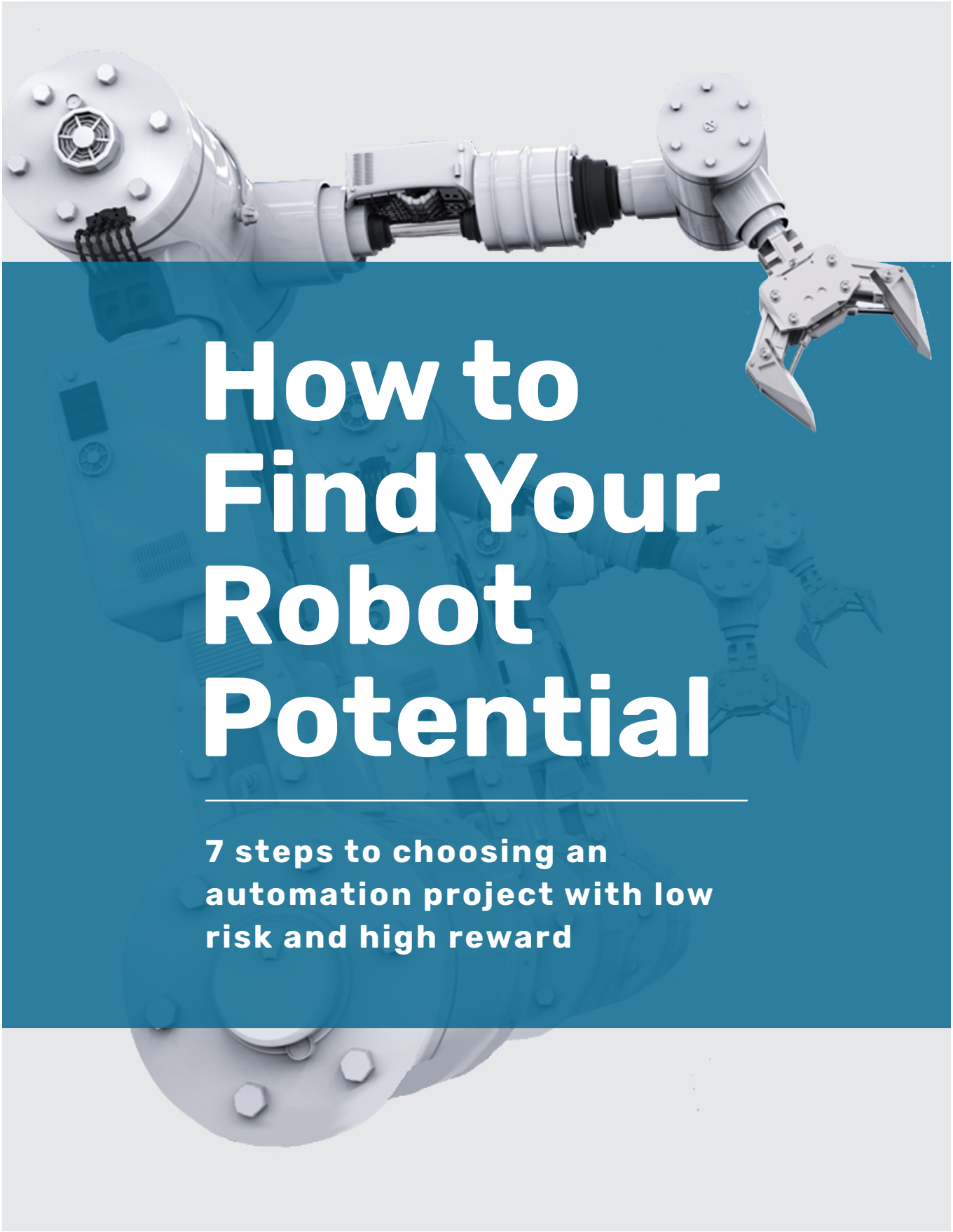


How to Find Your Robot Potential

7 steps to choosing an automation project with low risk and high reward

#HowToRobot

Connecting the World of Robots

www.howtorobot.com
hello@howtorobot.com

Table of Contents

Executive summary

If you are looking into automating processes at your company, this whitepaper is for you. It helps you form an overview of the overall automation potential and points you to the most meaningful starting point.

