



MAROS/TARO, well applied in Oil and Gas industry. In addition, I started to attend the Reliasoft training course in Sao Paulo.

After some months, I had a chance to have my first reliability project, that was a Integrated Data Center and the request was to deliver a RAM analysis to verify if the design configuration would achieve 99,99% in 20 years.

I achieved my target and delivered this RAM Analysis and in addition to demonstrate the operational availability achieved, I was able to demonstrate that we would reduce \$1.400.000,00 direct cost in redundant system. Because the astonish result, this analysis was famous, and I was able to present this analysis in the second Reliability Symposium in Brasil. Since then, I started to get more and more involved in reliability analysis and deliver such analysis in different projects as well as present in national conferences such as ABRAMN, Symposium de Confiabilidade, international project such as ESREL, PSAM, ARS Europe. In 2006 I got my Certified Professional Reliability (CRP) from Reliasoft after completing the Reliability project and present in a recognized Reliability conference. From 2007 and on, I started to be more and more involved with Reliability engineering projects, present in international reliability conference and from 2011 I started to leave abroad and work as Reliability Engineer for international projects in Kuwait, UK, Germany, Austria, Switzerland, China, Malaysia, Poland, Lithuania and many other international projects.

After 22 years on this path, I asked myself if I achieved a successful career as Reliability Engineer. However, to answer this question we need to understand first what a successful career is about?

### **What is success career?**

Success is basically achievement of your goals, but the successful career depends on the meaning that each individual understand for success. For many, success is measure by how much money you make, to others, how much recognition you have in the fields, to others is how powerful you become in an organization, and many understand that is a combination for all these factors together. Indeed, still career success is about how to achieve your professional goals no matter what it is. Therefore, one important element of success is the goals and what is important about goals is firstly, need to be your goals, which has meaning for you, not for your parents, friends or neighbours.

Success has a price, and you need to be willing to pay it. You need dedication, time and the most important patient. Ideen no matter how much effort dedication, time and patience you have, still the success is never guarantee because, especially for Reliability Engineer, you have to have the three right factors such as:

- To be in the right place.
- To be with the right people.
- To be in the right time.

To achieve the professional success in your career it is necessary all these factors as show the figure 1. The ups and downs can mostly be explained based on the influence of one of the small pyramids.

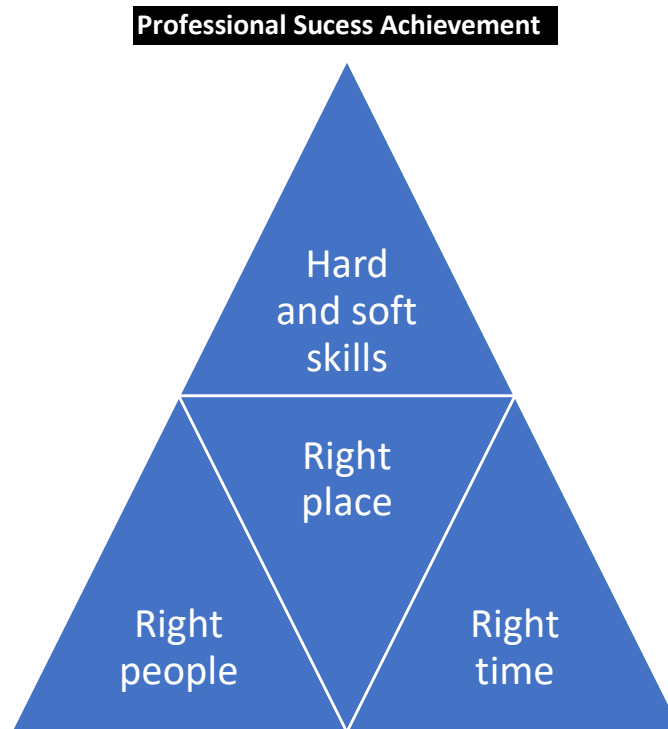


Figure 1 – The professional success pyramid.

To be in the right place, meaning, the competitive industry that the competitiveness requires high performance achievement and therefore, reliability program is value as well as reliability engineers to support such achievement throughout lifecycle.

