

DESIGNING AN EFFECTIVE CHANGE CONTROL PROCESS



An eBook by EAC Product Development Solutions
Written by: Chris Woerther
Edited by: Clair Tyra



TABLE OF CONTENTS

INTRODUCTION

PHASE ONE

[Reporting & Logging Issues](#)

[The Queue](#)

PHASE TWO

[Change Request](#)

[Change Request Approved](#)

[Board Review](#)

PHASE THREE

[The Change Notice](#)

[The Implementation Board Review](#)

SUMMARY

APPENDIX A

APPENDIX B

Designing An Effective Change Control Process

Copyright © 2016 by EAC Product Development Solutions
14501 Judicial Rd #10, Burnsville, MN 55306
952-435-5533

INTRODUCTION

Formal change control does not even exist in many companies today. The excuse typically falls somewhere between “we don’t have the time to set it up” and “we don’t know how to do it or where to start.” Companies that use those excuses ironically spend more time dealing with downstream and long term repeated issues than they would if they took the time to outline a feasible change process.

We live in a business environment where costly recalls, lawsuits and product reliability are paramount and a formal change control process would undoubtedly support all those efforts.

Organizations that do have basic change controls in place often do not consider the effects of that change throughout the organization. In many cases, engineering itself is left in the dark. For example, companies that manage change through their ERP system usually do not have a closed loop process to get the CAD data updated at its source. The engineering data is usually updated or modified to reflect the change within the ERP system; however, that information is rarely shared back to the original CAD source. This will result in an error if that part is reused at a later time.

In many cases, the change process does not account for any cost analysis or change justification prior to making the change. Usually, the change command is simply made without question by whoever decided it was necessary.

For example, maybe a customer escalates a small change request through an in-house customer service representative. Let’s assume this is a fairly simple engineering change, so it is completed without going through a formal change request process. The change is then issued to manufacturing, much too late, and they have to retool the equipment used to manufacture this product. As a result, manufacturing incurs substantial cost to meet the demand. Or, perhaps worse, the project is delayed. In this case, manufacturing engineers should have been involved in the decision of approving or rejecting this change request to assure it’s validity.

According to a study by the Aberdeen Group, only an average of 62% of Change Deadlines are met. Failure to meet change deadlines directly affect project budgets and quality. (See Appendix B.1)

While the critical needs of every company will vary, this E-Book will outline basic concepts that should be considered when defining a change control process for your organization. A complete change control process can be broken down into three basic phases.

Figure 1
Three basic phases
for an effective
Change Control
Process



NOTE: Keep in mind however, even the most mature and effective process does not replace the occasional need to pick up the phone or contact someone directly if there is a true emergency.

PHASE ONE

REPORTING & LOGGING ISSUES

In an undefined change control process, a person will escalate an engineering related issue in various uncontrolled ways; like a visit to an engineer's desk, a phone call, or an email. These issues are rarely, if ever, logged or recorded. In many cases, the decision to act upon the issue is decided on the spot with only the engineer making the change and the person who escalated it having any knowledge of the change.

As in the previous example, you can see there could be significant downstream cost incurred from any engineering change. While trust in your engineers to be able to make a decision like this is important, mistakes do happen. It is best to run all change request or issues through a defined process to mitigate as much risk as possible.

The first step in a well-designed change control process is providing an efficient way for anyone in the organization to report and log issues. There are many technologies available to facilitate this log but a basic user interface and easy access are essential for encouraging employees to utilize the tool. It needs to be a place where they can make basic comments and attach reference documents and images to further explain the issue.

Knowledge is the value currency of product development. It is the foundation of a self-sustaining, problem-solving, systematic organization. Logging and reporting issues in a manner that is visible to the entire organization will prevent time to market delays and reduce cost risks along the way.

The log should also provide a way for a person to flag the issue based on severity. The next chapter discusses how a reviewer views these issues in a queue. A flag based on the severity of the issue will allow the reviewer to prioritize what is addressed first, and what can wait.

