



eCameron, Inc.

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Industry

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This Issue

Red Project Management Part 4: Third Party Recovery. The pros and cons of using a third party to identify the underlying causes of a Red Project and how to get the most from a consultant will be discussed.

Word Document Template. A summary of required document content and the functions in MS Word® to create them.

Book Synopsis: *The Toyota Way: Fourteen Management Principles from the World's Greatest Manufacturer*, by Jeffrey Liker. A detailed account of the Toyota Production System and its fourteen base principles.

Next Issue

Discussion Topic:

Implementing agile principles to solve a simple problem—bug fix cycles.

Management Technique:

Remote Projects. Techniques and tools in managing or participating in geographically dispersed projects.

Book Synopsis:

***Agile Project Management: Creating Innovative Products*, by Jim Highsmith.** An introduction to agile project management and its eighteen recommended practices.

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Red Projects

Projects that are either significantly behind schedule, over budget or both are referred to as Red Projects. In the past three issues of this newsletter, we have discussed the actions a Project Manager should take when trying to get a Red Project back on track. February's issue discussed the first few days of being assigned to the project,

the March issue discussed some of the basic processes that are often missing and contribute to the failure of the project and the April issue discussed the Project Manager as a lobbyist.

This issue will discuss requirements and benefits of using a consultant as the recovery manager.

Part 4: Third Party Recovery

In the first three parts of this series we have glossed over the fact that red projects falter under the guidance and supervision of the existing management structure. Steering and Executive Committees, organizational management and Project Management Organizations (PMO) failed to identify and correct problems before the project was in serious trouble. While none of these groups are responsible for the proper execution of the project—the Project Manager is responsible for that—they should have monitored and guided the project. Either these groups did not see the problems in time to correct the situation or they are a contributing factor to the project's problems. As mentioned before, the Project Manager should be accountable for all that has gone on, but the organization's or project's entire structure may be at fault.

Analyzing the project and its influencing factors needs to be completed before a turnaround can begin. This task often falls on the Project Manager. But the existing Project Manager may not be the best person for this task as they are often too close to the problems to be objective, are beleaguered with meetings and corrective action reports and saddled with the perceived failure.

It takes more than accepting responsibility and blame; the Project Manager must fix the problems. This requires understanding what went wrong and changing it so that the problems are corrected and will not be repeated. This can be difficult since the pressure of the situation may not give the Project Manager enough time to stand back and objectively look at the project.

In many situations, the stigma surrounding the existing Project Manager has biased the view of outside parties who then do not trust the Project Manager to fix the project. This frequently culminates with the customer demanding change; often in the form of replacing the Project Manager. When this happens, there are a number of options that need to be considered. The common options, with their advantages and disadvantages, are summarized in Table 1.

One option is to use an internal resource to replace or supplement the current Project Manager. This option assumes that the talent required to recover the project is available in-house. But, this may not always be the case. If available, this usually is the most cost effective method of solving the problem. However, prior to selecting this option, two tasks should be completed: (1) understand why this resource was not applied to the project earlier to avoid its current condition, and (2) ensure that the major problem was the Project Manager and not an organizational issue (methodology, process, procedure, etc.) that an internal replacement will not have the authority or background to fix.

Another option is to hire a new employee for the task. This is a good option if other conditions warrant it. Justifications may include, the organization wants to specialize in project recovery, it is in the process of acquiring other projects that will require due diligence, it has a large number of projects that can run into problems or it wants to implement methodologies new to the organization. In addition to fixing the project at hand, this person can also be part of standard project reviews and men-

Option	Advantages	Disadvantages
Replace the Project Manager with a different internal resource	<ul style="list-style-type: none"> • Removes the potential problems with a given individual. • May be the most cost effective. 	<ul style="list-style-type: none"> • Assumes the entire problem is with one person and not a greater problem within the organization or methodology. • Skills needed may not be in the organization.
Hire a new Project Manager to replace the existing one	<ul style="list-style-type: none"> • Removes the potential problems with a given individual. • Brings in new methodologies, fresh ideas or more experience. 	<ul style="list-style-type: none"> • Assumes the entire problem is with one person and not a greater problem within the organization or methodology. • Specialized skills for fixing red projects may not be needed in the future. • Ramp time for the person.
Replace the Project Manager with a contract resource	<ul style="list-style-type: none"> • Removes the potential problems with a given individual. • Brings in new methodologies, fresh ideas or more experience. • If the project is short-term, can be very cost effective. 	<ul style="list-style-type: none"> • Ramp time for the person. • Loss of the Project Management knowledge when the person leaves.
Augment a Project Manager with external consultant	<ul style="list-style-type: none"> • Brings in new methodologies, fresh ideas or more experience. • If the project is short-term, reduces the commitment. • The consultant has a mentoring role that helps retain the knowledge in the organization. 	<ul style="list-style-type: none"> • Cost of two people doing the same job. • Time to do knowledge transfer may lengthen recovery time. • Ramp time for the person.

Table 1 - Options for a Project Manager

tor to ensure that projects stay on track and are setup for success.

A third option is to replace the Project Manager with a contract resource. Since specialized experience is required to fix a Red Project, the qualifications or attributes of a contract resource are not necessarily attributes the organization requires on an ongoing basis. They are temporarily needed to identify and fix a unique set of problems, implement processes or methodologies to help prevent their reoccurrence and train the organization on those processes. Bringing on a temporary team member to do these tasks can be very cost effective. Given that only one project needs this resource, the following goals should be kept in mind:

- Minimize the tenure of the consultant, thereby decreasing the financial impact.
- Retain the knowledge within the organization on how the project was fixed.
- Train the staff on these techniques preserving the investment.

When the project is one of a kind and the conditions that occurred to create the problems have little or no chance of reoccurring, hiring a consultant to recover and run the project can be the best option. Given that the consultant has a clear statement of work (see next section) the consultant's time can be focused on solving the problems with the pro-

ject reducing the overall cost of project recovery. Care should be taken, though, to retain any applicable knowledge in the organization; this is best addressed with the final option.