To be with the right people, meaning, manager that support the reliability program based on the mindset to improve constantly their products and asset performance. In addition, to have the right team is very important because since your colleagues has also the mindset to constant improve the methods, product and asset performance, you will low resistance bout your ideas and solution rather than high resistance to any chance and willing to keep everything the way it is.

To be in the right time, meaning, the time when economy is growing, investment is available in a sense that will be money for reliability implementation. In the end of day, is all about money, without money we do not do anything and ideas, initiatives, and program and not sustainable.

Therefore, when you as a reliability engineer, despite of all your time, effort and patient, when you are not achieving success in your career, please remember the three rights factors.

Thus, considering that, the third right factor, such as the right time, is almost intuitive let's explore the two other factors a little bit more.

### **Which are the right place and people for Reliability Engineers?**

Nowadays, there is an international migration phenomenon across the globe which attract people mainly to USA and Europe countries. Indeed, many young people associates a success career with an international career, that means, live and work abroad. In fact, a success career is not a necessary international career. However, may young people have high influenced for the media. The reality is, work abroad can be a path for success but can lead your career to unsuccess in case you are not prepared.

Unfortunately, many young professionals do not have a clue, how hard is to live abroad, especially the young ones, who mostly lived with their parents, and try the adventure to live abroad. I am living abroad for 12 years; I had experience to live in German and London as well as work part time in Kuwait. So, why live abroad is hard?

- 1 – you need to get used with the culture
- 2 - You need to speak in foreign language, no more how skills you are, it is not your mother language.
- 3 – You need to understand taxes declaration, law and regulations all in a foreign language
- 4 – You are never sure if you will get the extend your visa, you expect to get but you never know.
- 5 – You do not know how to do in crises such as car accident, critical disease, victim of a crime
- 6 – You have to get used with the food
- 7 – You are mostly by yourself.

In the top of that, you must perform in your workplace and achieve your professional goals. It's is important to remind that, usually, to convince the locals that you are good enough to working in there, you have to be in higher level than the locals' ones.

That why, it is far better you have a successful career in your country first, than if it's necessary, if you prepared to, if it makes sense, you try out and international career.

Therefore, the ones when are looking for an international career, need to be aware that firstly they need to be prepared and secondly, they have to find a right country, both are essential first step for a successful international career.

In case of reliability engineering, because the necessity to have knowledge about statistic and reliability theory as well as experience in equipment, is very advisable to spend a time in your country as Reliability engineer because it will enable you to learn

fast in your mother language. However, it will only happen if you find the right organization.

### What is the reliability Engineer profile?

The reliability engineering aims to support product develop to achieve high reliability performance for a specific time as well as robustness and durability. Therefore, the reliability engineer needs to be creative and investigative as demonstrate the Holland's hexagonal.

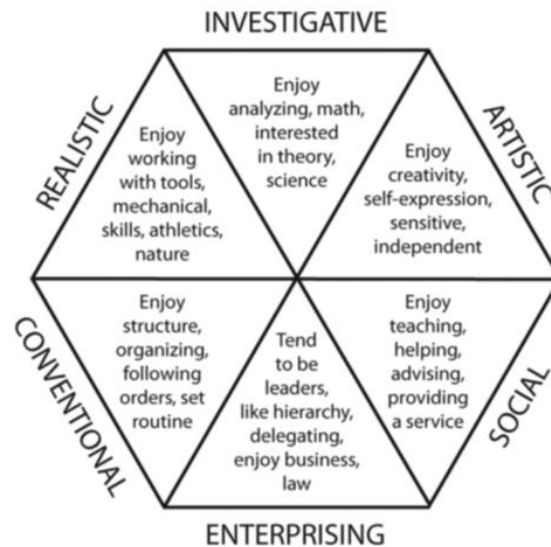


Figure 1 – Holland's hexagonal

The Creative belongs to the artistic feature and for Reliability Engineer professional it is essential to be creative because in many cases, there will be not an easy or standard solution for product development or recover asset high performance.

The Investigative is another important reliability engineer feature that differentiate reliability engineer than other because statistic, mathematics models as well as equipment and product knowledge are essential knowledge that reliability engineer must have.

