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FROM CAPEX TO OPEX – THE HANDOVER MANAGEMENT PARADIGM

White Paper

Abstract

This white paper provides guidance on the transition phase between projects and live operation

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1 Introduction

We all know that in a project environment the primary drivers are time and budget, with secondary drivers of quality and inspections. Good project managers are however defined by the number of projects they have delivered on time, and within budget.

Operational drivers are cost and throughput, and their managers are defined by their ability to drive production costs down and deliver a reliable and safe production to meet customer demand. In many cases the fact that there are differing drivers creates tension and potential conflict at the interface.

Project teams are quite often seen by the operations teams as having short term objectives focused on the handover of the "keys", while Operations teams try to hold on as long as possible in order to ensure their expectations are met when the project is delivered.

Conversely, Operations teams are seen by Project teams as wanting to increase project scope by going over and above what was originally agreed, and constantly trying to change things.

Figure 1 - CAPEX to OPEX transition incorporating Handover Management

In our daily lives we manage differing drivers as normal, with examples including when we buy a house or a car. We know what we want and our drivers are clear to us, and the driver for the sales person is also clear - where they have no long term interest in the commitment, only a short term drive to make the sale. We also know how the process works, and if we can't get everything we want, we agree on compromises whether they are in terms of feature, function or finish.

So, if we exist in a world of differing drivers and apply the concept of compromise on a daily basis, why do we so often find such negativity between the team delivering a project and the operations departments? We believe that the root cause of this is that in most cases both parties do not know the details of what is being delivered and what has been excluded due to compromises made during the procurement phase.

As a net result of this, assumptions are made by the operations teams, and when the cost or time pressure on the project team is increasing, often you will find short cuts are taken to the detriment of the final operation.

This is effectively where handover management can simplify the process as well as eliminate a lot of the conjecture and negativity around project delivery. Handover management therefore manages the transition from CAPEX to OPEX, making it clear to all parties what is being delivered, how it will be taken into the operational environment while minimising transition impact and managing various stakeholder concerns.

2 Handover Management – Overview

The Handover Management process effectively defines a project's 'exit strategy', and when there are clearly identified deliverables and a clearly defined process, it creates a simpler more efficient delivery strategy.

Handover isn't something that is confined to the end of the project, but is defined early in the process in the form of a Handover Management Plan, allowing the delivery to be managed against the plan for the duration of the project.

It also needs to be stressed that this handover management plan is not the project schedule. Project schedule creation and management is a well-honed skill of many project managers, and is therefore left to the project manager to control. The Handover Management plan is focused on what, where and how the various elements of the project will be handed over. e.g.

- The document delivery list defines all delivery documents, and these will be delivered in four phases throughout the project. Once a document is delivered it needs to be reviewed and commented on within three weeks. All comments will be addressed and the final document will be loaded into "X" document repository within three weeks of the comments being received.

Handover Management is not a project quality management system, however, it does feed off the results of a solid quality management process. If the contractor has a robust quality management system in place where all equipment and functionality tests are clearly defined, it simplifies the handover process.

An example of this is a clearly defined ITP (Inspection and Test Plan), which defines the equipment installation and commissioning process step by step, clearly identifying all tests to be carried out, certification to be supplied, and each of the quality hold point during the process.

Handover Management can be broken up into the ten distinct elements set out below. Each of these are interdependent, however the overall success of a handover will be judged by how well the delivery of each sub grouping is managed.

3 The 10 elements of Handover Management

3.1 Physical Acceptance

This covers the review and acceptance of the tangible components supplied as part of the project delivery. There are usually two separate work streams, namely Hardware and Infrastructure, as shown below. Each of these work streams would go through several tests or inspections culminating in customer acceptance.

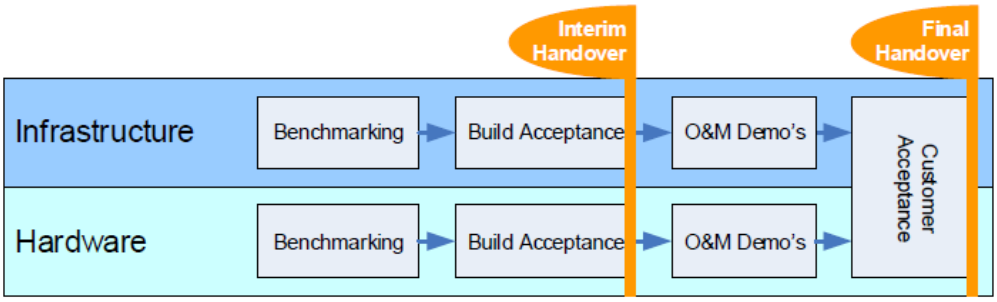

Figure 2 – Physical acceptance process

From a project perspective, the physical acceptance is usually a well-managed element, where defect inspections are carried out with the operations teams and snags are identified and closed out.