KEY POINTS

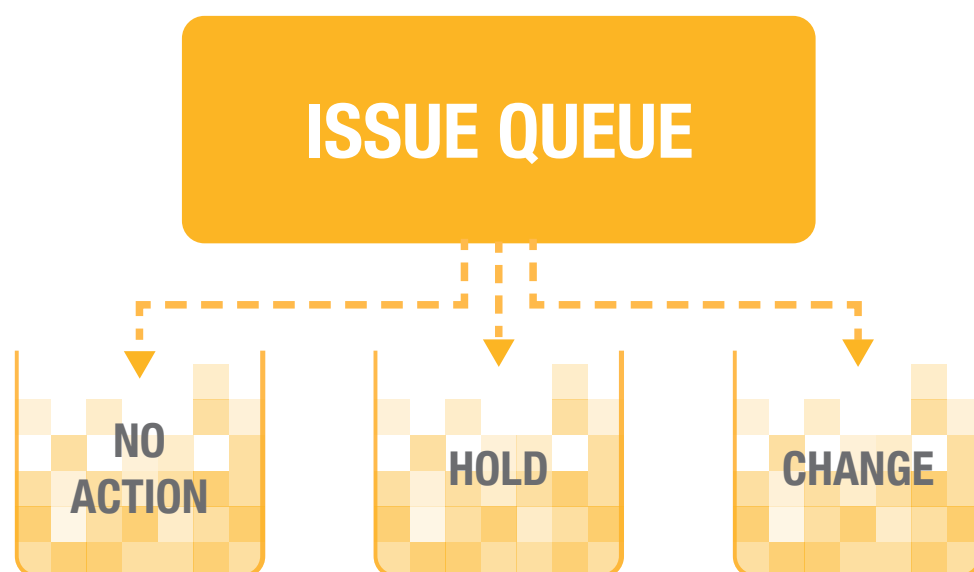
- Accessibility to all employees to log issues
- Issue can be reported without direct access to engineering
- Issuers will receive a communication when a decision is made

THE QUEUE

Once the issue has been reported, it should be stored in an Issue Queue. In an undefined change control setting, engineers would drop what they are working on to address the new issue. They often end up in firefighting mode, always addressing issues instead of focusing on true product design. An issue queue prevents the engineer from getting distracted, which naturally boosts productivity and moral.

The issue queue acts as a filter to determine actions that may need to be taken depending on the issue. An engineer (or engineers) with enough knowledge to triage all types of issues should review the issue queue regularly. They are responsible for deciding the fate of the issue.

There are three categories that issues can be divided into: no action, hold, and change:



*Figure 1
Issues sent to the
Issue Queue can
be routed into three
buckets.*

The actual name of these categories change depending on what you decide to call them or the software system used to manage them.

ISSUE QUEUE: NO ACTION

This category exists if the issue simply is not justifiable or cannot be validated. This does happen and it is beneficial to have the decision to “do nothing” recorded.

ISSUE QUEUE: HOLD

When the issue is not critical enough to require immediate correction, acknowledgment of the issue may be all that is required. This logged and recorded issue can then stay in the issue queue. If other similar issues begin to collect, the engineer can then decide to resolve these issues together at one time.

An example of this would be if a customer complains about an on/off switch failing on your product. The issue would be reported to engineering – via a change control process – from customer service, which by default would put it in the issue queue. By itself, one complaint about a failed switch may not require a formal engineering change. It could in fact just be a single faulty switch.

With the switch issue sitting in the queue you could acknowledge that this did happen but not act upon it immediately. On the other hand, let’s say over the next few months you see 10 more issues logged with the exact same switch problem. Since you are tracking these issues in the queue, you could quickly identify that this has become a more serious issue. You can then start a formal change based on the 11 total issues reported, further justifying the requested change to the switch.

In undefined change environments, these issues are reported via email or other methods (or not at all). As a result, no one may have ever noticed the switch becoming a wide spread issue.

In many cases, this is where companies are hit the hardest. They live in a fog of unasked questions – where the unknown answers could dramatically affect warranties and customer loyalty. Monitoring these issues from the start eliminates the risk of undetected widespread issues.

Note: Whether the issue is rejected, on hold, or pushed through for a formal change request, the person that submitted the issue needs to get a notification of the decision made by the reviewer. This keeps information flowing through the organization and leads to visibility and understanding of the issue.

ISSUE QUEUE: CHANGE

If in fact the issue is valid and requires action, requesting a formal change needs to be an option. Safety issues are typically an example of where this would be used. In most cases every possible safety issue in a product should trigger a formal change request – if for no other reason than to thoroughly evaluate the severity of the issue.