It is important to understand that, without data, there is no reliability engineering because data is the basis of statistic and mathematics that are the basis of reliability engineering. Therefore, it is essential that, the reliability engineer work out data and create a well structure database that enable to turn out data into information for decision makers. The figure 2 below shows an example of organization maturity concerning data utilization. Concerning the Reliability Engineer career success achievement, the organization must be at least on the proficient level. Otherwise, the reliability engineer is in the wrong place and will not achieve success, in this case one of the right factors is missed, that is the right place.

	Aware	Proficient	Driven	Innovative
<b>Culture</b>	The organization knows data is valuable, but does not know how to collect or utilize it	Data is utilized for basic reporting. Teams reactively discuss data & measure results	Data use is pro-active across departments for decision-making and results measurement	Data is fluid throughout the organization and dynamically integrated into all functions
<b>Technology</b>	No data architecture exists, data is consumed in bespoke disconnected tools	Basic system for collecting and analyzing raw data exists, & a small team utilizes it	Data teams use tools and systems to efficiently generate insight throughout the organization	Data systems are highly efficient, informing decisions and predicting results
<b>Strategy</b>	Data is only leveraged on an ad-hoc basis for basic decisions and reporting	Decisions are made using data and data is used to measure performance and results for organization objectives	Data is leveraged not just for measuring results, but also for competitive intelligence and predicting outcomes	Data is used to invent new products, publish market research, and establish clear competitive advantage
<b>Data Management &amp; Governance</b>	Governance is largely non-existent, the source of truth is vague	A data modeling layer may exist and definitions of measurement are beginning	Data quality is reliable, there is a single source of truth and confidence in data	Data is meshed into all organizational systems with confidence and systematic process

**Figure 2 – Data Maturity Model. Source: Flatspel**

Unfortunately, the reliability engineer profile does not fit on all types of organization. That explains why, it so hard for reliability engineers to implement and perform reliability engineering analysis in many organizations across the globe.

### **Which are the organization profile for Reliability Engineer?**

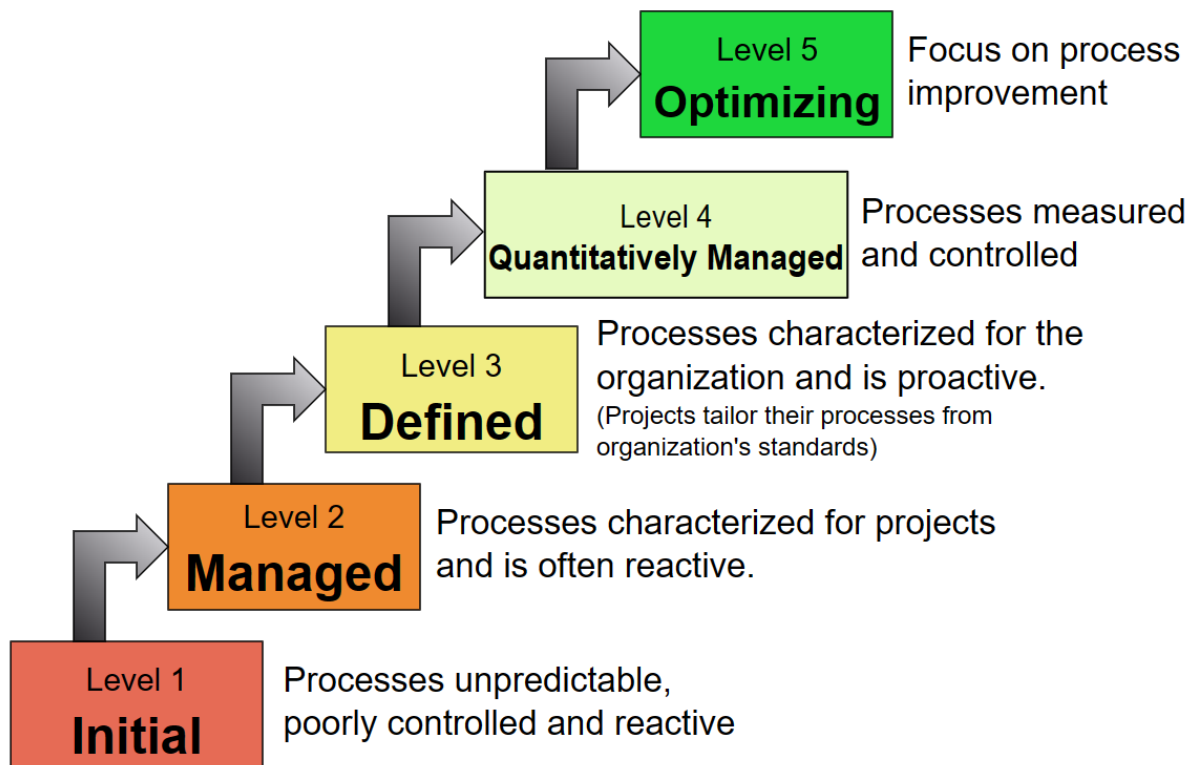
In addition to data maturity, the organisational maturity is another essential factor for the Reliability Engineer achieve a successful career. Concerning the organizational maturity, we can define five levels of maturity as shows the figure 3.

