Chapter 21: Improving the Chance of Process Success

What is the chance that the processes you use will successfully deliver the intended results? In a process in which one step is done after the other and the failure of one step can fail the whole process, there are many opportunities for problems. In a series arrangement, the risks add together. Your total business risk is the sum of all the risks in all your business processes. The total risk to a production line is the sum of all the risks in each production line step. The total risk for an equipment item is the sum of all the risks from each of its components. Figure 21.1 represents how the risks to the individual parts in a roller bearing add together to make the total risk for the bearing. A risk that fails any component of the bearing will fail the whole bearing. Every machine, process, and job carry the cumulative risk of failure from all its elements.

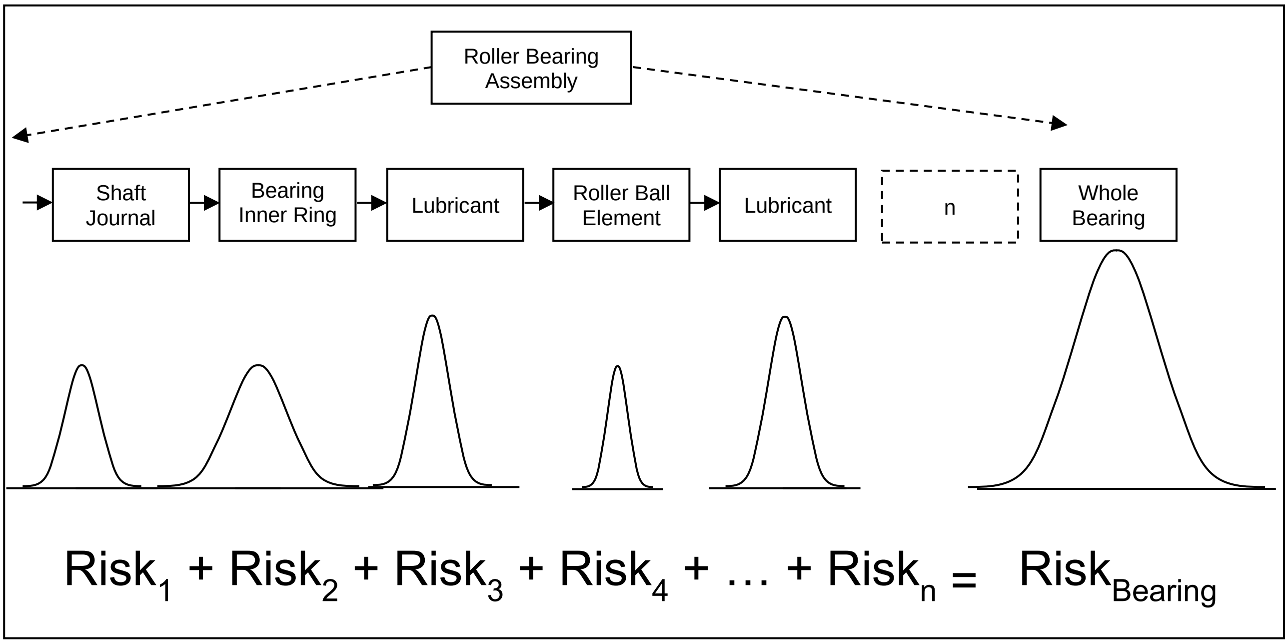

Figure 21.1—Risk from Each Equipment Part Adds Together

To improve equipment reliability, remove the risk of parts failure. To improve production line performance, remove the risk of production line step failures. To improve workplace safety, remove the risks of workplace harm. You'll create a more successful business when you use processes containing fewer risks.

You can estimate the chance of successfully completing a process by gauging the chance that each step will be successfully completed. The method is called Chance of Success Mapping.

Estimating the Chance of Process Success

The four-step process for crossing a busy road shown in Figure 21.2 is a simple example of how Chance of Success Mapping can improve process success rates. The aim is to understand how each step can be made more successful. By removing the risks of failure at each step and introducing more effective step practices, the chance of process success rises.