From a handover management perspective, we are more concerned with ensuring that there is a controlled process in place, and that the defects are closed out. Another area to monitor and be aware of is the potential for operations teams to try and push for scope creep during these inspections, or to allow opinion engineering to interfere.

Both of these items need to be managed and contained when they present themselves, which comes back to proper stakeholder engagement through the handover management function.

3.2 Functional Acceptance

This covers the review and acceptance of the system functionality. This takes the Equipment and Infrastructure delivered as part of the physical acceptance, and turns it into an operating and functional system.

In some simple projects the Functional acceptance is almost non-existent as the control systems are extremely simple. Once again there are two separate work streams, namely Controls and Applications, as shown below. Each of these work streams go through several tests or inspections, culminating in the Customer Acceptance.

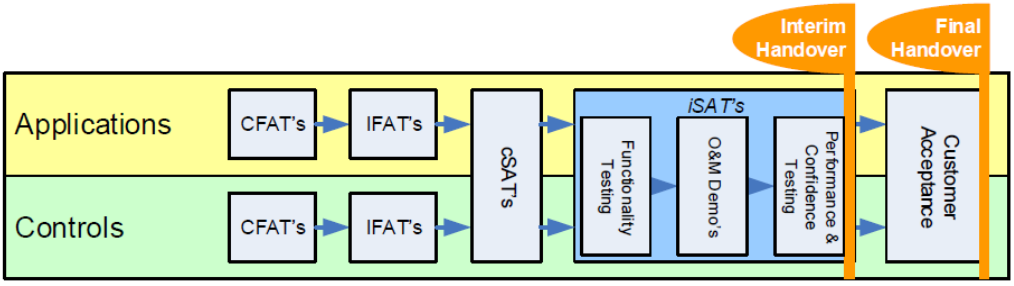

Figure 3 – Functional acceptance process

Once again from a project perspective this element is also fairly well controlled, however it is also an area where short cuts may be taken as this is usually when the project team is under immense time pressures. This element needs to be tightly managed through the test specifications, and each element of the test needs to be referenced back to the URD (User Requirements Document).

Once the testing is complete and all of the deficiencies are resolved, a compliance matrix between the URD and the completed tests needs to be drawn up to confirm all functionality has been delivered.

As iSAT's (integrated Site Acceptance Tests) are formal acceptance tests they are usually planned and performed over a pre-defined period, as agreed between the project team and stakeholders in the operations team and is usually co-ordinated by the Handover Manager. To prevent confusion and potential corruption of the iSAT's, all software and hardware configurations on the equipment being tested are frozen for the duration of the tests.

This is another area where scope creep or functionality changes can be introduced, and this also needs to be tightly managed, as the majority of these tests are usually carried out close to the end of the project, and any changes by that stage can cause the project to fail if not correctly managed.

While the handover management function would not be responsible for performing or monitoring these tests, it needs to monitor the results of the testing and to manage stakeholder expectations. This helps to ensure that the system provides all of the required functionality as defined in the URD.

3.3 Documentation

During the delivery of the project a huge volume of documentation will be generated, some of which will be required for O&M (Operations and Maintenance) of the system in the future.

It is essential to identify this delivery documentation as early in the project as possible in the form of a document delivery list, and to ensure that all aspects of the delivery are covered. We have found that there are three classes of documentation that are required:

1. **As-Built Documentation** which covers drawings, schematics and model files. These files will go through several iterations throughout the life of the project, and need to be tracked to ensure all elements are updated to the final delivery status on completion of the project.
2. **Operations and Maintenance Documentation** which covers items such as standard manufacturers literature, residual risk reviews, maintenance method statements, operational instructions, training materials and maintenance instructions.
3. **Basis of Design Documentation** includes elements such as the URD, Detailed Design Specifications, User Interface Specifications, test certification and records of any deviations from defined standards and their justification. This is a particularly important part of the delivery documentation - in most instances the documentation would never be required, however, if there was to be a query around functionality, these documents are the ones you would need.

Test certification is quite frequently neglected or not controlled properly, and then results in a mad scramble towards the end of the project to try and get this together. We have found that by having a clearly defined ITP where the relevant certification is defined, and required to be provided with the test plan, then this issue is limited.

The handover management function is to monitor the documentation delivery, track document review progress and to ensure that the overall delivery list is being managed adequately.