For Reliability Engineer it is essential to work in an organization with at least level 3 of maturity. It is clear that initial level of maturity there will be no decision based on data and a reactive product and performance improvement where the reliability engineers are not well used to develop product and support asset high performance achievement.

In addition, the level 2, defined is also not appropriate for reliability engineers because organizations strongly organized based on project management approach focus on document delivery, activities based on SAP cost only and follow standards and procedures.

Therefore, at least maturity level 3 is necessary for Reliability Engineer achieve a successful career. As higher as the Organizational management maturity level and

data utilization maturity level, higher will be the chance for reliability engineer achieve success in this organization.



**Figure 3 – Organization Maturity Model.**

The bad news is that most of organization that are looking for reliability engineers are in the level 2 and need to hire reliability engineers to deliver project document for a client based in some specific standard, especially in Europe.

Despite of the necessity that every professional has to have a job, it is important that reliability engineers be aware of what type of organization they are working concerning the management maturity level and data utilization maturity level. This will be decisive in their success of fail in pursue a successful Reliability engineer career.

Unfortunately, may organization do not have a clear idea what reliability engineering is about and make a confusion with safety engineering or maintenance engineering which are completely different professional careers. Indeed, on both cases, the level of data utilization maturity and management maturity for a successful career achieving can be owner that the ones required for reliability engineers.

Safety engineer is based on standards and very simple mathematic models. Maintenance engineers is based on standards methods and procedures that requires far more knowledge about the equipment rather than mathematic models and statistis. However, still exist intelligence in Safety and Maintenance engineering but nothing that we can compare with reliability engineering that is based on statistic and mathematic models.

Despite the importance of organizational maturity and data utilization maturity, still it is necessary that the organization has a very well-structured reliability program with well establish pillars such as:

- Reliability Culture.
- Reliability leadership.
- Reliability organizational structure.
- Reliability Resource.
- Reliability Process.

The **Reliability culture** is the way that Reliability teams and leaders act preventive and proactive in daily basis for Reliability high performance achievement based on their believes and values.

The **Reliability leadership** is the way different leaders in different organization levels communicate, reinforce, and support the Reliability vision, mission, policies and activities.

The **Reliability Organizational Structure** is the way the Reliability Team are formally organized internally and externally concerning the internal and external interface for the Reliability Program Implementation.

The **Reliability Resources** are all resources like human, technological and time dedicated to the achievement of the product development and reliability requirement based on the Reliability program implementation.