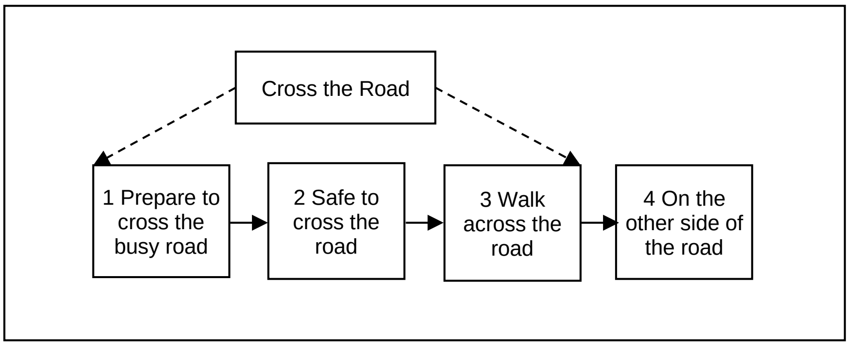

Figure 21.2—Simplified Process for Crossing a Road

The spreadsheet for the process of crossing a busy road is shown in Table 21.1. Its process map goes across the top of the table and the chance of success investigation is conducted underneath. Because the process is a series, if one step is done poorly, the whole process performs poorly—which, when crossing a dangerous road, means that you increase the chance of being run over or getting seriously injured. Success depends on preparing yourself well and ensuring that nothing bad happens as you cross the road.

Chance of Success Mapping for Crossing the Road													
No	*Process Steps*	1 Prepare to Cross the Busy Road	Chance of Success for this Step		2 Safe to Cross the Road	Chance of Success for this Step		3 Walk across the Road	Chance of Success for this Step		Chance of Success to this Point		4 On the Other Side of the Road
1 2 3			Low %	High %		Low %	High %		Low %	High %	Low %	High %	
4	*Step Purpose*	Check the traffic conditions			Confirm there is time to cross			Physically move the distance					Reach the other side unharmed
5	*Step Importance*	☹			☹			☹					😐
6	*Step Target Outcome*	Look both ways	99	100	No traffic too close	90	98	Traverse directly across the road	98	100	86	98	Safely across the busy road
7	*Opportunity to Do Step*	1.1 Be at roadside			2.1 When no vehicles within 200 m			3.1 When no vehicles approach during crossing					4.1 On the other side of the road
8								3.2 Surface is traversable					
9 10 11	*Step Risks*	1.1.1 Obstructions 1.1.2 On a bend			2.1.1 Speeding car 2.1.2 Reversing car			3.1.1 Speeding car 3.2.1 Uneven surface 3.2.2 Potholes					
12 13 14	*Risk Mitigations*	1.1.1.1 Find clear line of sight 1.1.2.1 Move 100 m clear of bend	100	100	2.1.1.1 Give 300 m clearance 2.1.2.1 Look both ways	98	99	3.1.1.1 Give 300 m clearance 3.2.1.1 Plan route to follow	99	100	97	99	*Alternative option:* Move to a better spot with higher chance of success

Table 21.1—Chance of Success Mapping for Crossing the Road

Your chance of successfully crossing the road diminishes with every risk you face, and it improves with every uncertainty you remove. Because the risk to a process is the sum of the risks from each step, you investigate individual steps to see how they could be failed and look at what can be done to remove the causes of failure and promote the chance of success.