The last, and commonly overlooked, option to be discussed is augmenting the current or new Project Manager with an experienced consultant. By doing this the consultant can mentor and train the full-time resource. This provides the greatest amount of knowledge transfer and education on the project and helps prevent other projects from suffering a similar fate.

Although this may be a more expensive route, since two resources are being paid to do essentially the same job, costs can be minimized if one considers the facts that (1) the consultant can more quickly turn over the project to the full-

eCameron, Inc. has significant experience managing and correcting projects that have run into trouble. This gives us the ability to assist companies in averting the problems at the beginning of a project and correcting projects that are not meeting their goals. For more information please contact:

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time resource, and (2) the processes and procedures can be applied to other projects.

Prerequisites to Get the Most Benefit From a Third Party

Just identifying the need for an outside consultant is a big step in fixing the problem. But the reason for this selection needs to be understood and agreed to by everyone—the team, management and the customer. To ensure the organization understands the reasons, it is best to create a mission statement. This should clearly state the reasons a consultant is required and the expected results. The reasons may be because the organization is lacking the expertise for managing this style project, lacking the skills at recovering Red Projects, needs experience with new methodologies (critical chain, agile, lean, etc.) or needs skills in meeting the ever changing demands of the customer; whatever the reasons, they should be documented. Managers and the customer have to agree to the fact that there is a problem that must be solved. They have to be aware that changes may be recommended that require their assistance or affect them directly. An organization that is aware that changes are required and that a consultant will be chartered with recommending and implementing those changes will greatly expedite the process of getting the project back on track.

Ideally the process of bring in a consultant will consist of two phases. The first phase should be an audit to determine what is wrong with the project and what should be done to fix it. The second phase is the implementation of the recommendations.

The two-phase approach gives a natural break to resolve a number of key issues that may arise for the business and the project. These include:

- Ensuring there is a business justification to fix the project.
- Securing more funds to complete the project.
- Requesting the consultant performing the audit continue by implementing the solution.
- Requesting other consultants to bid on the implementation phase.

Regardless, the first step must be a project audit. The pro-

ject audit consists of analyzing methods, processes and procedures, reviewing the staff, stakeholder roles and the customer to determine the root cause of the problems. This is done independently of others in the organization to provide an unbiased and candid view of the project. All aspects need to be reviewed; including the customer and the management team. This phase will identify the next steps for recovery. The deliverables should include:

- A report of items contributing to the project's failure,
- Plans, processes and procedures to implement,
- Level of effort estimates, to be used in developing a budget for the recovery.

For the implementation phase, the goals of the consultant should be clearly stated. Obviously he or she will be tasked with fixing the project, but more specific goals must be made. The recommendations from the audit should be used to create a statement of work for the consultant. This is extremely valuable for both parties. It clearly defines the work to be done for the organization and provides measurable criteria to judge the effectiveness of the consultant. For the consultant, it defines bounds and success criteria for the engagement as well as defining the authority they will have while implementing the changes.

In addition to the items recommended by the audit, the organization should supplement the list with the following tasks:

- Mentoring a Project Manager in the recover process,
- Training other Project Managers to prevent reoccurrence,
- Documenting the processes and procedures implemented.

To expedite the recovery, and reduce confusion, some simple ground rules should be set prior to the consultant commencing work. The organization must be ready to supply the consultant with:

- The authority to execute the recommendations,
- A resource to mentor, even if only part-time.

Not giving the consultant the authority to execute the decisions sets the process up for failure. To grant authority does not mean that the consultant has a blank check to do

Need	Benefit
New Management Style	Assess the customer, the team and the executive committees to suggest or implement new management techniques and processes.
Large Project Experience	Implement new approaches (i.e. phasing the project) to better handle the scope. Implement processes and train team members on different methods of handling the project.
Methodology Expertise	Experience with agile, critical chain, lean or other methodologies.
Control of Frequent Change	Analyze change logs for the number of changes in the project requirements. Implement a Change Request process or restart the project at the design phase implementing processes that will fully gather the requirements.
Short-term Specialized Needs	Manage the project in the most cost effective manner possible, minimizing the investment in training and infrastructure changes.
Mentoring and Training	Identify the areas of the organization that need improvement and train individuals or implement processes to build the group.
Head Count or Scope Reduction	Perform the functions of the "hatchet man"; reduce head count or scope, stabilizing the project. Minimizes the long lasting animosity that these tasks leave in an organization.

Table 2 - Considerations in Hiring a Consultant

what he or she wants, but removes the constraints so that an accepted plan will be not reopened at every step. For instance, assume it is determined that a new Change Management process is needed and that the Quality Assurance group will administer this—requiring organizational changes. Once this is approved, the corporate Quality Assurance manager does not have veto rights to stop the plan. The consultant has the authority to assign tasks, reorganize staff, implement new processes and any other agreed upon actions to execute the plan.

There is a lot to learn in a recovery process. The education is not limited to how to fix the project, but also how to keep problems from reoccurring. The knowledge gained is applicable in many future situations, as well as in finishing off the faulty project. For this reason an internal Project Manager should be assigned to the consultant to be mentored and trained to take over the day-to-day running of the project. This retains the knowledge in the organization, and reduces the dependence on the consultant. The result is a reduction in the short-term and long-term cost.

The Benefits of an Outsider

There are a number of advantages in hiring a consultant to run or help run a project that is in trouble. The most obvious is that doing so brings in a set of skills that do not exist in the organization. These skills could be in managing risks, changes, remote teams, subordinates, superiors or the customer. Often, though, the biggest advantage is that the person is new to the group. They bring a fresh set of eyes and new ideas to the project. Table 2 enumerates some of the benefits one can get from a consultant.

There are also less tangible benefits. A consultant is often met with more openness than other team members. It is common for consultants to get the ear of executives simply by the fact they are from the outside. Ideas proposed by


a consultant may be similar or the same as those proposed in the past, but are heeded without significant question. A large majority of this is due to the psychology of having a consultant make the statement; some is due to the "honeymoon" period of any new person. Regardless, changes are made more quickly.