Where documents go through several review and update iterations, then it is essential that the reviewer's comments are tracked and that they are cleared when the next release is issued.

3.4 Software Management and Licensing

Like most things in life, software and control systems have become the norm in industrial applications. As a result of this when a project is delivered, there will be a plethora of software applications and local bespoke codes or parameters developed as part of the project delivery.

All of these systems need to be backed up and safeguarded as part of the handover process. This allows the maintenance team to roll back the system to the setpoints that were provided when the system was commissioned if necessary.

In addition to this there will be a number of the computers and control systems that will have defined software applications loaded on them, and the licences for the software will need to be controlled in order to ensure they are available to reload onto their replacements should it be necessary, or for audit purposes.

Some of these licenses may need to be renewed on an ongoing basis, such as anti-virus software or perpetual licensed systems. It is important that the renewal dates are tracked to ensure that they do not expire during the handover and early life phases of the system, and to ensure the operations team are aware when the systems need renewal.

Where bespoke software is developed for a system, there might be a requirement for this to be managed under an escrow agreement. This is intended to protect the end user of the system from the supplier going into liquidation, leaving them without access to the source code in the event that modifications are required.

3.5 Training

An essential part of any handover process is the delivery of focused training to ensure that the new system can be adopted into the operation as seamlessly as possible. There are three distinct types of training that need to be covered:

- Familiarisation training
- Operational training
- Maintenance training

A detailed training matrix would need to be developed in order to match individual training packages required for the system against defined roles. Each of these training packages needs to be developed to the level required for the identified roles.

In existing systems a TNA (Training Needs Analysis) would need to be performed to assess the current skill levels and identify what new skills would be needed to match the requirements of the new system.

3.6 Training Delivery

There would be a mixture of training delivery methods, from classroom based to hands on. The management and delivery of the training to the operational teams will need to be closely monitored and managed, as the success of the transition between CAPEX and OPEX will depend on the operational team being trained well enough to perform their duties correctly.

This is often easier to achieve in new build environments because existing operational teams would already have their own duties, and consequently, training would be an add-on to their existing work load. This requires a lot of effort and negotiation with the various stakeholders to ensure it goes off smoothly.

3.7 Maintenance and Operational Integration

The maintenance integration process ensures that all assets are registered within a CMMS (Computerised Maintenance Management system), and that the required spares are available for use when the system goes live.

We have published a separate article on how to develop a basic maintenance plan in this kind of transition called "Developing and Delivering a maintenance plan – the basics" which is published on our web site. This process can start as soon as the design is complete, or once all the assets have been identified.

The operational integration process needs to look at how the system will be run and how this fits in with existing business processes. It is vital that the system designers help the operational team to develop a set of SOP's (Standard Operating Practices), which cover how the system will be run in a normal operational environment.

The design team would also help with the initial development of CSOP's (Contingency Standard Operating Practices), in relation to how the system reacts to any abnormal situation. These CSOP's will also need to be expanded beyond the system, to look at bigger picture contingency modes that are not system related.

3.8 Operational Readiness and Go-Live

Operational readiness is a progressive state indicating the maturity of the project handover state. In the run up to the go-live phase of the project, several operational trials are identified and planned.

These trials would require co-operation between all of the stakeholders and as a result, it is vital that they have been engaged with the process every step of the way, and understand their roles in the particular tests being carried out.

During this period, both the most suitable system configurations and the contingency operations need to be identified and tested. Once the operational trials are complete, the system enters a reliability period during the early go-live phase, where the project team runs the system with minimal intervention to ensure that a reasonable level of operational maturity has been achieved.

During this period, daily error logs are reviewed, RCA (Root Cause Analysis) is performed on any failures, and assessments made of the system performance.

Once the system has gone through the reliability phase, it enters a confidence period where operational teams run the system with support from the project team. This is the most important phase of the handover, as this is where the results of all the activities monitored by the handover team are put to the test.

It is also the time to identify weak areas within the operation and to set corrective actions in place to address these items. These are usually related to additional training, clarification of SOP's and CSOP's as well as the development of additional SOP's and CSOP's.

3.9 Post Go-Live System Optimisation

Now that the system is in live operation, and there are a series of corrective actions in place to resolve operational issues, it is time to focus on the system performance. In many industries the system performance will vary from a test environment into real production, and this might result in operating parameters, response times and PID (Proportional-Integral-Derivative) loops that need to be adjusted to real world parameters.

Our experience has shown that the error rate on a system post go-live is invariably higher than it is after a settling in period. The key, however, as shown in the graph below, is how quickly the system error rate can be brought down to a "normal" level of system related noise.