The whitepaper introduces you to an easy to understand step-by-step guide that helps you determine automation potential in your production. The method helps you identify robot projects with low risk and high reward.

This whitepaper covers topics such as:

- Typical incentives for automating
- Things to look for when mapping automation potential
- Evaluating automation potential
- Choosing the right automation project
- Avoiding common pitfalls (saving time and money)

After reading this whitepaper, you will be equipped for spotting the most obvious automation potential and to taking the first step toward automation.

The method underlying this whitepaper has been tried-and-tested on hundreds of organisations in the recent years. By following this structured process, many companies have seen their automation projects yield greater profits.

About the author

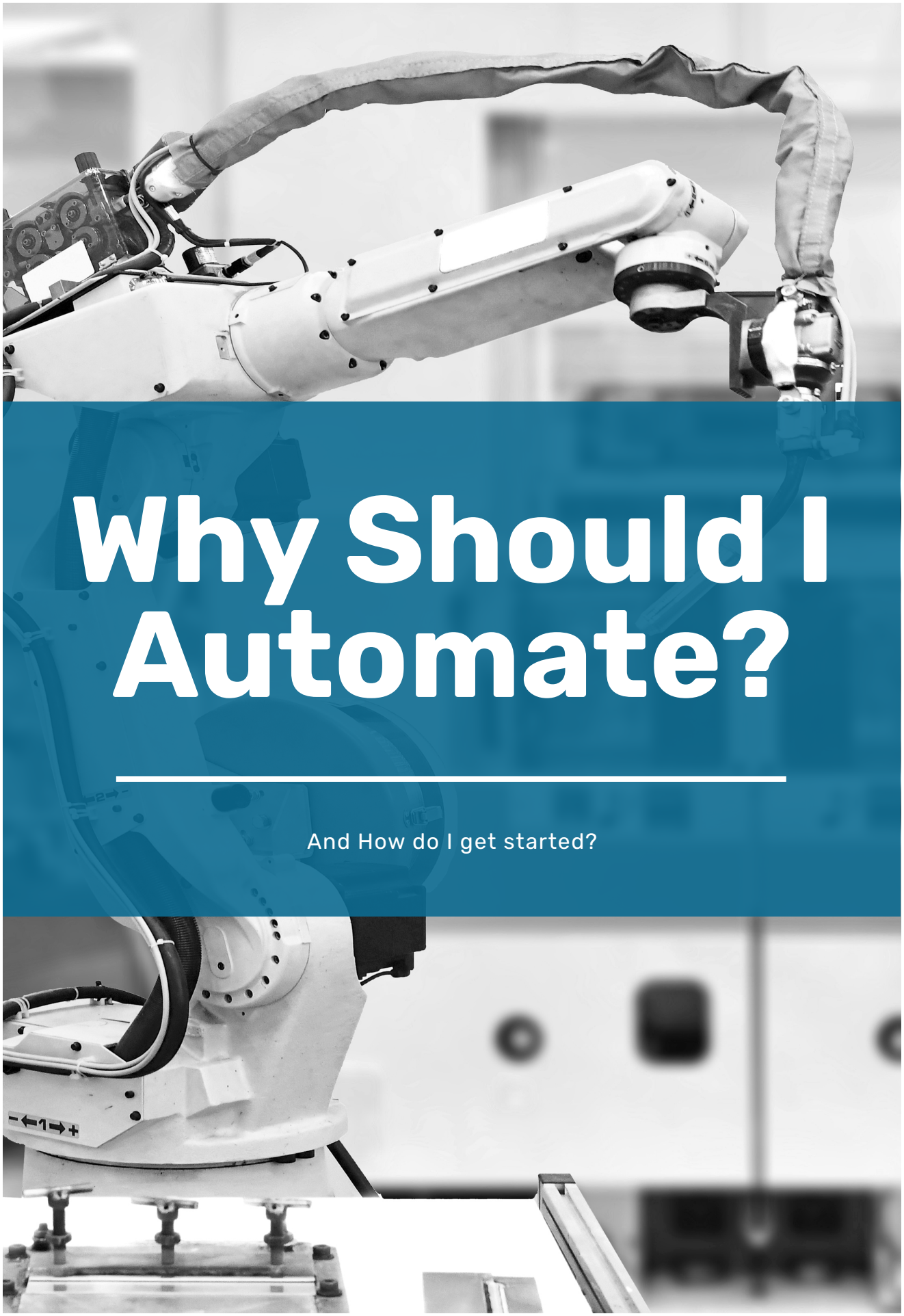
Niels Korsager

Senior Production & Automation Advisor

Production Engineer with more than 25 years of experience with production development through layout improvement, production optimization, and automation.

Has led the development and implementation of production setup and robot-controlled production cells for several large companies.

MBA in Management of Technology and former lecturer at Southern Danish University specializing in process improvement and automation and production technique.



Why Should I Automate?

And How do I get started?

Why should I automate?

Manufacturing companies are often under pressure from competition and earnings. Robots and automation can be effective measures to becoming more competitive and to positively impacting the bottom line. The usual reasons for automating are:

- **Increased effectivity**
- **Improved quality**
- **Improved working environment**
- **Liberating and enabling workers to focus on more challenging tasks**
- **A wish to gaining more experience with automation**

Robot solutions and automation technology has rapidly improved in the recent years. This makes still more tasks open to automation – and not just production tasks. Processes in areas like warehousing, logistics, packaging etc. are beginning to welcome automation as well.

Many companies have already decided on implementing robot technology and therefore have a need for tangible knowledge on how to go forward with this. How does one identify the processes in which automation makes the most sense? And how does one select the most profitable solution?

There are many robot and automation solutions on the market, and it is easy getting too hyped on the technological possibilities. However, if you do not make sure to introduce said technology where it actually benefits exactly your company, the implementation of the robot project can be a very costly affair for both company and employees.