Another advantage is that a consultant has no history with the team—there is nothing preconceived about the project or the people. They can be objective and review the staff and the processes and not have the bias of time. Reflecting back on the first three parts in this series one might see how much easier many of those steps would be for someone with benefit of objectivity and no history.

Many projects need very difficult decisions made and executed. These decisions could include reducing scope, restructuring resources, assigning blame to given individuals and terminating team members. Often when these decisions are made and executed, hard feelings are created and can be very difficult to overcome. By using a consultant, who will have a short tenure with the organization, many of these negative attributes leave with the person. This can help diffuse some very sensitive situations.

Selecting the right consultant can bring a whole new set of ideas and skills to the organization. These include prior Red Project experience, objectivity, new processes and procedures and attention to detail.

* * *

Over the course of this series of articles, tried-and-true methods for recovering Red Projects have been discussed. The suggestions made here are generic. Every project has its unique set of issues and answers; the hope is that the reader better understands the process of what needs to be done. There are no simple answers, but the task is neither complex nor mysterious. 

Tools: Generic Word Template

Documentation is often a significant part of the project deliverables. Therefore, having consistent and clear documentation is imperative. A generic document template is the key to making this happen. Following is an extract from a more comprehensive MS Word® usage document found on our [website](#). It is intended to introduce the reader to a number of functions in MS Word® that help in document generation.

Each element discussed will be found in the sample documents found on our website. Each type of page will be reviewed to clarify how to achieve the results using MS Word®. The accompanying figures may be difficult to read, hence hyperlinks have been provided to larger images.

The **Title Page** (Figure 1) contains the primary properties to verify that the document is the complete and correct version. These are:

1. Document Title. The document title is maintained in the document property's "Title" property and is inserted using a field.
2. Abstract. A brief description of the purpose of the document. This can be maintained in the document

property "Comments", but this proves problematic in some older versions of MS Word®.

3. Author. From the document property's "Author" property. This should not require editing unless the document was not generated by the author (i.e. a document control person). The author is the "Name" field on the User Information tab defined in the options for MS Word®.
4. Date. This is the date, as defined by the project's document control plan that corresponds with the document's current status. Here the MS Word® field SAVE-DATE is used. This date will change if the document is saved and hence will reflect inadvertent changes. This field updates automatically.
5. Revision. The revision number formatted as per the project's document control plan. Here it is a composite of three fields, the custom document properties MajorVer and MinorVer and the standard property REV (REVNUM in MS Word® 2003) resulting in a version number of MajorVer.MinorVer.Rev. Custom fields must be updated manually. The REV property is incremented automatically each time the document is saved.
6. Pages. The total number of pages in the document. This

field, NUMPAGES, is updated automatically.

7. Status. A standard custom field for the document showing the status (i.e. Draft, Internal Approval, Customer Approval, Approved, etc.) per the document control plan. This field is updated manually.
8. Full document location. The full path and name for the document. This will be the specific location of where the document is stored so that it may be found more easily. It is embedded in the footer. The field FILENAME is updated automatically. If a configuration management tool is used, this should be changed according to features of that system.
9. Watermark. A WordArt® watermark denoting "Draft" status. Usually only needed for draft documents, although other watermarks can be used. Embedded in the header. This is updated manually.
10. Project/company logo. Although this may seem like a trivial item, this quickly identifies the document as being part of the project.

The title block commonly contains the following optional information (all are maintained in the document custom properties):

11. Document number. The project's document number per the document control plan.
12. Project Name. Used to distinguish between multiple projects in a program or company.
13. Component Name. The sub-component in the project that this document relates to.

The **Copyright Page** (Figure 2) contains the copyright no-

tices, document disclaimers, etc. for the company or customer and references to trademarks within this document. Notable elements are:

1. Copyright Information for the company or customer and all products, trademarks, etc. referred to outside the project.
2. Page number. The format "Page i of N" is used to denote preface section.
3. Document name. Here only the name (sans path) is used.
4. Confidentiality notice. Most documents are either company or customer confidential. If they are, this notice should be on each page.

In this example this is the second page of the document. When printing the document double sided it will appear as the back of the title page.

The **Tables of Contents page** (Figure 3) contains the three types of commonly used and easily generated tables—Table of Contents, Table of Figures and Table of Tables. The Table of Contents is generated automatically from the "Heading" styles. The Tables of Figures and Table of Tables are generated automatically from the captions on the tables and figures.

1. Table of Contents. Should include a reference to itself and the other tables. In some technical documents these pages can become numerous and lengthy.
2. Table of Figures, Table of Tables, etc. All items with captions (i.e. equations, maps, etc.).

It is important to note that consistency should be maintained

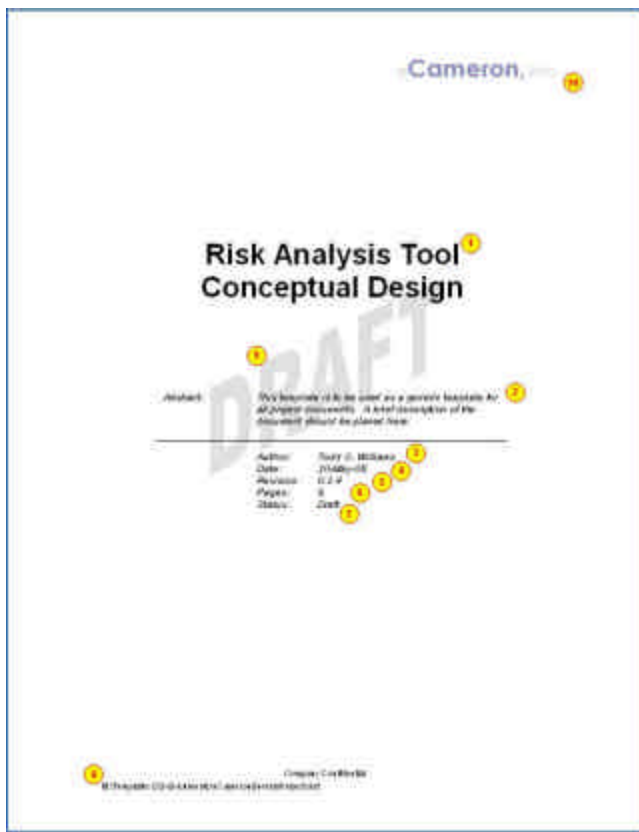


Figure 1 - Title Page



Figure 2 - Copyright Page

Figure 3 - Table of Contents Page

in the format of all captions. This improves the readability and professionalism of the document.