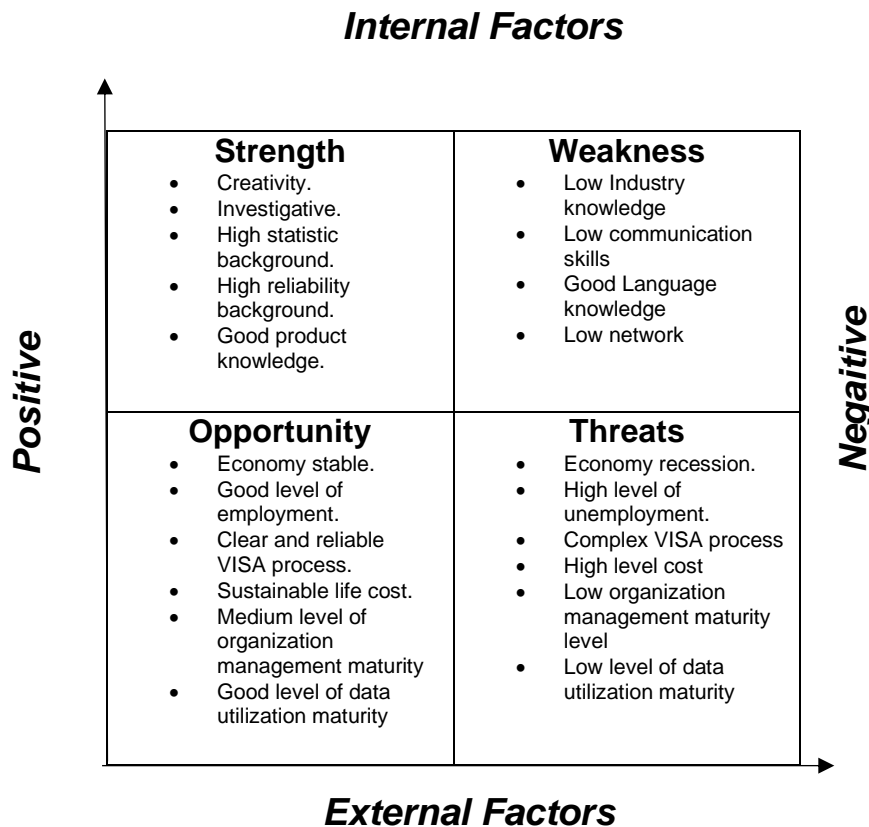
The **Reliability Management Process** aims to plan, implement, control, and improve the Reliability activities. The Reliability management process will be escribed in procedures for better identification and clarification of different reliability methods for reliability requirement verification, demonstration, and assurance.

### **Why career strategy is necessary to achieve success?**

Similarly, to organizations, that need to establish a strategy to be more competitive and lucrative by establishing a strategy thinking that, constantly take decision about what to do and in which direction to go, reliability engineer also need to be clear about, what to do and in which direction to go by reading the environment conditions and understanding the opportunities and threats that they are facing and confront with their weakness and strong competences to be able to achieve a success career in short, medium and long time period.

In this sense the simple and know SWOT matrix as shows the figure will help the professional to career strategy and chive the successful reliability engineer career.





**Figure 4 – SWOT Analysis for Reliability Engineer successful achievement.**

It is important to bear in mind that, the career strategy depends upon the level of maturity that the reliability engineer is in their career. Therefore, depends on such level, it will require more effort on hard technical skills (language proficiency, statistic, reliability methods, software) or soft skills (communication, psychology, negotiation, conflict resolution).

We can be divided the reliability career maturity level in five stages such as Junior, Experience, Senior/principal, Expert and International Expert as shows figure 5.

At **Junior maturity level**, usually the first two to five years as reliability engineer, we have a lot of energy, a good theoretical background but very low practice and experience. During this time both increasing technical and practical skills are important. It is essential here to get support the right specialist/ experts to accelerate the Reliability Engineer Career. Your own effort is very important in this phase meaning, you have to constantly read books, papers and take part into reliability engineering conferences.

At **Experience maturity** Level, which is usually between five to 10 years working as reliability engineer you have enough technical and practical background in some areas of reliability engineering depends upon where you worked, which project you were involved and the specialist/experts that support you. During this phase, your own effort to get more technical knowledge are also important but it is also important to start to develop you soft skills. During this phase, many reliability engineers chose to go

through a manager career, what is fine based on each individual profile and professional goals. The Reliability Engineer need to be aware that, if they are promoted to a manager, they will not be dedicated to a reliability engineering analysis rather than coordinate other engineers to do such analysis. Therefore, in addition to soft skills for a manager position, it is very important to have a very good technical background to lead technically their teams. And here, many make a mistake when they try to early to go through the management career path without the proper background.

At **Senior/Principal** maturity level, usually after 10 years as reliability engineer, the reliability engineer has enough technical background to do all requested tasks and support the youngers engineers. Many reliabilities engineer when they get in this point, they do not look for new reliability methods applications, do not think out of the box and not look for new solutions. That is the main difference between the Senior/Principal maturity level to the Specialist maturity level.