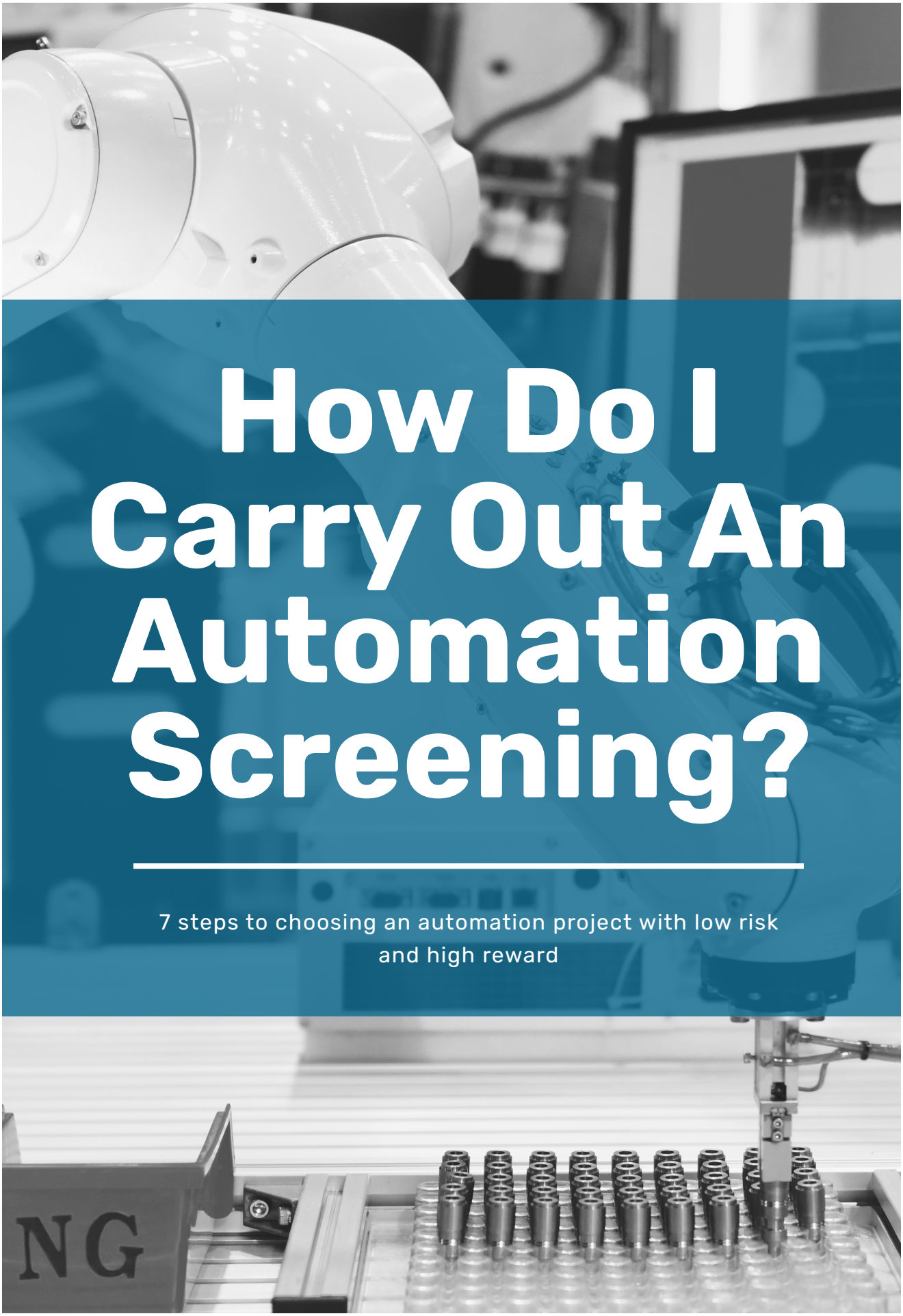
How do I get started?

You should always begin by identifying the robot potential in your production before investing in a robot solution. This means finding the processes in the production that are worth the effort – instead of choosing some solution in advance and try fitting it into the production afterwards.

Naturally, the first question to emerge is: How do I identify the automation potential in my production? The answer: An automation screening. An automation screening is a step-by-step examination of the production and its individual processes – from materials to goods that enter production to the finished products being shelved in the storage.

The initial aim of the automation screening is to create an overview of the processes that have the best potential for automation. Thereafter, the screening estimates the difficulties in automating said processes with existing technology, and it estimates the risk and identifies potential pitfalls.

This overview enables you to evaluate and select the most suitable processes for your robot project.



How Do I Carry Out An Automation Screening?

7 steps to choosing an automation project with low risk and high reward

How do I carry out an automation screening?

An automation screening consists of seven steps:

1. Describe your incentives for automating
2. Identify your high-runner products
3. Map out your production flow
4. Optimize your production flow
5. Estimate the load rate for every process step
6. Estimate the automation complexity
7. Prioritize your automation projects

When you've carried out all seven steps, you'll have a qualified and documented basis for selecting the point of departure for your automation project(s).

Step 1

Describe your incentives for automating

Describe the main reasons for automating processes at your company. Give a general description of the decisions your company has made that endorse and support these reasons.

As earlier mentioned, there are multiple reasons for automating. The typical ones are:

Increased effectivity

Robots can, in some situations, and if given the proper task, be more effective that people, even if they do not work as fast. Robots do not get fatigued, sick etc. and therefore do not suffer from effectivity loss. Robots can, in principle, work around the clock 365 days a year without having to be paid for working over.