The **Reference and Approvals Page** (Figure 4) contains references to any documents that are called out in this document and the list of approvers and their signatures. In the example document and template, this page is after the Table of Contents but it is often prior to the Table of Contents or the last page of the document. Each has equal merit.

1. Referenced Documents. This is the information required to uniquely identify the documents used while generating this document. Additional data about the document may be included (namely, Document Number if the project uses them).
2. Approvals. A list of all people that have the authority to approve this document. In many cases this can be the most important page of the document. Fully describe the person's responsibility for approving versus reviewing this document. There should be no ambiguity.

The **Basic Content Page** (Figure 5) is the format for the body of the document. Key elements to note are:

1. Section headings are numbered. The format is contained in styles of the headings and is updated automatically, based on the setting in the style. This provides unambiguous references to sections of the document during discussions and in document cross-references.
2. Page number format. The format of the page numbering has changed to "Page # of N" to denote the body of the document.

Document Name	Revision	Date

Approver Name	Title	Signature	Date

Figure 4 - Reference and Approvals Page

Figure 5 - Basic Content Page

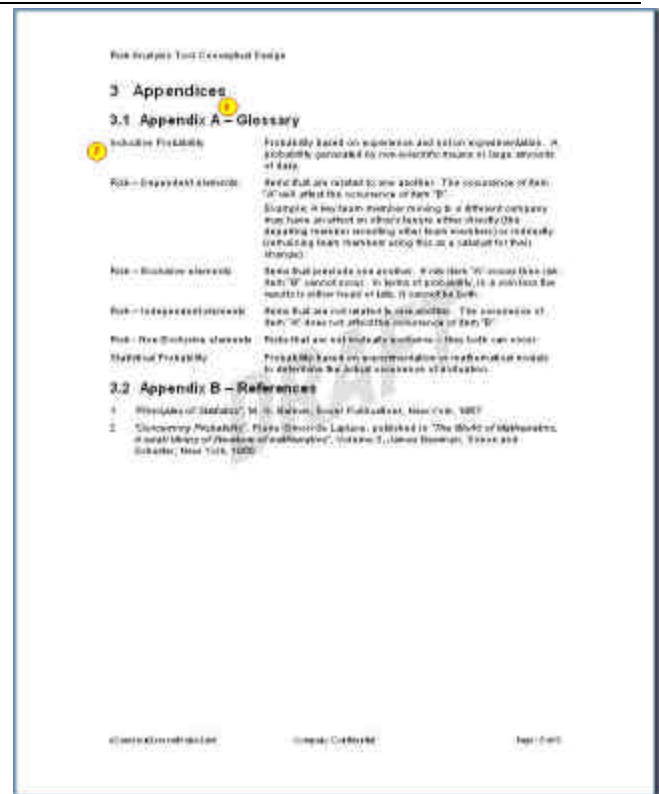
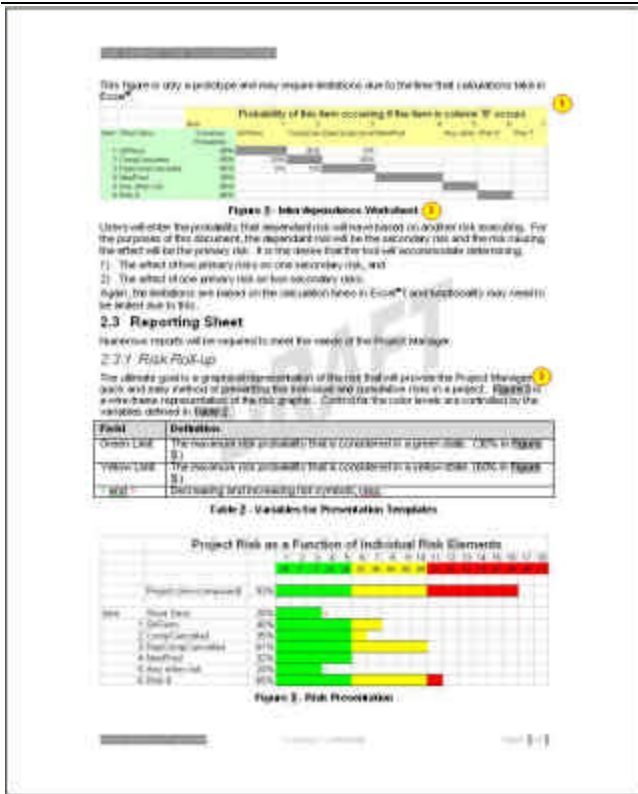


Figure 6 - Figures and Table

Figure 7 - Reference/Appendix

3. Document title. It should be repeated on all (or just odd) pages.
4. Internal hyperlinks. These are represented in a notable color. External links should show the entire URL to allow the user of a printed document to look up the reference.

3. Inline text "Cross References" to the table or figure. For easy reference and cleaner reading use only the "Label and Number" for the link.

The **Figures and Table** page (Figure 6) example shows:

1. Figures and tables embedded inline with the text. This is the simplest and most readable method of inserting images and tables. Figures are large and easy to read.
2. Captions. All table and figures should have captions with meaningful descriptions and consistent format.

The **Reference/Appendix** page (Figure 7) example shows:

1. Reference sections. Appendices that are lettered with a SEQ field.
 2. Cross References. Items that appear here are cross referenced from other sections. (See Figure 5 item 4.)
- This work may seem overwhelming if one is not familiar with Microsoft Word®, but starting with the supplied template and understanding the basic concepts of Word, it is not that difficult.