A process chance of success analysis starts by replicating the process map across the top of a spreadsheet. These steps make up the process as designed, and the combination of all the steps is your current process design. The purpose of each step in the process is explained. Every step has one or more functions in the process, and it must deliver all its required outcomes. These are its target values. All step targets are recorded in the table. When a target is not achieved, the step has failed. Smiley faces are used to show how critical a step is to overall process success; a sad face denotes a critical step, and a normal face is an important step. A step may be unimportant, important, or critical. It is unimportant if its failure has no impact on the process outcome. A step is important if, when it goes wrong, it causes a loss of time or money but can be corrected to perform properly. A step is critical if, when it goes wrong, someone is injured, there is a disastrous product release, or a step target cannot be achieved. It is very unlikely that any step in a series process is unimportant. If that were the case, you would eliminate the step because it is a waste of time and effort.

To find the problems that could prevent process success, you identify all the risks in each of the steps and note them in the spreadsheet. With each step's existing risks and problems known, you can estimate each step's current best chance of success and worst chance of success. This establishes the two ends of the frequency distribution of possible outcomes for the step. The estimates of best and worst chances of success are made using historical records of the frequency of past bad results and the frequency of great results in doing each step.

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When crossing a busy road, you will most often cross it successfully, but occasionally, you will not be able to cross because of existing dangers. Your experience tells you that for every 100 times you arrive at a busy road, you won't be able to cross it every time. You use historical evidence accumulated over the years to gauge the lower and upper ranges for the chance of completing each step of a process. There is a degree of uncertainty in estimating the chance of success range, but you are unlikely to come up with wild, crazy values if estimates are based on factual historical information from similar past situations. The likelihood scale of a calibrated risk matrix is a useful gauge of uncertainty when there are no complete historical records available.

The individual steps multiply together to give you a low to high range for the chance of success of completing the whole process. In the table, the chance of successfully crossing the road goes from 86% to 98%. An 86% chance of success of safely crossing the road is too low. Because you know the poor risks to address, you choose mitigations to eliminate them or minimize their impact on success. The controls you will use are recorded for each step. To estimate the revised chance of success range, you presume that the new risk controls are in place and that they are being done properly. If the planned risk mitigations noted in the table have been done, the chance of safely crossing the road goes up to 97% to 99%. To massively reduce the chance of harm when crossing a road, you need to use traffic lights controlled for pedestrian crossing. To eliminate traffic risk when crossing a busy thoroughfare take a pedestrian bridge over the road.

Estimating the Chance of Equipment Success

For your equipment, you can do risk simulations for the chance of success of its parts. In Table 21.2, a section of the chain of components that assemble into a ball bearing is modelled in a Chance of Success Mapping spreadsheet. The spreadsheet is configured to let you record each part's risks and then add risk controls to reduce them. Following that, you gauge how much difference the new mitigations are likely to make in increasing the whole component's reliability.

The component map of the bearing design is laid out across the top of the spreadsheet. The accumulated steps are the process design. Each part is briefly described so that you understand why it's there and what it does. Below each item is a note on the consequence or utility when it performs successfully. Next you identify the risk severity of each step with smiley faces. For each item in the component chain, clearly describe all the required outcomes it must deliver (i.e., its targets). Under each step list the tasks to be done to successfully deliver each step target.

The first intent is to gauge the chance of success range for the bearing exactly as your company is running its equipment today. The estimates of low and high chance are for the operating service and care that are now being used. Beside each step target, indicate the worst odds (low) and best odds (high) that a step will deliver each of its required targets. The upper and lower chances of success allocations are based on the historical frequency of risk events over the organization's operating history. This information is typically found in the maintenance and operations management systems. If complete and accurate failure information is not available, you ask for the estimates of long serving operations and maintenance staff.

To simplify choosing the lower and upper ranges, suppose you have 100 of these parts in your operation. How many times during the service lives of the imagined 100 items could a defect arise for the issue being considered? This gives you a percentage for the low chance of success value. Then, for the same issue ask, yourself, of the 100 items, how many are likely to be perfect every time this situation arises? That is the upper value of the chance of success for that step in your process. When the chances become very small for a 100-opportunity scenario, use bigger groups of opportunities, such as the chance in 1,000 or 10,000 of the issues or items under consideration. Mass-produced parts will have a very low chance of containing defects, likely measured in a few per 10,000 items, whereas any part made one by one using job shop processes has many humans involved and therefore a greater risk of errors. The failure rates from work done in job shops would be measured in defects per 100 and even defects per dozen.

