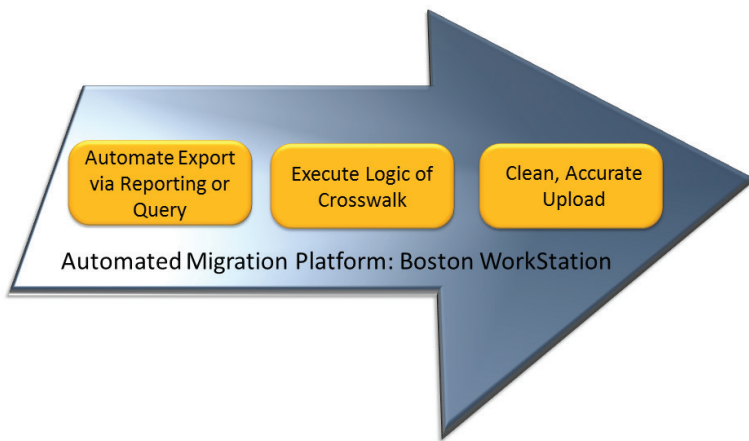
Making an automation platform a central component in a migration strategy offers a number of advantages. Boston WorkStation:

- Removes the risk of human error associated with manual data entry
- Eliminates the often extraordinary costs associated with increased staffing
- Keeps the project on time and under budget
- Drives adoption of the new system

Now, let's examine the ways an automation platform can positively impact each step of the migration process and lead to faster adoption of the new HIS.

Automating Data Extraction Using Boston WorkStation

As mentioned above, the saying "Garbage In - Garbage Out" is a real concern with any migration. A traditional bulk extract and load of data is designed to stuff values into database tables. An application's screen does the same thing, just as a single transaction. However in the case of data entered into a screen, everything goes through innumerable filters before actually being stored – and the user can react to your organization's particular issues on the fly. In order for a mass load to mimic this, the data quality logic would first need to be understood and then programmed for and this is typically expensive. It also can be incomplete, requiring massive amounts of cleanup work.



Since Boston WorkStation performs the keystrokes, mouse clicks and most importantly reads the screen to make decisions on what actions to take, it can very quickly perform the work that would be manually performed. In the case where documents must be extracted to PDF files, for instance, the solution was for Boston WorkStation to first automate the manual document retrieval and printing to PDF process.

Since the printing was associated with a given patient, identifying information was available on the screen. Boston WorkStation read this information and used it to create the documents' file name. This allowed the target system to import and associate the documents with each patient. Using Boston WorkStation, documents to migrate were chosen based on business logic, providing a clinician with usable, actionable information in the new system, not just mountains of data to sift through.

Nearly any data migration requires some type of data scrubbing. A compelling benefit of using Boston WorkStation to move the data is that each transaction can run through any number of business rules or filters prior to import. This allows "on the fly" data quality checks (verifying a patient's address for example) that prevent data quality issues in the first place, and can even prevent multiple medical record numbers for a single patient.

A need for the highest level of data quality is a part of all migrations, and not just with patient charts. In many phases of HIS system migration, there will be a choice between a mass import with suspect data quality or usability flaws versus an incredibly time consuming manual effort to bring in high quality, usable data. An automation platform provides the best of both worlds: quality data without manual intervention.

Automation and the Validation Process

Nearly any structural validation can be accomplished with automation. Logical validation requires humans to create the crosswalks. However, once they are created, validation becomes structural $A=B, C=D$. Where the Boston WorkStation approach shines is in its flexibility. As long as the source data is electronic, Boston WorkStation can read and validate the data. An additional validation benefit arises as a side effect of Boston WorkStation's transactional nature.

Boston WorkStation loads data by automating human workflows. A user performing a given task will validate data in two ways, one by comparing it against learned rules (structural and logical validation from above), and second by reacting to screen prompts or messages. Since Boston WorkStation acts exactly as a user, it takes the same approach. This allows small sets of data to be used to rapidly identify structural or logical data errors. Additionally Boston WorkStation is doing more than simply loading data, it is also testing the system. Many times errors in system build are identified during verification loads.