Improved quality

Robots are, in some cases, better than people at performing repeated precision work. Robots do not lack precision, regardless of the amount of repetitions or of the time of day. Therefore, the resulting quality will be much more consistent and uniform.

Better work environment

Robots can overtake work that requires heavy lifting, repeated, straining movements and awkward turns of the body. This liberates workers from heavy, dangerous or dirty work and thus betters the working environment.

Enabling employees to focus on more complicated and demanding tasks

Automating helps free employees and enables them to focus on other tasks at the organization. This is an important factor for companies that have a hard time finding employees due to, for example, low unemployment rates.

Of course, you can have more than one reason to look into automation, and different reasons might influence each other. It is, however, very important to make clear, which one is the most decisive. The most important incentive might play a big role in the selection of an automation solution.

Step 2
Identify your high-runner products

When you've decided on your primary incentive for automating, you need to identify one or more products in your production characterized as a high-runner.

This is because automation is a big investment. Therefore, it is important that the products and processes that the automation will support are lasting and have a significant capacity so that the investment will pay off.

A high-runner product is characterized by:

- Having a large production quantity
- Being a strategic priority for the company, and by being expected to keep or increase its market value.

Not choosing a high-runner product can – in the worst case – render the automation project redundant or even obstruct the production. This is because the parameters, on which you based the automation solution, lost their relevance because the production is changing.

In any case, there is a risk that the selected product will go out of production. To minimize this risk, one can consider investing in a solution made from standard modules that can be customized and repurposed for other tasks.

Why are product families interesting?

Instead of looking at individual products, looking at product families can be an advantage. A product family is a group of products that are very much alike in their design, meaning that they can – presumably – be managed by the same automation solution.

Step 3
Map your production flow

When a high-runner product has been identified, you need to map its production flow, i.e. the different processes it runs through.

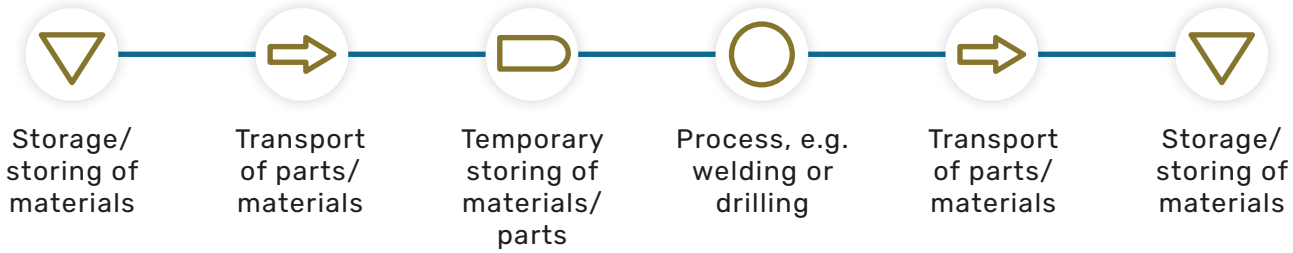
You do this to gain an overview of the processes that can potentially be automated. Such an overview is also necessary for optimizing your production flow which can often be a good idea (step 4).

You map the production flow of a material/component by following its way through the entire production: From the raw material arrives at the storage all the way to the finished product that leaves production.

A product is, generally, to be found in five stages or process steps in the course of production:

1. **Storage:** Depositing of materials/components on a fixed storage location.
2. **Transport:** Transportation of materials/components form one location or process to another.
3. **Temporary/buffer storage:** Temporary storing of materials/components.
4. **Process:** Processing materials or components (e.g. welding, drilling, **assembly etc.).**
5. **Inspection:** Controlling of components (e.g. quality inspection).