The chance of success for a step is dependent on how many risks are present in the step and each individual risk's probability of occurrence. Each risk reduces the odds of a step's successful completion. The effect of all risks in a step on the step reliability, or the step chance of success, is taken into consideration by multiplying all low chances together to determine the total worst impact on the step and then multiplying together all high chances to determine the best odds of step success.

Once low and high chance of success estimates are made for each component step, the entire assembly's chance of success range can be gauged by multiplying together the relevant values of all its steps. To get the assembly's least chance of success, all the component's low chances are multiplied. Similarly, to get the assembly's best chance of success, all the components' high chances are multiplied. At any place along the chain, you can gauge the success range by inserting equations to calculate the lows and highs of success to that point.

All risks to the outcome of a step need to be identified and recorded. Every situation that can fail the step needs to be assessed for its impact on reliability. For example, in the table, every risk to journal machining needs to be listed when calculating the probability of success for the journal and the subsequent impact on the life of the bearing. As the Step 1 shaft journal is made, the same machining activity produces both the journal shape and surface finish required in Step Targets 1.1.1 and 1.1.2. Because there are two separate quality requirements for the shaft journal from one machining event, and one or the other or both can be done wrong, each machining risk from the same job activity is noted in the spreadsheet and included in the process calculation.

According to Table 21.2, the least chance of success for the assembled bearing using current practices is 69%. For every 100 ball bearings mounted on a shaft, up to 31 of them will contain defects related to the journal, the inner ring, the lubricant, or the rolling element. Doing the very best possible, the highest chance of success of all items being defect-free is 93%. With the best odds, seven ball bearings out of 100 mounted on shafts will fail before their full-service life. With the worst odds, 31 out of every 100 will fail before their time. The biggest contributor to the current chance of failure is lubricant contamination.

To increase the chance of success, you do a risk analysis for each item to identify what causes the risks at each step so that those risks can be removed. In the example in Table 21.3, the causes of risks to the success of each step are listed. It is important to identify every risk that will prevent the item from working right the first time. If you do not spot a risk, you cannot protect against it. When analysing equipment, it would pay for you to review the Physics of Failure Factors Analysis guidewords to check whether there are other risks you need to include into the spreadsheet.