Book Synopsis

Continuing education is critical to a Project Manager. There are a variety of books on Project Management methodology describing processes and procedures that can be implemented to solve various problems, reduce risk or hasten the pace of deployment. Many of these books reference "lean thinking" and applying these principles to project management. Toyota is often considered the progenitor of lean manufacturing and a set of principles that guide, not only their manufacturing processes, but also their management and engineering practices. Toyota's overall business philosophy is encompassed in the Toyota Production System (TPS). Books on process rarely pass up the opportunity to compare their methodology with some aspect of Toyota's system.



The Toyota Way: Fourteen Management Principles from the World's Greatest Manufacturer

Author: Jeffrey Liker, Ph.D.
 McGraw-Hill, January 2004
 350 Pages, ISBN: 0071392319

The book *"The Toyota Way: Fourteen Management Principles from the World's Greatest Manufacturer"* by Jeffrey Liker, describes the principles that Toyota uses in their company to improve processes throughout their workforce—from manufacturing, to design engineering, to the organization of an administrator's desk and files.

Admittedly biased toward the Toyota Corporation, Liker does an excellent job of presenting their philosophy to the reader and only a few chapters (4-6) can be skipped without affecting the value of the book (the author even suggests this in the introduction of chapter 4).

The following synopsis is intended to serve two purposes: (1) provide enough detail to allow the reader to make an informed decision on whether or not to read the book (highly recommended), and (2) to be used as reference material after reading it.

The Toyota Way provides the reader with a basic knowledge of Toyota management principles. These principals are commonly referred to as the "standard" for lean manufacturing. The book is broken into three sections—an introduction to the Toyota Production System (TPS), the fourteen principles of TPS and a discussion on implementing the principles. It contains a variety of examples of how TPS is used at Toyota as well as in organizations other than automobile manufacturing.

Introduction

The first section of the book, six chapters, provides a history of the Toyota system and background for the presentation of the fourteen management principles, which are the primary objective of the book. These chapters are a high-level discussion of Liker's grouping of the principles and show how the principals are applied and examples of how they are used within Toyota.

Liker groups the principles into four broad categories, represented by a pyramid; the foundation being Philosophy, proceeding to Process, People/Partners, and, at the pinnacle, Problem Solving. At the same time Liker was preparing this book, Toyota started documenting their system; hence he contrasts his grouping to the internal Toyota grouping. He describes how many of the principles will result in counter-intuitive conclusions that the book plans to show improves operations.

In order to properly represent the philosophy, he takes the reader through the history of the Toyota Company from its days as an automated loom manufacturer. He feels it is important to understand the metamorphosis of the corporate culture and philosophy as it slowly transformed into to TPS; he reinforces this throughout the book.

As a visual aid, he diagrams the "TPS House". The foundation comprised of the Toyota Way Philosophy, Visual Management, Standardized Processes and Leveled Production. The two pillars supporting the roof are Just-in-Time (JIT) philosophy and *Jidoka* (in-station quality). This supports the roof of Best Quality, Safety and Morale, Lowest Cost and Shortest Lead Time.

To illustrate the application of these principles he provides a short recount of the teams and processes that developed the initial Lexus and Prius automobiles.

He then proceeds, in the second section, with a detailed

discussion of each of the fourteen principles.

Principle 1: Base Your Management Decisions on a Long-Term Philosophy, Even at the Expense of Short-Term Financial Goals

Principle 1 Key Terms	
Trust	Employees and the local culture need to trust the company
Long-term	Long-term goals over short-term financial gain
Customer	An end-user or an operation that is downstream from the operation being performed

The philosophy that is truly the foundation of the Toyota Way is the belief that the long-term view must be taken. The long-term commitment is focused on what is best for the customer. At times, short-term financial gains must be sacrificed to benefit the customer. This is present in nearly every principle that follows and Liker reiterates this concept numerous times throughout the book. In the third section of the book, where he discusses implementation in other organizations, he spends significant time describing what the outcome will be when this philosophy does not exist prior to attempting to implement a lean philosophy.

In the process of globalizing their company, one of the hurdles for Toyota was taking the "Toyota DNA", as Gary Convis, the first American President within Toyota refers to it, and infusing it into different cultures (Liker primarily discusses implementation in the US, but stresses the philosophy is global). To assist they adopted the following operating principles.

- Honor each country
- Respect the culture and the customer
- Allow for quality of life
- Create outstanding products
- Foster the Toyota culture
- Pursue growth
- Work to develop partners

In all aspects of their business, Toyota had to build trust—mutual trust with employees and mutual trust in the country/culture where they would be located. Toyota had to be a good corporate citizen.

Principle 2: Create Continuous Process Flow to Bring Problems to the Surface

Principle 2 Key Terms	
One-Piece	Processing one unit at a time, not batch processing
Value Chain	The sequence of processes that add value to the end product
<i>Muda</i>	Waste
<i>Takt</i>	Meter - Timing of operations
<i>Kaizen</i>	Incremental improvement
Lean Cell	An area for processing where a small number of one-piece operations will be preformed

Liker makes the claim that most business processes are 90%

waste; only 10% of the process adds value to the end product (the Value Chain). Eliminating *muda* (waste) is the primary target of any lean initiative. If one focuses on reducing 90% of the problem, then the implementation will see the quickest return. This is done through a process of continuous improvement—*kaizen*. He cites the eight type of *muda* as:

1. Over Production
2. Waiting
3. Unnecessary Transport
4. Over Processing
5. Excess Inventory
6. Unnecessary Movement
7. Defects
8. Unused Employee Creativity

This principle is based on the concept that the quickest way to reduce waste is through implementing one-piece continuous flow. The benefits are:

1. Builds in Quality
2. Creates Real Flexibility
3. Creates Higher Productivity
4. Frees Up Space
5. Improves Safety
6. Improves Morale
7. Reduces Cost of Inventory

He presents a number of examples to illustrate this point and, by doing so, addresses some common problems that arise.

He states that the standard manufacturing method of batch processing is often implemented to cover up issues in the process flow. He uses a common example of excessive changeover times. Batch processing methods are often used to minimize the effect of long changeover times by spreading the time over a large number of units. One-piece flow will require steps like this be analyzed closely to determine a better way of doing the conversions to minimize their impact.