When mapping out the production flow – the product's journey through production – use a symbol to mark every time the product goes from one process step to another. This gives you a complete mapping of the product's flow through production and the exact stages it passes through.



Example of how such a mapping could be recorded

Step 4
Optimize your production flow

When you've mapped out your production flow, you need to consider the possibility of optimizing it before automating.

Optimizing your production flow helps you gain more from the automation project and ensures that the robot's capacities are utilized to the full. Optimization also helps reduce the risk of the robot creating new bottlenecks after its implementation.

Are there any inconveniencies in the way the product runs through the production? If/when finding such inconveniencies, you should try optimizing these, for example through LEAN or similar methods.

A good starting point is the identification of bottlenecks. Bottlenecks in production are typically characterized by materials/components piling up before or after a given process step.

Bottlenecks at some process typically occur if:

- There is long or frequent changeover time
- The cycle time is greater than at the preceding process
- The cycle time is lesser than at the following process

See if you can avoid bottlenecks by optimizing and adjusting the changeover and cycle time. For example, by re-scheduling your product mix to reduce the number of changeovers, or you can move a process closer to the storage room and thereby minimize transportation of materials or the need of a temporary storage.

Step 5
Estimate the load rate for every process step

Now, having decided that the production flow has been sufficiently optimized, it is time to estimate the load rate of each of the process steps on the parameters of productivity, quality, working environment, and resources.

To do this, you have to identify the most burdened processes, as these are typically the most rewarding ones to automate.

Red

There are big problems/ great load linked to this process step (points: 3).

Yellow

There are some problems/ some load linked to this process step (points: 2).

Green

There are no problems/ no load linked to this process step (points:1).

In a complex production environment, singling out problems and assigning scores can be difficult. As an inspiration, the check lists below can help you uncover problems as well as estimate their load rate.

Productivity

When identifying challenges related to productivity, a rule of thumb tells you to find bottlenecks in production that cannot be solved through regular flow optimization:

- Are you producing less units than you should/desire?
- Does the process have a much changeover time?
- Does the cycle time vary with the time of day and/or with the operator?
- What is the uptime of the process?
- Is the process beset with waiting periods, e.g. where operators must wait for certain procedures to complete before resuming their work?
- Do other processes in the production stop if this process is not running?

Quality

When identifying challenges in relation to quality, a rule of thumb is to find the place in the flow where there are high error rates or where many products/materials are discarded or reworked. Spotting errors earlier in the production process minimizes time wasted working on defect materials.

- Do products often have defects greater than the tolerated level?
- Does the quality of the product vary with the operator, e.g. with day/night shifts?
- Would improving the quality of the product be beneficial, e.g. by allowing for higher price setting, easier assembly etc?

Working environment

When identifying challenges in relation to working environment, a rule of thumb is to look for places in the production that involve repetitive, monotonous and/or straining work.

- Is there repetitive, monotonous, or straining work?
- Does the working area comprise large amounts of dust, noise or vibrations?
- Are chemical products employed, and is personnel in risk of inhalation and/or skin-contact?

Resources

Resource-related challenges are often linked to processes that require a fixed operator attendance and are not very difficult to carry out.

- Are there one or more employees linked to this process?
- Does the process depend on few key employees that hold special knowledge and/or have extensive experience and craftsmanship?

Table 1 shows how you can document the total load rate for each process and prioritize them according to their profit potential. Use the template in appendix 1 for your own automation screening.

Priority	Process ID number	Category	Load rate	Total score
1	4 Welding	Productivity	2	11
		Quality	3	
		Working environment	3	
		Resources	3	
2	6 Transport from temporary storage to finished goods storage	Productivity	3	8
		Quality	1	
		Working environment	2	
		Resources	2	

Table 1: Prioritization of automation projects

Step 6
Estimate the automation complexity

Having estimated the load rate og the individual processes, you need to estimate the automation complexity of each process step. This means figuring out how difficult the automation of the task will presumably be. Such an estimate indicates if the job can be done with a standard solution, or if the project is in risk of becoming a prolonged development project.