After the risk identification is completed, select mitigations that remove the risks or at least control them to very low frequencies. This includes changing the way a task is done or making process design changes to increase the chance of success. In the example in Table 21.4, controls for the risks are added to the list. The low and high estimates for risk are then updated for each item on the presumption the mitigations will be correctly implemented and used. The revised chance of success from eliminating risks moves the low chance of success to 88% and the best chance of success to 95%.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	R	S	U	V	W	X
1	**Chance of Success Mapping for a Roller Bearing**																					
2																						
3																						
4		1 Shaft Journal			2 Bearing Inner Ring			3 Lubricant			4 Roller Ball Element			5 Lubricant					n			Whole Bearing
5	**Step Functions**	1.1 Fully support bearing inner ring			2.1 Allow rolling element to rotate			3.1 Reduce friction			4.1 Rotate			5.1 Reduce friction					n.1:			
6		1.2 Locate bearing			2.2 Take full service load			3.2 Prevent surface contact			4.2 Take full service load			5.2 Prevent surface contact					n.2:			
7											4.3 Axially align shaft inside housing											
8																						
9	**Consequence of Achievement**	Full bearing service life			Full bearing service life			Full bearing service life			Full bearing service life			Full bearing service life					Full bearing service life			Full bearing service life
10																						
11	**Step Importance**	☹			☹			☹			☹			☹					☹			☹
12																						
13	**Step Targets**	1.1.1 Correct fit, tolerance, and form			2.1.1 Raceway surface finish to specification			3.1.1 Chemically correct			4.1.1 Element perfectly smooth			5.1.1 Chemically correct								
14		1.1.2 Suitable surface finish			2.2.1 Ring shaped to specification			3.1.2 Correct viscosity			4.1.2 Element perfectly shaped			5.1.2 Correct viscosity								
15		1.2.1 Suitable metallurgical properties			2.2.2 Take full service loads			3.1.3 Contaminate-free			4.2.1 Take full service loads			5.1.3 Contaminate-free								
16								3.2.1 Take full service load						5.2.1 Take full service load								
17																						
18			Chance of Success for This Item			Chance of Success for This Item			Chance of Success for This Item			Chance of Success for This Item			Chance of Success for This Item		**Chance of Success to This Point**			Assembly Chance of Success		
19			Low	High		Low	High		Low	High		Low	High		Low	High	Least	Best		Least	Best	
20			%	%		%	%		%	%		%	%		%	%	%	%		%	%	
21	**Step Tasks for Each Target**	1.1.1.1 Accurate machining	99.5	99.9	2.1.1.1 Accurate machining	99.95	99.99	3.1.1.1 Correct lube for the service	99	99.9	4.1.1.1 Accurate machining	99.95	99.99	5.1.1.1 Correct lube for the service	99	99.9						
22		1.1.2.1 Accurate machining	99.5	99.9	2.2.1.1 Accurate machining	99.95	99.99	3.1.1.2 Correct formulation	99	99.9	4.1.1.2 Accurate machining	99.95	99.99	5.1.1.2 Correct formulation	99	99.9						
23		1.2.1.1 Correct material selection	99	99.9	2.2.2.1 Fully supported on a round shaft journal	99.5	99.9	3.1.1.3 Correct additives	99	99.9	4.2.1.1 Fully supported on a round shaft journal	99.50	99	5.1.2.3 Correct additives	99	99.9						
24					2.2.2.2 Accurate machining	99.95	99.99	3.1.2.1 Correct temperature	95	99	4.3.1 Position inner ring at proper point	99	99.5	5.1.2.1 Correct temperature	95	99						
25								3.1.3.1 Solids-free	99	99.9				5.1.3.1 Solids-free	99	99.9						
26								3.1.3.2 Water-free	99	99.9				5.1.3.2 Water-free	99	99.9						
27								3.1.3.3 Product ingress free	99	99.9				5.1.3.3 Product ingress free	99	99.9						
28								3.2.1.1 Load within design limits	95	99				5.2.1.1 Load within design limits	95	99						
29			98.01	99.7		99.35	99.87		84.97	97.42		98.41	98.49		84.97	97.42	69.2	93.1				
30																						