KEY POINTS

- Easy reporting to capture ALL issues
- Scheduled issue reviewing
- Issues can be prioritized base on urgency
- Common issues can be grouped as one
- Historical log of all issues

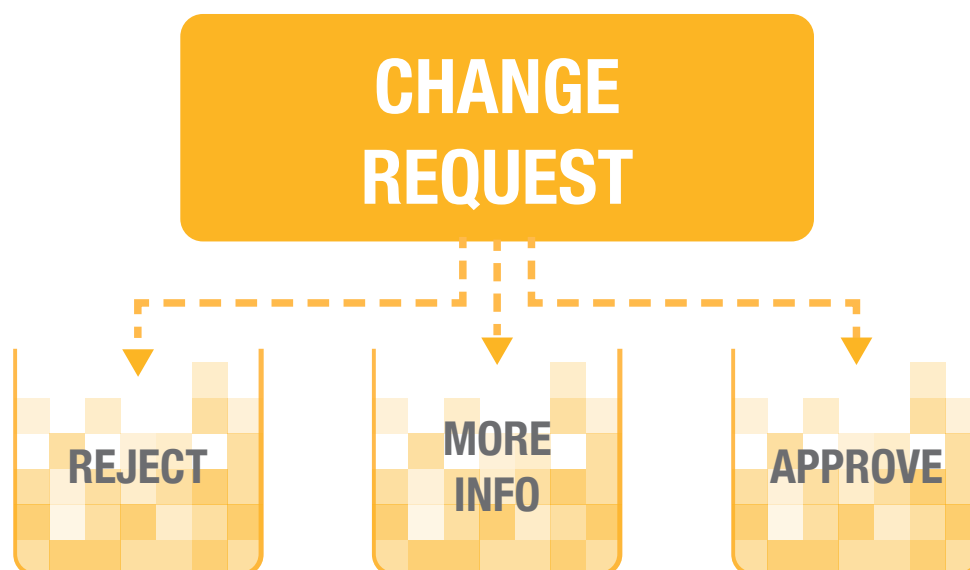
PHASE TWO

FORMAL CHANGE REQUEST

The next step in a Change Control Process is the Change Request. A Change Request is exactly that; a formal request to have a change made to existing engineering data. To be clear though, this is still just a request for a change. The people requesting this change will have enough product knowledge to identify if the issue needs correction.

This is the second stage of review and is typically managed by an engineering manager, or someone in a senior engineering position. The options for routing these issues should be: reject, request for more info, or approve for further action.

*Figure 2
During a formal
Change Request,
issues can be routed
three different ways.*



FORMAL CHANGE REQUEST: REJECT

In this scenario the Change Request Reviewer may determine the request is not valid or appropriate during their initial review of the issue. When this happens, the issuer should be notified that the request has been rejected.

FORMAL CHANGE REQUEST: REQUEST MORE INFORMATION

If the Change Request Reviewer does not feel there is enough information in the request to make an informed decision on whether or not the change

KEY POINTS

should be approved, they can request more information. A notice and a task should go back to the issuer of the Change Request asking that more detailed information be provided as part of this request. Once the issuers task it complete, the Change Request Reviewer will then be notified to review the request again.

FORMAL CHANGE REQUEST: APPROVED FOR FURTHER ACTION

If the Change Request is approved by the reviewer for further action, the change control process should allow for two change routes: Fast Track Change and Full Formal Change.

- Controlled Change Request creation limiting false requests
- Preliminary screening prior to full CRB review
- Traceable request for more information

CHANGE REQUEST APPROVED

CHANGE REQUEST APPROVED FAST TRACK

A fast track change is typically a very basic change. It's often a drawing correction or a change that does not require any downstream actions other than engineering edits. A fast track change is usually assigned to an engineer who executes and then records the completion of the required change. In most cases, once the change has been completed and recorded the Change Control Process terminates.

For example, perhaps a spelling change is needed. This has no effect on manufacturing or any other department downstream. In this case, a Fast Track Change would be a good fit.

In many companies the internal policies are very strict on what can or cannot be classified as a fast track change. It is really dependent on each specific environment. Regardless, significant attention should be given to this fast track option availability.

CHANGE REQUEST APPROVED FULL FORMAL CHANGE

When a full change is required it is usually because it affects the fit, form, or function of a part or product. These types of changes have the potential to be incredibly costly and will likely require additional verification in the change process before proceeding.

A Full Formal Change will require detailed engineering analysis to support the request. It is assigned to an appropriate product engineer related to the request. This may also include engineering effort, design or part where used review, engineering validity to make the change and so on.

Only basic design or drawing effort should be done to the actual engineering data at this point, however, there needs to be enough information to enable an enlightened decision. Avoid any unneeded preliminary work in case the request is denied. Once this engineering analysis is complete, it should go to a Change Request Board Review.