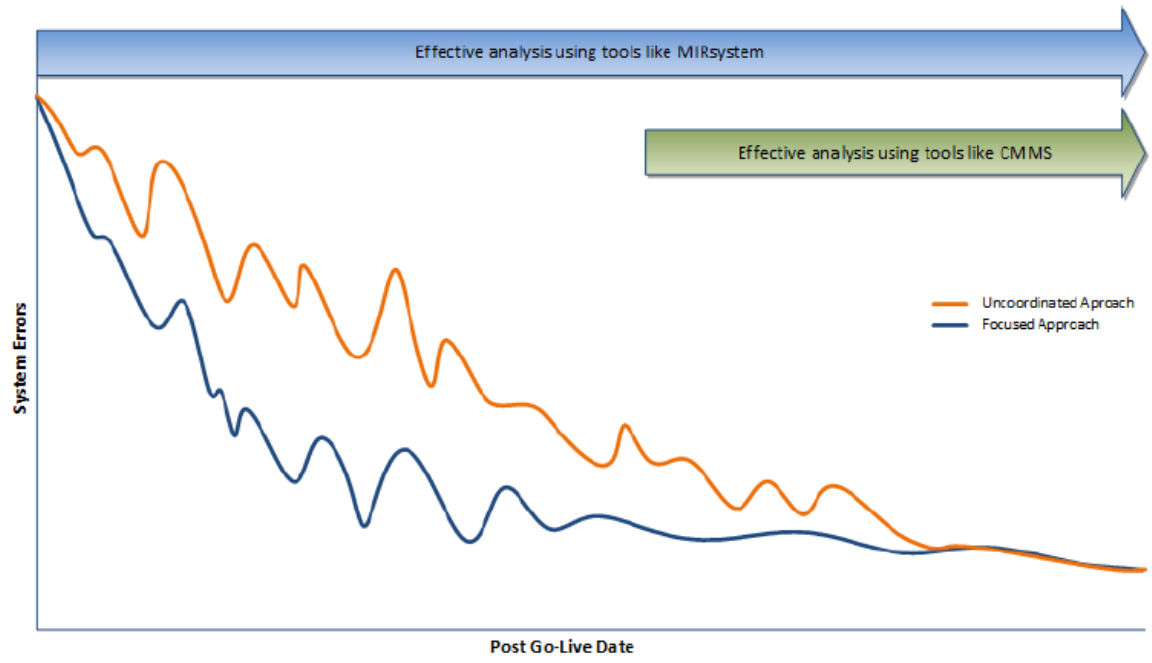

Figure 4 – Declining error rate post go-live

The gap between an uncoordinated approach and a focused approach is an area of opportunity, and if there isn't a clear action plan in place to drive the error rates down, then these costs could be quite substantial.

Say for example, one in five errors results in downtime that cost £1,000 a time and over the course of a year there are 500 events, the opportunity cost would be £500,000. If we were able to reduce this by 20%, this would provide a saving of £100,000.

In order to achieve a focused approach we need to have the right tools, such as the MIRsystem, where all system related errors are monitored constantly and RCA is carried out on the top 5% of all events on a daily basis.

Any findings are then implemented and all the adjustments made. What you need to be aware of is that a fix may not necessarily deliver the anticipated results, so you need to monitor and track the results for a period to confirm that the changes have been effective. It is absolutely vital that records of all of these mini projects are retained in order to reverse the setting if they have not been successful.

3.10 First Maintenance Review

When the initial maintenance plan is developed it is usually done on the basis of the OEM recommendations in order to protect the warrantee on the system. The issue with these recommendations is that some of them will be vital as they are a defensive action based on an FMEA or HAZOP process, while other actions are purely based on the designers gut feel.

After a period of operation of around a year, you will have started to gather a reasonable level of data in the CMMS, which will then need to be reviewed in order to refine the maintenance activities. It is also the ideal time to perform an RCM (Reliability Centred Maintenance) analysis using the failure history as a basis for the analysis in order to identify the most cost effective maintenance activities.

4 Conclusion

Handover management is therefore far more than merely delivering a new piece of equipment, or a system, as part of a project into a live operational environment, it provides a holistic delivery of the project into a stable and fully supportable live operation. While some items are clearly project deliverables and others are clearly operational deliverable, the transition between the two and the delivery of a stable operational environment requires a different skill set. Handover management needs to be delivered by people who know and understand the project environment as well as the operational environment.

While we know that the success of a project is measured by time and budget, and the success of an operational system is measured by operational costs and reliable performance, the ultimate success of a great handover is measured by the level of impact on the operation at the go-live point, how engaged the stakeholders feel in the entire delivery process, and how stable the system is once the handover is complete.