Table 21.2—Chance of Success Mapping for a Roller Bearing

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
1	**Process Chance of Success Mapping: Identifying Risks for Each Part**																							
2																								
3–4		1 Shaft Journal			2 Bearing Inner Ring			3 Lubricant			4 Roller Ball Element			5 Lubricant							n			Whole Bearing
5	**Step Tasks for Each Target**	1.1.1.1 Accurate machining	99.5	99.9	2.1.1.1 Accurate machining	99.95	99.99	3.1.1.1 Correct lube for the service	99	99.9	4.1.1.1 Accurate machining	99.95	99.99	5.1.1.1 Correct lube for the service	99	99.9								
6		1.1.2.1 Accurate machining	99.5	99.9	2.2.1.1 Accurate machining	99.95	99.99	3.1.1.2 Correct formulation	99	99.9	4.1.1.2 Accurate machining	99.95	99.99	5.1.1.2 Correct formulation	99	99.9								
7		1.2.1.1 Correct material selection	99	99.9	2.2.2.1 Fully supported on a round shaft journal	99.5	99.9	3.1.1.3 Correct additives	99	99.9	4.2.1.1 Fully supported on a round shaft journal	99.50	99	5.1.2.3 Correct additives	99	99.9								
8					2.2.2.2 Accurate machining	99.95	99.99	3.1.2.1 Correct temperature	95	99	4.3.1.1 Position inner ring at proper point	99	99.5	5.1.2.1 Correct temperature	95	99								
9								3.1.3.1 Solids-free	99	99.9				5.1.3.1 Solids-free	99	99.9								
10								3.1.3.2 Water-free	99	99.9				5.1.3.2 Water-free	99	99.9								
11								3.1.3.3 Product ingress free	99	99.9				5.1.3.3 Product ingress free	99	99.9								
12								3.2.1.1 Load within design limits	95	99				5.2.1.1 Load within design limits	95	99								
13			98.51	99.8		99.45	99.89		86.69	97.72		98.46	98.5		86.69	97.72		72.5	93.8					
14																								
15	**Risk Causes in Step Tasks**	1.1.1.1.1 Incorrect machining setup			2.1.1.1.1 Incorrect machining setup			3.1.1.1.1 Service duty misunderstood			4.1.1.1.1 Incorrect machining setup			Same as Item 3 Lubricant										
16		1.1.1.1.2 Measurement error			2.1.1.1.2 Measurement error			3.1.1.1.2 Misinterpreted selection table			4.1.1.1.2 Measurement error													
17		1.1.1.1.3 Wrong drawing			2.1.1.1.3 Wrong drawing			3.1.1.2.1 Wrong lube taken from store			4.1.1.1.3 Wrong drawing													
18		1.1.1.1.4 Incorrect part size or tolerance in drawing			2.1.1.1.4 Incorrect part size or tolerance in drawing			3.1.1.2.2 Wax, varnish, coking			4.1.1.1.3 Incorrect part size or tolerance in drawing													
19		1.1.1.1.5 Misread a drawing measurement			2.1.1.1.5 Poor cutting tool condition			3.1.1.3.1 Additives depleated during service			4.2.2.1.1 Poor cutting tool condition													
20		1.1.1.1.6 Poor cutting tool condition			2.2.2.1.1 Wrong clearnace bearing supplied			3.1.2.1.1 Machine overloaded			4.3.1.1.1 Inner ring not hard against shoulder													
21		1.2.1.1.1 Wrong material chosen						3.1.2.1.2 Machine in high temperature location																
22		1.2.1.1.2 Wrong material supplied						3.1.3.1.1 Wear particles in lube																
23		1.2.1.1.3 Misread catalog selection						3.1.3.1.2 Sand, rust, or other solids in lube																
24								3.1.3.2.1 Water																
25								3.1.3.3.1 Product ingress																
26								3.2.1.1.1 Overloaded during operation																