KEY POINTS

- Optional “Fast Track” for basic changes
- Optional “Full Track” for major or more complex changes

BOARD REVIEW

The change request board review is typically a meeting to review the details around the requested change. The attendees of this meeting are critical. It must include people representing all departments that could be effected by or have knowledge of the cost of the change.

For example, the meeting could include engineering, sales, purchasing, marketing, manufacturing, QA, etc. During this meeting consideration of the overall cost, viability and necessity of this change needs to be considered.

For example, your customer may request a non-safety or warranty related

change. You must consider the total return on investment of the requested change. This means paying attention to any significant engineering, manufacturing and/or sourcing changes that may be required to complete the change.

BOARD REVIEW: REJECTED

If, after thorough consideration, the change results in minimal ROI, it should be denied or rejected because it is too costly to make. If it is rejected at this point, it should be recorded and the Change Control Process terminates. An email notice should go to the entire change team, including the issuer of the change request, that the change has been rejected and the reason for rejection.

BOARD REVIEW: PROCEED TO CHANGE NOTICE

If the decision is made to proceed with the change, it should then go to the next step of the overall change process, The Change Notice.

KEY POINTS

- Elimination of early, possibly unneeded work
- Thorough review of change before approval
- Eliminate executing unneeded changes
- Multi-department change review board
- Elimination of down-stream surprise costs

PHASE THREE

THE CHANGE NOTICE

Note: Once the issue has made it to this stage, there is no longer an option to reject it. It has already been analyzed and deemed pertinent by the appointed people.

Once the Change Request is approved, the next step is to design a Change Notice Process. Similar to the Issue Queue, change requests that are approved do not necessarily need to be acted upon right away. They can be addressed based on available resources and/or urgency of the requested change.

As part of developing the implementation plan, the engineering manager now has the opportunity to assign tasks required by this change to the appropriate designer or engineer based on expertise and/or availability.

Any other people or departments that are affected will also have to complete their assigned tasks to execute the change. This could include RFQ's to suppliers, customer notifications, tooling design and manufacturing, overall manufacturing process changes, QA procedures and/or documentation, etc.

The Change Notice Process can be defined as dynamic or static. Although it truly depends on the environment, the most common is undoubtedly a static process. This is because the same downstream departments and teams are notified and responsible for executing their designated change. Because so many parties are involved, it becomes fairly complex while addressing many activities across many departments. In most cases it is unrealistic to recreate a process for each change.

In a dynamic Change Notice Process, a new process is developed specifically for each change. This is most commonly seen in more basic processes that only have a handful of tasks. Yet they tend to have enough variation in

KEY POINTS

process from change to change that they must be developed dynamically for each change notice.

Whatever the process that best suits your organization, be sure that the software you choose supports your method.

- Controlled assignments of change tasks
- Controlled execution of change tasks
- Task completion tracking
- Ensures you're working with latest information

IMPLEMENTATION BOARD REVIEW

Once the plan is fully defined, it often will require a change implementation board review. Similar to the change request review board, this should include representation from all departments that have a role in the implementation plan.

Like before, this board cannot reject the change. They can only request a rework of the implementation plan. This is most commonly required with a dynamic change notice process plan. A static plan does not need reviewed for each change. That said, even with a static plan, if the change is costly or complex enough a review of the downstream steps required may still be justified.

Once the implementation plan is approved, the execution of the plan is started. Again, this typically starts with the engineering tasks. Once engineering has completed and released the required design and/or drawing changes, the downstream change activities are triggered to be executed.

The rest of the activities typically include a combination of serial and parallel tasks completed by the departments that are either affected by or account for the change. Only then is the requested change considered implemented.

KEY POINTS

Once the change is implemented, the pending issues and/or change requests need to be updated to reflect its completion. Ideally your change control system manages this automatically based on task completions.

- Change Process progress reporting
- Process issue identification
- Process execution optimization
- Multi-department change completion tracking
- Eliminate missed execution of change tasks
- Overall process reporting

SUMMARY

Although the outlined approach to Change Control may seem complex, it doesn't have to be. It is most important to simply find a good starting point. It is intended to be something that will give the control you need, but not so complicated that people spend more time logging the change than actually doing it. It is also good to remember that any process is a living thing. It will grow and change as your company does. The process should be reviewed every couple years at least to insure it is still properly accomplishing what it is intended to do. Appendix A includes some examples of both static and dynamic Change Control Processes.