Automating Data Import Using Boston WorkStation

It is easy to see the benefit of using Boston WorkStation to solve data import challenges. After all, the alternative solution is to use people. Any time using people is proposed to solve a data import problem – that problem can be solved with Boston WorkStation. The process is straightforward: Boston WorkStation is configured to perform the exact same work that a person would do. It does not matter what the target application is – if a person could type the data in, so can Boston WorkStation. In addition, Boston WorkStation will comply with the exact same data quality rules that a person would use and will never deviate by trying to force data into the system with wildcards as human users would.

Complex data quality rules are easier to implement using Boston WorkStation than it would be for creating bulk load. Why? Because the vendor did much of the work for you when they created the screens, after all the end user needs to be prompted and guided when using the application. Bad data will cause a popup or error message on the screen, something that Boston WorkStation will react to accordingly, just like a trusted employee would do. Prior to being entered into the new system, any individual piece of information can be compared against a crosswalk (the legacy system calls it X, the new system calls it Y) or against defined business logic, or even used as a lookup into another system. Boston WorkStation excels at taking unstructured data and translating it into discrete data for the new system. For instance, free text that indicated a patient was a smoker could easily be used to instruct the automation to complete fields in the new system that relate to smoking habits.

Handling Large Volumes

Boston WorkStation is routinely used to move anywhere from thousands of records to millions of records. Using virtual machines, users can have dozens of Boston WorkStation instances working in concert. Obviously, each transaction is being entered into the screen individually. Boston WorkStation is not a push/play solution where all the data is stuffed into a system instantly. And, that is a very good thing. Using the Boston WorkStation approach yields an unexpected benefit because it allows a staged load where a small subset of records can be moved to make sure the system is configured correctly to accept the data, followed by the ability to load large volumes in a short time. Loading everything at once causes natural inertia - there is a now a significant barrier to change. A staged load allows for testing and rapid reaction and since the programming is simply mimicking end user workflow, you are not beholden to the vendor to make expensive and time consuming modifications to the import and you are able to control your own deadlines.

Overcoming Objections to Automation

Objections may arise to using an automation platform, but these objections are not based on technology. Experience shows that a painless migration combines vendor provided imports and the use of Boston WorkStation to fill in the inevitable gaps. There should not be an adversarial relationship between HIS vendors and Boston WorkStation, quite the opposite; several vendors actually use Boston WorkStation for many purposes. Boston WorkStation cannot harm or influence the new vendor's system, nor is its use detectable by the new system.

Conclusion

Mass movement of critical data is inevitable in every healthcare organization. As systems are updated and new systems are introduced, hospitals look for the least painful way to migrate data. The basic steps of Export, Validation and Import are consistent with any data migration. If performed manually these processes can compromise

data quality, increase costs and jeopardize the project timeline.

Automation technology should play a key role in any migration plan. Boston Software Systems' automation platform, Boston WorkStation, is programmed to act just as a human would, to extract, filter and import data - but many times faster and with 100% accuracy. Boston WorkStation eliminates the concern over data quality and the expense of additional staffing, keeps the migration project on time and on budget, and can help in the adoption of the new system. Understanding the key aspects of migration and the role of automation will ensure timelines and budgets are met.



Boston Software Systems revolutionizes how healthcare works by providing error-free automation for every application. Designed to meet the changing needs of the entire organization, Boston Software Systems offers the most sophisticated automation and migration platform available and has the best reputation in the industry for ease of use, customer support and giving customers peace of mind that critical data is 100% error free.

Over a thousand organizations worldwide respond to regulatory and business initiatives by using Boston Software Systems' technologies to automate and improve processes throughout a variety of departments. Customers include more than 75 HCA hospitals, Mayo hospitals, Stanford Medical Center, CHRISTUS Health, Lutheran Health Network and Catholic Health Initiatives. Boston Software Systems partners with leading application, technology and system vendors such as McKesson, MEDITECH, Siemens, Emdeon, Ingenix and Quest Diagnostics.

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