Table 21.3—Process Chance of Success Mapping: Identifying Risks for Each Part

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
1	**Process Chance of Success Mapping: Risk Controls Added for Each Part**																							
2																								
3		1 Shaft Journal			2 Bearing Inner Ring			3 Lubricant Grease			4 Roller Ball Element			5 Lubricant Grease							n			Whole Bearing
4																								
5	**Risk Controls**	1.1.1.1.1.1 Second person check machining setup prior cutting			2.1.1.1.1.1 Second person check machining setup prior cutting			3.1.1.1.1.1 Include service duty confirmation in engineering ITP			4.1.1.1.1.1 Second person check machining setup prior cutting			5.1.1.1.1.1 Include service duty confirmation in engineering ITP										
6		1.1.1.1.2.1 Double-check measure with calibrated micrometer			2.1.1.1.2.1 Double-check measure with calibrated micrometer			3.1.1.1.2.1 Second person to check selection table recommendation			4.1.1.1.2.1 Double-check measure with calibrated micrometer			5.1.1.1.2.1 Second person to check selection table recommendation										
7		1.1.1.1.3.1 Include drawing check in machining ITP			2.1.1.1.3.1 Include drawing check in machining ITP			3.1.1.2.1.1 Include lubricate confirmation in maintenance ITP			4.1.1.1.3.1 Include drawing check in machining ITP			5.1.1.2.1.1 Include lubricate confirmation in maintenance ITP										
8		1.1.1.1.4.1 Second person check all critical measurements on drawing			2.1.1.1.4.1 Second person check all critical measurements on drawing			3.1.1.2.2.1 Include chemistry condition in test laboratory report			4.1.1.1.4.1 Second person check all critical measurements on drawing			5.1.1.2.2.1 Include chemistry condition in test laboratory report										
9		1.1.1.1.5.1 Critical drawing measurements to be highlighted on drawing			2.1.1.1.5.1 Second person check cutting tool condition			3.1.1.2.2.2 Include test laboratory chemistry report review and action by maintenance engineer			4.1.1.1.5.1 Second person check cutting tool condition			5.1.1.2.2.2 Include test laboratory chemistry report review and action by maintenance engineer										
10		1.1.1.1.6.1 Second person check cutting tool condition			2.2.2.1.1.1 Include bearing clearnace check in maintenance ITP			3.1.1.3.1.1 Additives' levels in test laboratory report			2.2.2.1.1.1 Include position check in maintenance ITP			5.1.1.3.1.1 Additives' levels in test laboratory report										
11		1.2.1.1.1.1 Include material check in machining ITP						3.1.1.3.1.2 Include test laboratory additives report review and action by Maintenance Engineer						5.1.1.3.1.2 Include test laboratory additives report review and action by maintenance engineer										
12		1.2.1.1.2.1 Include material check in machining ITP						3.1.2.1.1.1 Operate equipment to precision operating procedure						5.1.2.1.1.1 Operate equipment to precision operating procedure										
13		1.2.1.1.3.1 Check catalogue selection against material list on drawing						3.1.2.1.2.1 Include location ambient temperature range in engineering ITP						5.1.2.1.2.1 Include location ambient temperature range in engineering ITP										
14	**Chance of Success with Mitigations**		Chance of Success for This Item			Chance of Success for This Item			Chance of Success for This Item			Chance of Success for This Item			Chance of Success for This Item			**Chance of Success to This Point**				Assembly Chance of Success		
15			Low	High		Low	High		Low	High		Low	High		Low	High		Least	Best			Least	Best	
16			%	%		%	%		%	%		%	%		%	%		%	%			%	%	
17	**Step Tasks for Each Target**	1.1.1.1 Accurate machining	99.9	99.95	2.1.1.1 Accurate machining	99.95	99.99	3.1.1.1 Correct lube for the service	99.9	99.95	4.1.1.1 Accurate machining	99.95	99.99	5.1.1.1 Correct lube for the service	99.9	99.95								
18		1.1.2.1 Accurate machining	99.9	99.95	2.2.1.1 Accurate machining	99.95	99.99	3.1.1.2 Correct formulation	99.9	99.95	4.1.1.2 Accurate machining	99.95	99.99	5.1.1.2 Correct formulation	99.9	99.95								
19		1.2.1.1 Correct material selection	99.9	99.95	2.2.2.1 Fully supported on a round shaft	99.95	99.99	3.1.1.3 Correct additives	99.9	99.95	4.2.1.1 Fully supported on a round shaft	99.95	99	5.1.2.3 Correct additives	99.9	99.95								
20					2.2.2.2 Accurate machining	99.95	99.99	3.1.2.1 Correct temperature	98	99.5	4.3.1 Position inner ring at proper point	99.5	99.5	5.1.2.1 Correct temperature	98	99.5								
21								3.1.3.1 Solids free	99.5	99.9				5.1.3.1 Solids free	99.5	99.9								
22								3.1.3.2 Water free	99.5	99.9				5.1.3.2 Water free	99.5	99.9								
23								3.1.3.3 Product ingress free	99.5	99.9				5.1.3.3 Product ingress free	99.5	99.9								
24								3.2.1.1 Load within design limits	98	99				5.2.1.1 Load within design limits	98	99								
25			99.7	99.85		99.8	99.96		94.32	98.06		99.35	98.49		94.32	98.06		87.9	94.5					