At **Specialist** maturity level, usually after 10 years as reliability engineer, the reliability engineer has deep technical background to do all requested tasks and support the youngers engineers as well as all related reliability engineering methods applicable to one specific industry. The Specialist can work in different types of products of one industry applying different reliability engineering methods. Please note that, here many Experiences engineer make a mistake when they try to become a reliability specialist. The specialist has technical theoretical background as well as practical background. By getting certificates or doing Master or PHD will give you theoretical background but not practical background.

At **Expert** level maturity level, usually after 15 or 20 years as reliability engineer, the Reliability Expert has deep technical background to do all requested tasks and support the youngers engineers as well as all related reliability engineering methods applicable to two or more different industry. Therefore, the Expert can work in different types of products of different industries by applying different reliability engineering methods and based on this experience compare different practices and propose best solutions. Usually, expert has experience in working in international projects.

At **International Expert** level maturity level, usually after 15 or 20 years as reliability engineer, the International Reliability Expert has basically the same technical background and soft skills when compared with the expert. The main difference here is that the International Reliability Expert has lived abroad, usually in more than one country working in different international projects, and he know different cultures, which enable them to advise the best way to implement reliability engineering concerning cultural factors. The international Expert is the level of a coach for reliability engineers and Managers, especially the ones who looking for an international career development.

*Junior Experience, Senior/ Specialist Expert International  
Principal Expert*



Figure 5 – Reliability Engineer career maturity level

### **How to achieve success an international Reliability Engineer career?**

After going through all important topics that have high influence on Reliability engineer career success such as the three right factors, the reliability engineer profile main features based on Holland's hexagon, the organization data utilization maturity level, the organizational management maturity level, the SWOT analysis for career strategy development and the identification of the reliability engineer technical maturity level we can agree that all such factors are essential for a successful reliability engineer career achievement.

However, whenever we speak about the international career, the location will influence drastically in such success achievement or not and in case of success achievement how long it takes. As described before, based on organization data utilization and management maturity levels, the career success will be faster or slower achieved. However, the country's culture will define in which country you will find more ideal organizations to develop the international Reliability Engineer international career.

So usually, countries like USA, United Kingdom, middle East countries, Australia are countries and regions that always try to expand their economy, the organizations tend to become more competitive and consequently, you will find far more organizations with higher management and data utilization maturity level.

By contrast, in Europe, since most organizations focus on following standards, internal procedures and are focused on delivering documentation, it is not the best region to develop an international Reliability Engineering career.

Whenever we consider international career there are developed countries such as Brazil, Indonesia, Malaysia, that have also high reliability culture in many organizations, especially the ones from Oil and Gas, based on the constant high performance achievement target. For the reliability engineers for Latin America as instance, Brazil can be a very good option because the additional reliability culture is spread out in many organizations in different industries sectors, reliability Engineering professional international seminar like International Reliability Symposium has been taking place since 2002, with participation of many reliability engineers form Latin America countries as well as USA. In addition, the easier Brazil culture adaptation will help on the international success career development for Latin Reliability engineers as well as other Latin America countries such as Mexico and Chile.

Despite of the country chosen, it important to research about all aspects listed above and looking for something that you will easily adapt concerning culture, language and social life.

On my experience, I have worked by Reliasoft and had a chance to work with North Americans, concerning reliability engineering, they are the best of the best reference, and the US organization are the best one for an international Reliability Engineer career.

The good news is that the reliability engineering culture has been in the last 10 years spread around Latin America countries specially Mexico, Chile, Peru based on increasing number of seminars, training papers and work developed by reliability engineers in Latin America.

### **The future of reliability engineering**

The future of reliability engineering is unknow, nowadays, a lot of attention for A.I and maintenance are taken but still the best maintenance strategy will always have a reliability. Therefore, the Industry 5.0 revolution will be the full-scale reliability implementation across the globe after many organizations find out that, A.I will not improve your product/ asset reliability but only highlight the issues.

In order to achieve this level, it will be necessary that organizations increase their level of maturity concerning data and management process as well as establish a roper Reliability program.

For young and experienced Reliability Engineers it is very important to choose the right organization as well as to work on their hard and soft skills and apply such skills in real life projects.

Finally, the most important thing of all, is to enjoy and have fun with reliability engineering otherwise it will not worth.