The concept of a lean cell is introduced. Using simplified examples, departmental processing is juxtaposed to cells to show the theory and the advantages of cell processing. The cell is contrary to departmental processing where the batch flow system is convenient.

Cell processing and one-piece flow are tightly coupled in TPS. Cells should be conveniently grouped machines staffed with cross-trained operators. They are designed to minimize operation inventory, product handling and movement. He cautions that lean cells are not created by co-locating equipment—this is considered "fake flow" (examples are given).

Determining the flow rate of material is integral to one-piece flow. Using the order rate and the available labor hours, one can determine the rate at which each piece should be processed at a workstation. This time is the *takt* time; it is considered the rhythm of the manufacturing floor.

He cautions that moving to one-piece is not easy. Initially it will be rough and even discouraging since problems that were covered up by the old process will immediately surface. The culture of "problem solving and perseverance" needs to be in place to achieve the desired result. This is

discussed further in the third section of the book.

Principle 3: Use the "Pull" System to Avoid Overproduction

Principle 3 Key Terms	
Pull System	A method where a process signals its predecessor that more material is needed
<i>Kanban</i>	A mechanism to signal a predecessor that material is needed.

This principle is one of the two walls of the TPS house introduced in the first section—the Just-in-Time (JIT) wall.

The pull system, producing only the required material after the subsequent operation signals a need for it, is the key to reducing overproduction.

As in many Japanese manufacturing systems, the key to controlling this is the *kanban*. A *kanban* is a mechanism of signaling for a specific amount of material. An example of a simple *kanban* is a table capable of only holding one item with the instruction that when the table is empty, the preceding operation must fill it. Liker stresses that these systems should be simple systems, not complex computerized systems.

Liker also points out where pull systems may not be appropriate. Pull and push may be needed—pull systems are not gospel. Factors affecting this are criticality of parts, manufacturing and delivery time, precedence of leveling the flow, etc.

Principle 4: Level Out the Workload (*Heijunka*)

Principle 4 Key Terms	
<i>Muda</i>	Waste
<i>Muri</i>	Overburden
<i>Mura</i>	Unevenness
<i>Heijunka</i>	Leveling workload

Liker describes the need to level the production line; removing the peaks and valleys caused by batch processing and customer order fluctuation. *Heijunka*, level work flow, is very important in optimizing the manufacturing line. This helps achieve the goal of minimizing waste (*muda*), not overburdening people or the equipment (*muri*) and not creating uneven (*mura*) production levels. This requires understanding the customer and the product mix as well as removing any issues such as changeover time. This can be very difficult to achieve and at times the goal of minimizing inventory must be sacrificed to maintain a level flow. Some conditions require production to build to inventory not to order.

He provides a service industry example with which most westerners are familiar—Doctor's office appointments. In this case, regularly scheduled appointments are made to a

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certain level and room is left for the anticipated urgent or emergency visits. Without this system patients would rarely get to see their doctor when they were actually sick.

Principle 5: Build a Culture of Stopping to Fix Problems, to Get Quality Right the First Time

Principle 5 Key Terms	
<i>Jidoka</i>	Quality takes precedent
<i>Andon</i>	Signal of a Quality Problem
5-Whys	Ask "Why?" five times to get to the root cause

This principle is the second of the two walls of the TPS house introduced in the introductory section—build in quality or *Jidoka*. Again through example, Liker illustrates this principle. The key is that any person in a process has the authority to stop processing and signal a quality issue (using an *Andon*), potentially stopping production. He softens this by reminding the reader that the entire production line does not come to an immediate halt, but rather has that potential if the problem is not solved; work in process (*kanban* and other inventory) allow limited time for a solution to be implemented.

The "5-Whys" philosophy of problem solving (Principle 14) is introduced; reinforcing again that these principles do not stand alone. The key is to find the source of the problem. He contends that this is much easier in a continuous flow line since the time elapsed since the problem occurred has been minimized.

Principle 6: Standardize Tasks Are the Foundation for Continuous Improvement and Employee Empowerment

Principle 6 Key Terms	
Standardization	Flexible standardization allowing for continuous improvement
Enabling bureaucracy	A bureaucratic system that empowers the employee

Liker shows that the TPS system is very bureaucratic, but that its implementation provides for continuous improvement from the people affected by the bureaucracy. He contrasts this to other bureaucratic structures that are rigid and inflexible and do not allow for growth and improvement. The bureaucracy that the Toyota Way promotes is standardization of tested, proven methods that are geared toward eliminating waste. He stresses that the standards must only be implemented after being fully thought out and gaining consensus (Principle 13), minimizing waste (Principle 2) and maintaining a learning organization (Principle 14).

He contrasts this with the "destructive implementation" of Frederick Taylor's standards followed by many large scale manufacturing industries after World War II.

Principle 7: Use Visual Control So No Problems Are Hidden

Principle 7 Key Terms	
Visual Control	Simple visual controls, reports and processes.
<i>Obeya</i>	Big room, War Room or Project Room

Visual controls are everywhere in TPS; from *kanban* to *andon*. There are no more obvious examples than in the project room, or *obeya*. In this room, concise charts and reports show the state of the project.

Liker spends significant time presenting less obvious examples. Daily work schedules maintained on a whiteboard, operation instructions that face away from the operator for the supervisor to use in auditing operations, filing standards at each individual's desk and dedicated tool locations, are discussed.

All processes and people are expected to follow the 5S Program. Listed below, these steps are used to make all work spaces efficient and productive, help people share workstations, reduce time looking for needed tools and improve the work environment.

- Sort: Sort out unneeded items
- Straighten: Have a place for everything
- Shine: Keep the area clean
- Standardize: Create rules and standard operating procedures
- Sustain: Maintain the system and continue to improve it

The A3 Report is mentioned as a succinct presentation tool but is covered in detail in Principle 13.