Each company will have its own flavor of a Change Control Process. Some companies will have an implementation plan of just a few tasks, while others will have many. Some processes will forgo the issue reporting and only use change requests and notices. Some companies will only use change notices. It all depends on the needs of each environment.

Regardless of the environment, each change process should include three major phases.

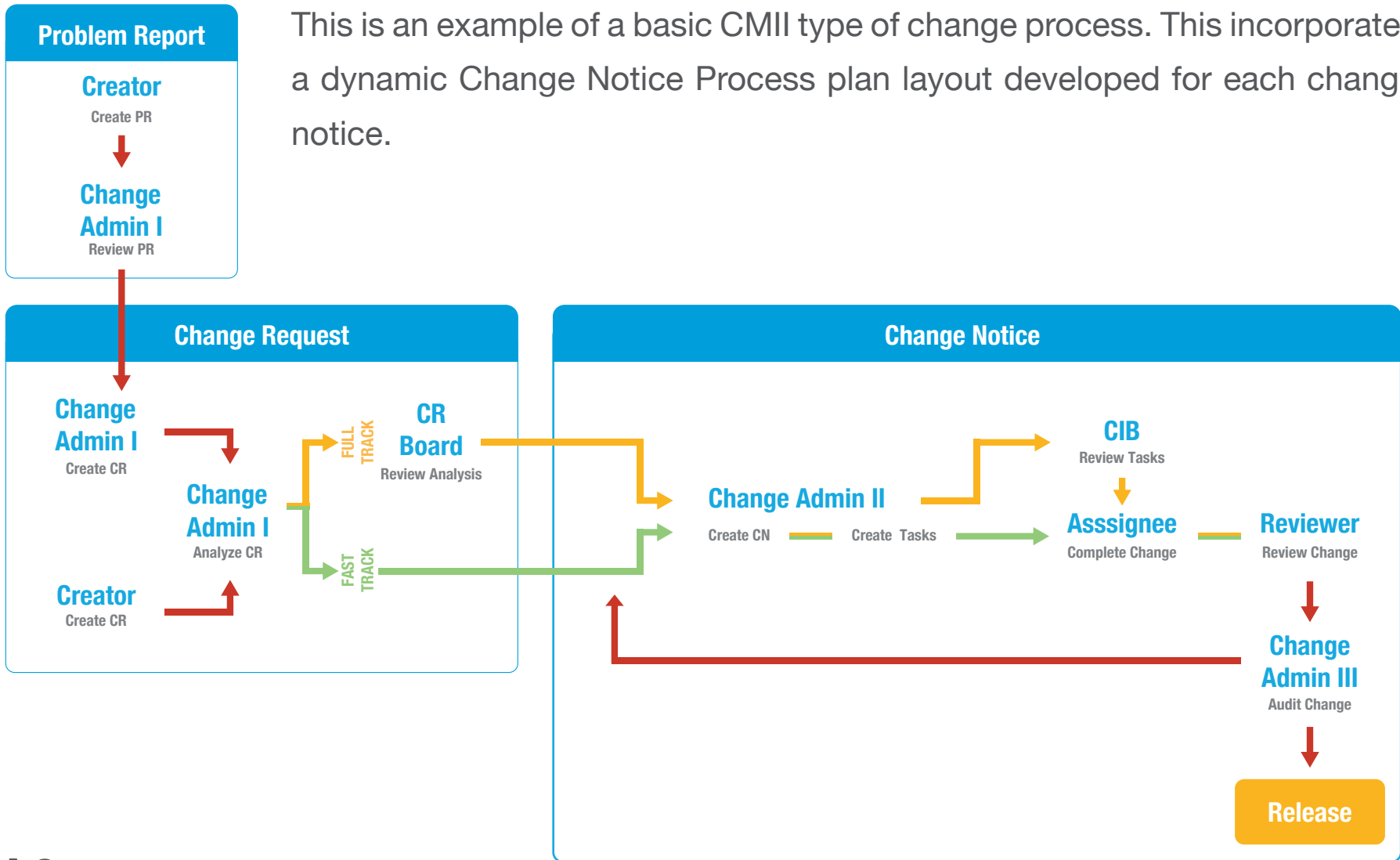


Keep in mind; the added control will often save you money in the long run. There are many reports outlining the wasted revenue by customers not having a good change control process in place. Appendix B provides examples of such reports.

Long term, you will most likely improve productivity and reduce quality issues. The benefits of having a controlled process in place by far outweigh whatever initial time and resources are required to get started.