Table 21.4— Process Chance of Success Mapping: Risk Controls Added for Each Part

Human nature is naturally positive, and so you will look at the odds of the best outcome and expect that is what you will get. The truth is that you should expect to get the worst outcome and not presume that anything better will result. Until your low value for the total process increases to reasonable odds, you need to keep refining your plan with better and tighter risk controls for uncertain situations.

The reduction in risk from before to after the mitigations brings financial gain to the business. The money made from the improved chance of success can be estimated using the potential TDAF costs saved. By lifting a bearing's least chance of success from 69% to 88%, potentially 19 bearing failures in every 100 bearings will be prevented. Those savings can fund the cost of the changes that need to be implemented. You have a business case to invest some of the savings to get the higher bearing success rate so that you can make new operating profits.

In the analysis table, you gauge the influence of various risks on step reliability and their consequential impact on process success. The selection of probability or chance of success values to use in the analysis depends on how much information you have about the effect of a cause on the opportunity to fail a process step. In an ideal world, the failure rate per opportunity for each process step would already be accurately collected by your enterprise resource management system. You would then feed current chance of success values into the spreadsheet. After making a change, you would quickly know whether a mitigation was successful from the new failure data collected. If you don't have accurate records to use in the analysis, it is necessary for a person who is knowledgeable about the situation being analysed to use the organization's operating history records and their personal experience to estimate the low and high values of chance. If you are not knowledgeable about the risks for a situation being analysed, you need to get help from the people who know the process well and feed their experience into the spreadsheet.

If it is vital to be highly certain of the estimates for success, you will need to collect actual data on the steps you want to control. This requires the introduction of a data collection form or software application to gather accurate information over an unbroken period for each process step's failure event frequency and the causes of each failure. Once you gather enough data on a step to be confident that you have captured all its variations, you have the historical information needed to gauge the range for its chance of success.

Risk and reliability professionals would find technical issue with the Chance of Success Mapping, or risk probability modelling, approach. It neglects mutually exclusive events, where the occurrence of one outcome precludes a future outcome from occurring. It is an imperfect methodology because risks are allowed to be informed guesswork. You can easily miss important risks, and those risks you spot require chance of success estimates based on history that is never stable over the long term and may not be representative of the future. It does not use the correct, integrated reliability block diagram of a process. Nonetheless, despite the technical impurities, the mapping gives you a simple, practical way to address the risks you identify and pick a better design for a more successful process. It applies fundamental risk management principles in a structured, logical way to let you improve a process by improving its individual steps' chance of success. Your model's chance of success values is unlikely to be accurate, but accuracy is not what you want from the modelling. Your aim is to find and use better solutions to reduce risk than you now have. The model gets you to look closely at what makes your processes fail and what you can do about maximizing their chance of success. In fact, it's not worth wasting a lot of time being excessively accurate with the risk probabilities, as you only seek to compare risk prevention options to pick the better choice. Even if a chance of success map has errors, provided the errors are consistently made you will still be able to identify the better choice to take. You will hardly ever be right in any single chance of success value, but you will understand what can go wrong with the process, and, most important of all, you will have a very good idea of what will or will not work to get higher odds of success. Though your risk probability model may technically be quite wrong, it will still indicate the risk mitigation that will most likely work best out of the choices you have available.

The future of your business, plant, and equipment can be as good as you want it to be if you keep spotting and removing the troubles that prevent success and build in the causes of great reliability.