Principle 8: Use Only Reliable, Thoroughly Tested Technology That Serves Your People and Processes

Principle 8 Key Terms	
Technology pull	Technology is pulled by manufacturing, not pushed to manufacturing

Although Toyota will venture into new technical fields (e.g. Prius), the TPS process will only bring in technology that will directly add value or reduce *muda* in a process. Implementation of technology is pulled by manufacturing, not pushed by IT (Information Technology) or other departments.

It is critical that processes are first streamlined and made more efficient prior to automation. The primary reason is that automated systems are more difficult to change and tune than manual systems. First understanding the manual process and its variables and building the minimal automation to handle that will create a better solution that is geared toward continuous improvement (*kaizen*.)

Implementing simple, inexpensive solutions (e.g. *andon* signals being small flags instead of a light towers) reduces investment, expedites implementation and eases refinement and tuning. Automated systems are costly and more difficult to implement and change.

Principle 9: Grow Leaders Who Thoroughly Understand the Work, Live the Philosophy, and Teach it to Others

Principle 9 Key Terms	
Corporate Culture	Retain culture in the people, and the people in the culture
Customer First	Customer is the next station or the entity buying the product

Throughout the book a few points on implementing a new philosophy are very prevalent:

- The culture, engrained with the fourteen principles, takes time to absorb.
- Without constant attention the principles will fade; one cannot implement "lean" and forget about it, it must be the way one thinks.

To do this people must be educated and trained. They must live and breathe the principles and mentor the people around them; breeding the philosophy in the company. This is the only way the organization can become a learning organization (Principle 14).

Integral in this are a few critical features:

- Having responsibility without authority. This philosophy requires that people gain acceptance to ideas through respect, knowledge and proving they are correct in their decision. Consensus building is essential.
- Putting customer first. One must always think of the customer, be it the end-user or the next person in the value adding process.
- "Go and See" (Principle 12). As a manager you must go there yourself. You cannot govern by reports.

Principle 10: Develop Exceptional People and Teams Who Follow Your Company's Philosophy

Principle 10 Key Terms

Teams	Reward team and teamwork
<i>Hoshin Kanri</i>	"Policy Deployment" in the form of employee goals
Motivation	Team motivation and individual attention

Teams are built and teamwork is achieved. Liker references Ken Blanchard's et al "The One-Minute Manager Builds High Performing Teams" and their five steps of team building:

1. Orientation: Selecting the people and introducing them to the concepts.
2. Dissatisfaction: Trying the concepts and encountering the frustrations of implementation and new job assignments.
3. Integration: Past the hurdles of the "newness" and attaining some of the goals that were anticipated.
4. Production: Getting real results of a semi-autonomous team. Continued improvement.

(Many people may know these as Forming, Storming, Norming and Performing.)

He further qualifies team building with the following points:

- The process is not a one-minute task, but rather a significant investment taking months or even years.
- Teams should be kept small (4-5 people) and numerous management tiers (maintaining the 4:1 or 5:1 ratio), admittedly sounding contrary to the low overhead concept.
- Motivation is based on team success not individual success. Individuals are assessed based on their good or bad practices.

When working with people do not focus on one motivational theory, practice five motivational theories, two internal and three external.

- Internal Motivation
 - a) Pay, security, environment of improvement
 - b) 5S Programs, accessibility to management
- External Motivation
 - c) Standards, training, rewards (team level)
 - d) Immediate reinforcement of behavior
 - e) Achievable and measurable goals—*Hoshin Kanri*

Principle 11: Respect Your Extended Network of Partners and Suppliers by Challenging Them and Helping Them Improve

Principle 11 Key Terms

<i>Hoshin Kanri</i>	"Policy Deployment" in the form of supplier goals
<i>Jishuken</i>	Voluntary study groups

Toyota treats suppliers much like they treat their employees—with respect and dignity—challenging them to do better and helping them to achieve excellence. Liker uses a modified Maslow Needs Hierarchy to describe TPS' treatment of the supply chain. It describes the five levels as:

1. Fair and Honorable Business Relations (the base)
2. Stable, Reliable Processes
3. Clear Expectations and Goals—*Hoshin Kanri*
4. Enabling Systems
5. Learning Enterprise (pinnacle)

In applying this philosophy, a company does not use the standards of lowest price and competitive; bid nor do they abandon a supplier at their first mistake, nor do they let them flounder to solve their own problems. Toyota uses price targets and stretch goals, but also works to help their supplier achieve those goals. Cross functional teams are sent to help the supplier discover and fix problems so that the supplier becomes a stronger, better supplier. This gives Toyota a reputation of being tough but fair.

One method Toyota uses to assist suppliers is through associations that suppliers may join to improve their understanding and implementation of TPS. In these organizations, suppliers attend study groups to share their experiences implementing TPS. This process is called *jishuken*.

As with an operation's value chain, Toyota's value engineering principles are key to the supplier's success. Properly designed parts are more cost effective to make and maintain. This concept includes a cross functional design team with a goal of optimizing cost, manufacturability and quality using an iterative design approach.

Principle 12: Go and See for Yourself to Thoroughly Understand the Situation (*Genchi Genbutsu*)

Principle 12 Key Terms

<i>Genchi Genbutsu</i>	"Go and See"
<i>Gemba</i>	Actual Place
Ohno Circle	Stopping to do deep observation of a process
<i>Hourensou</i>	Trusted advisors

Throughout the book he need for design engineers and management to go to the manufacturing floor to see the processes and how the design affects them is reinforced.

Genchi genbutsu, "go-and-see", is not a new term to this principle nor is it restricted to engineering. Liker points out that it is surely a greater requirement for an engineer, but it is a process that all must follow. Often the word *gemba* (actual place) is used instead of *genchi genbutsu*.

Taiichi Ohno, the father of the waste reduction drive at Toyota, was instrumental in defining ways to identify *muda*. One process that he promoted was to simply stand in one location, called an Ohno Circle, and watch the processes being performed. By simply watching, people can easily note methods to remove wasted processing.

Management at Toyota is described as a style that might be considered "micromanagement" in western business culture. Managers are expected to "go-and-see" all operations in the business. This is true for all employees from the CEO down. The philosophy is that without experiencing the situation for yourself, *genchi genbutsu*, you really do not have an understanding of how it can be improved.