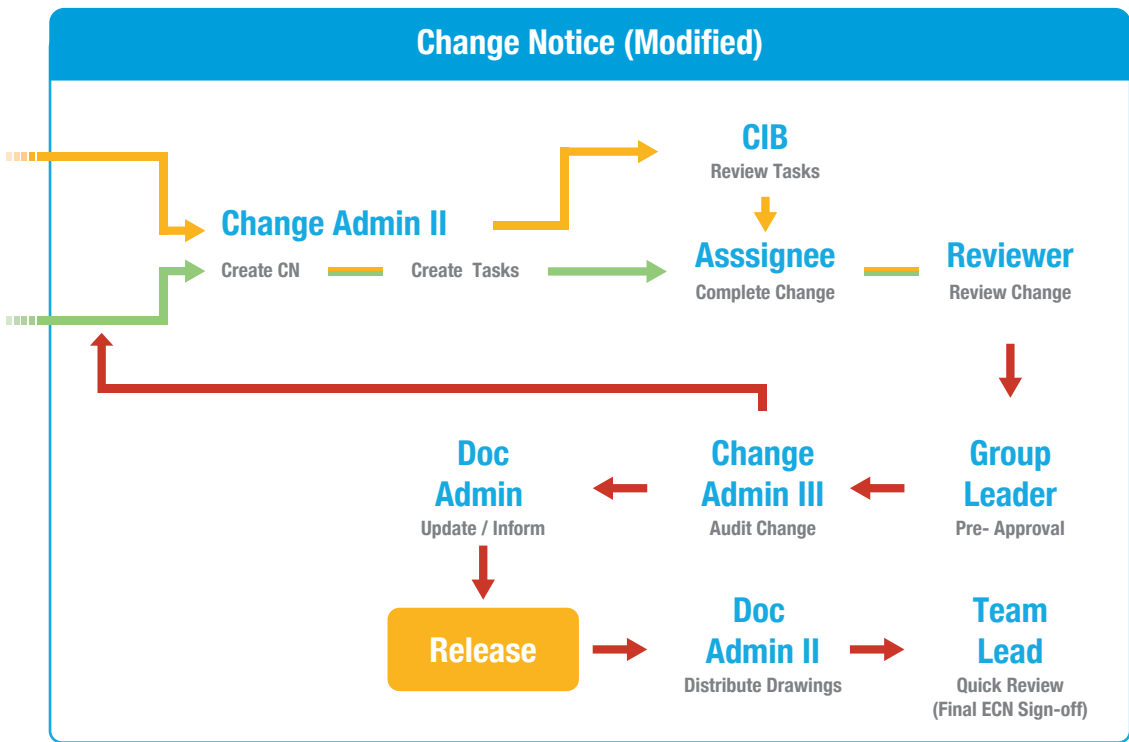
APPENDIX A

A.1



A.2

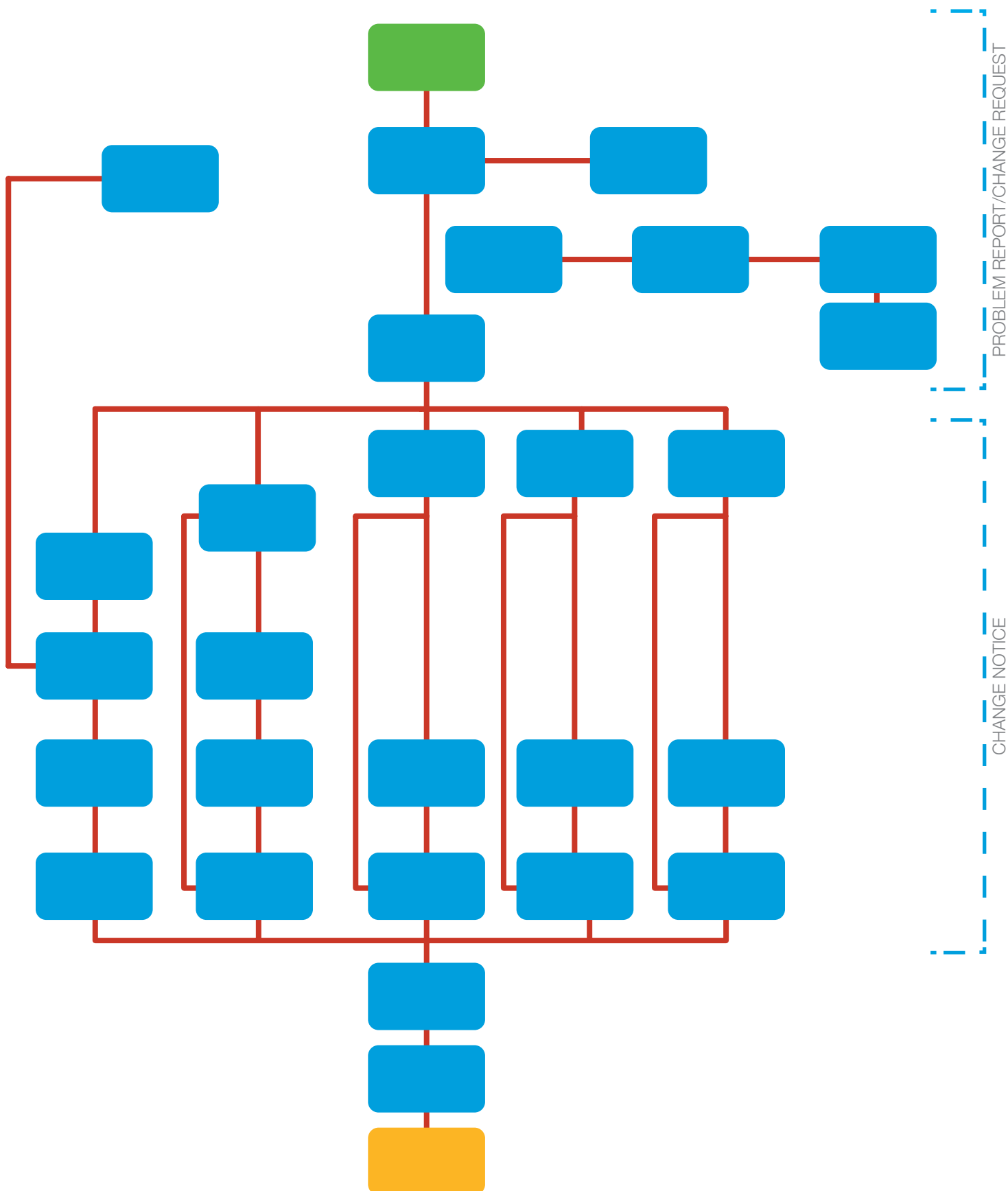
This is an example of a slightly more complex change process from start to finish. The biggest deference in this process is a static change notice process. This was developed due to the fact the change notice process, downstream from engineering, was repetitive and did not change from notice to notice.