Liker provides Tadashi Yamashima's (President, Toyota Technical Center) ten management principles, which are abbreviated below:

1. Always keep the final target in mind
2. Clearly assign tasks to yourself and others
3. Think and speak on verified, proven information and data
4. Take full advantage of the wisdom and experiences of others to send, gather or discuss information
5. Share information with others in a timely fashion
6. Always report, inform and consult in a timely manner
7. Analyze and understand shortcomings in your capabilities in a measurable way
8. Relentlessly strive to conduct *kaizen* activities
9. Think "outside the box," or beyond common sense and standard rules
10. Always be mindful of protecting your safety and health

Within Toyota it is understood that some very senior executives are not able to practice *genchi genbutsu* to the level expected in their early days, hence they must have a trusted advisor summarize the situations. This process is *Hourensou*. Even though the concept exists and the CEO of Toyota uses it, he still goes to the manufacturing floor regularly to experience it himself.

Liker stresses that although all the principles are interdependent; this principle is the most universal of all the principles. It is critical that everyone stay in touch with the value added process of manufacturing the end product.

Principle 13: Make Decisions Slowly by Consensus, Thoroughly Consider All Options; Implement Decisions Rapidly

Principle 13 Key Terms

<i>Nemawashi</i>	Make decisions slowly by consensus, implement quickly
PDCA	W. Edwards Deming's Plan-Do-Check-Act

The goal is never to make a hasty, ill-thought decision. A correct, but hasty, action is apt to bring a larger reprimand than a properly thought out process that fails. This concept is repeated throughout the book using the analogy of the

tortoise and the hare. Smooth, steady, methodical pace, considering many options is better than sprinting to decisions. Once the decision is made it should be implemented quickly. This entire process is known as *nemawashi*.

The following decision parameters are discussed in detail:

1. Find what is really going on (go-and-see)
2. Determine the underlying cause
3. Consider a broad range of alternatives
4. Build consensus on the resolution
5. Use efficient communication tools

The concept of "sets" is highlighted in the process of a "set of alternative solutions" and is contrasted to the "point based solution"; the latter potentially overlooking a better solution by never considering it.

Consensus is key to the decision process. The book contrasts the us-and-them mentality in the work place to TPS. This is the antithesis of the Toyota Way. The decision process is, as most TPS processes, cross functional and requires multiple steps in refining the options for decisions prior to execution. W. Edwards Deming's process of Plan-Do-Check-Act (PDCA) is discussed as applied to the decision process.

An example of the "A3 Report", mentioned in Principle 7, an efficient communication tool, is shown as relating to a purchasing process improvement proposal. The concise format requires that the presenter show only facts in a well thought manner and minimizes the chance that important details might be lost in a more voluminous report.

Principle 14: Become a Learning Organization Through Relentless Reflection (*Hansei*) and Continuous Improvement (*Kaizen*)

Principle 14 Key Terms

Learning Organization	An organization that is continually learning and improving
<i>Hansei</i>	Self-reflection to determine what can be done better
<i>Hoshin Kanri</i>	"Policy Deployment" in the form of organizational and employees goals

The fourteenth principle, creating a learning organization, applies many of preceding principles to the organization as a whole—continuous improvement, *kaizen*, organizational and individual goals, *hoshin kanri* and a new concept, deep reflection, *hansei*. *Hansei* is described as a process steeped in the Japanese culture. For this reason it is considered a difficult concept to master by western cultures. The process involves looking at everything that one does and examining it for what could have been done better. This deep reflection is often interpreted by westerners as criticism when its intent is improvement.

General problem solving technique is discussed and is based on the 5-Whys process to determine the root cause.

1. Initial problem perception
2. Clarify the problem
3. Locate area/point of cause
4. Investigate root cause (5-Whys)
5. Countermeasure
6. Evaluate
7. Standardize

He sites a common cause of failure when implementing TPS-type systems is the difference in the philosophy of metrics in an organization. Organizations that focus on direct results, and not on proper processes, have trouble succeeding. TPS philosophy is that process will drive results—monitor process and results will come naturally.

Three types of metrics used at Toyota are:

1. Global Performance Measures at the company level
2. Operational Performance at the department level
3. Stretch Goals at the business unit and workgroup level

Application of Principles

The last two chapters discuss applying the principles at another company. Liker cautions that the commitment to a lean business, be it manufacturing, service or technical, must be from the top and long-term. Anything else is a short-term fix and will not achieve the results that Toyota has seen. Again he provides a number of examples to help illustrate how lean thinking can be implemented.

Liker expresses that the initiative must be top-down. Assigning the initiative to a subordinate is a common source for failure since the philosophy will not be bred into the company from the CEO down. Philosophy cannot be delegated.

He provides an outline of a two-phase training workshop facilitated by a lean systems expert that focuses on Value Stream Mapping—determining the path in the process that adds values to the product. This is followed by a third phase (outside the workshop) for sustaining and continuous improvement.

Phase One: Preparation

- Clearly define the scope. Look for something that will be

able to show an impact.

- Set Objectives.
- Create preliminary current state map.
- Collect relevant documentation.
- Post preliminary current state map.

Phase Two: *Kaizen* Workshop

- Identify the customer; there may be more than one.
- Analyze the current state map. Walk through the process, define non-value add, value add and non-value add but required steps.
- Develop a future state vision. Follow a brainstorming process and create one-piece flow, work cells and apply as many of the fourteen principles as make sense.
- Implement the decisions. This may take time and require a phased approach. Create a plan and execute.
- Evaluate. Monitor the new process with metrics that are lean. Do not over measure since measuring is non-value add.

Phase Three: Sustaining and continuous improvement.

* * *

The Toyota Way is an excellent book to understand lean systems and is a perfect primer to learning other project management techniques such as agile or critical chain, or simply improving ones current management skills.

* * *

(This article was the basis for the Wikipedia article on book "The Toyota Way". More discussion may be found there: http://en.wikipedia.org/wiki/The_Toyota_Way)

Resources and Templates

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