APPENDIX A

A.3

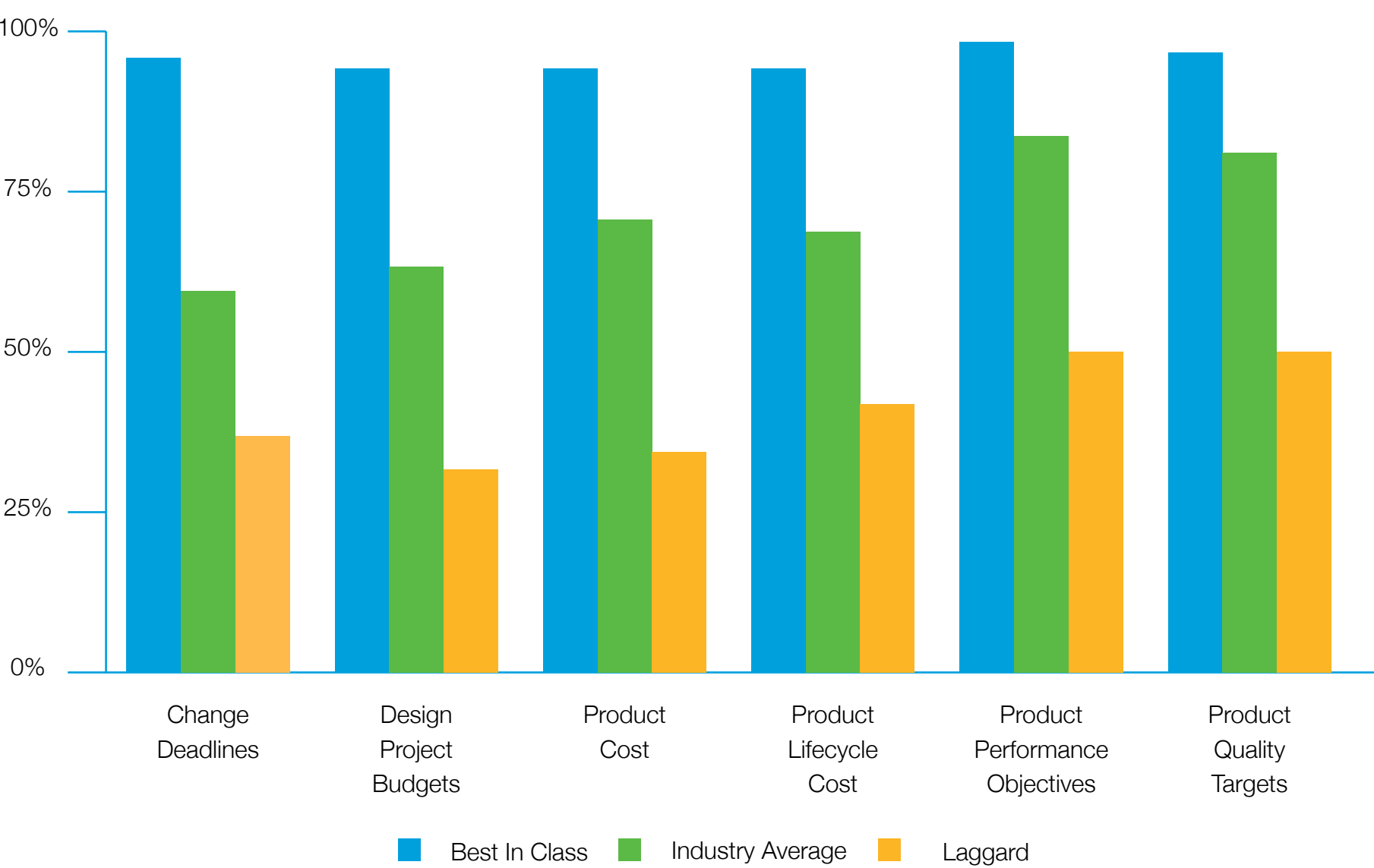
Below is a visual example of a more complex global Change Process. This is a high-level layout of the overall process; more pages of process detail each phase. As you can see, it can become quite complex depending on the environment.



APPENDIX B

B.1 Source: Aberdeen Group — www.aberdeen.com

The Percent of Products Meeting Targets Across the Competitive Framework



APPENDIX B

B.2 Source: Aberdeen Group — www.aberdeen.com

Overall, Best-in-Class performers take a more structured approach to change processes than the industry Average or Laggard companies. Best-in-Class companies have implemented two critical processes more frequently than their competitors: formal impact analysis and formal change implementation plans.

The Best-in-Class are almost five-times as likely as Industry Average companies to perform a formal impact analysis process. By contrast, few Laggard organizations indicated possessing a formal change review process. Impact analysis processes allow companies to make more informed decisions and approach change with greater consideration of the overall implications of the proposed change. These companies take into account a greater number of factors when making a change.

| CRITERIA | BEST-IN-CLASS | INDUSTRY AVERAGE | LAGGARD |
|--|---------------|------------------|---------|
| Impact on product requirements | 82% | 61% | 45% |
| Change in manufacturing tooling/equipment | 94% | 70% | 60% |
| Current supply/purchase orders | 65% | 54% | 35% |
| Current demand/sales orders | 65% | 54% | 35% |
| Change in manufacturing processes | 94% | 78% | 70% |
| Related documentation | 65% | 50% | 45% |
| Impact of change on related components or assemblies | 94% | 78% | 70% |
| Part obsolescence | 59% | 63% | 55% |
| Change in product cost | 100% | 87% | 65% |
| Product reliability | 76% | 78% | 45% |
| Product performance | 88% | 85% | 50% |
| Current inventory | 59% | 61% | 55% |
| Packing or labeling impact | 47% | 50% | 25% |

APPENDIX B

B.3 Source: Aberdeen Group — www.aberdeen.com

Research for this report found that 63% of respondents indicated shortening development lead times as the top pressure pushing them to improve change management performance, while only 20% of survey participants report reducing product costs as their driver. There has been a shift in perspective on change management. Companies now recognize that better change can drive top-line benefits and so are developing processes with an eye towards improving speed to market.

| PRESSURES | RESPONSE |
|---|----------|
| Shortening development lead times | 63% |
| Market need for a quick response to quality issues | 43% |
| Challenge of implementing change in complex, global supply chains | 35% |
| Rapidly changing market requirements for product capabilities | 29% |
| Reduced product development budgets | 20% |