The assessment of the automation complexity is therefore an important tool that helps select automation projects with the lowest cost that also have the biggest chance of yielding a profit in the depreciation period.

You can use Gain & Co's Automation Index for this step. The Automation Index describes the complexity of a robot project in relation to:

- The complexity of the task the robot is set to perform
- The maturity of the required technology

Use the index by estimating the complexity of each process mentioned in step 5. The Automation Index is divided into three levels:

A1: A low-risk automation solution

A low-risk automation solution. The market offers standard solutions. The task to be automated is a known process which has been solved several times.

A2: A medium-risk automation solution

The technology required for automating is somewhat complex, and that standard solutions can be difficult to find and/or implement. These solutions, if such solutions exist, might not have been sufficiently tested. Consequently, the automation project entails some degree of risk, as robot solutions might be weaker.

A3: A high-risk automation solution

There are no tested standard solutions in the market and the task has a high level of complexity. This will likely be a high-risk innovation project that might require research at university level.

Assigning an Automation Index value to individual processes at your production can be difficult. Therefore, it might be a good idea to contact an independent advisor or to search for similar, market available robot solutions that others have experience with.

Investing in less complicated solutions and automating simple tasks can be a good way of netting a profit within a couple of years. For more advanced solutions that need to be developed along the way, financial gains are usually several years down the line. Companies investing in such solutions typically do this to gain a competitive edge in the space of time where competitors develop similar solutions.

Step 7
Prioritize your automation projects

Now, having estimated both load rate and automation complexity for each process, you need to prioritize the projects. This is done by comparing the load rate from step 5 with the assigned Automation Index value from step 6. Doing this in a coordinate system is recommended.

The total load rate is calculated by adding up points from all 4 categories.

At this point, the primary reason for automating (that you selected in step 1) can be emphasized. You do this by weighting the relevant category, i. e. multiplying the score with some factor. See the example below.

Example: Work environment is highly prioritized and therefore influences the final score:

Priority	Process ID number	Category	Load rate	Emphasis	Total score
1	4 Welding	Productivity	2		12.5
		Quality	3		
		Working environment	3	X 1.5	
		Resources	3		

Table 2: Weighted load rate taking into account the company's primary reason for automating

Now, you have a number of process steps that have been assigned a load rate and an Automation Index value. If you want to be sure to select the project with the greatest automation potential, you need to choose the process(es) with the greatest load rate and the lowest complexity, i.e. the lowest Automation Index value.

Placing the analysed processes in a coordinate system can help create an overview. The x-axis measures the increasing load rate, and the y-axis measures the assigned Automation Index value. Processes with the greatest automation potential arrange themselves in the top right corner. Processes in this area have high potential and low risk. See the following example:

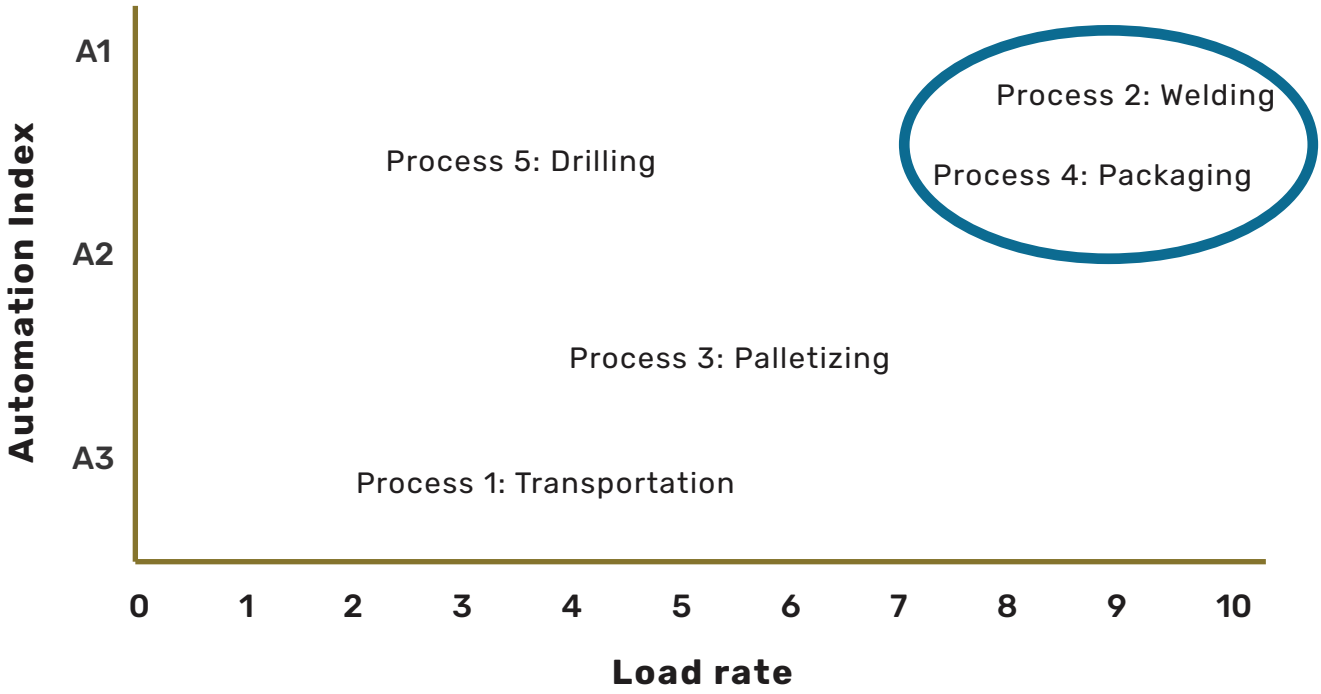


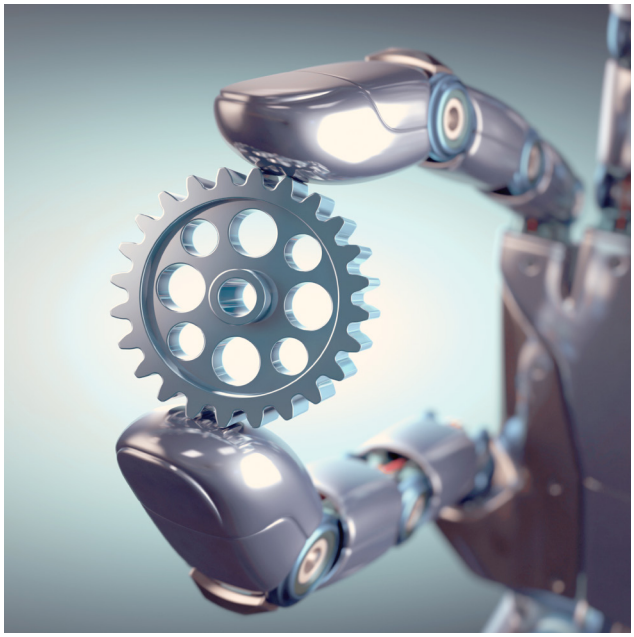
Figure 3: Example: An illustration of automation potential

It might, of course, be the case that there is an urgent need for solving some work environment- or quality-related issue that forces one to disregard the scoring system.

Automation is not reserved for individual processes alone

In this step-by-step guide, the identification of automation potential has been restricted to individual processes. However, the biggest automation potential is not always limited to including one process step alone. Automation can comprise more process steps at once and also affect IT systems etc.

Whether or not you should automate a single process or more process steps at once depends on the company's stage of development and the competitive situation it finds itself in.



Conclusion

Prior to initiating an automation project, you should single out the processes that have the greatest potential. The definition of such potential depends on the state of the company in question. Some companies emphasize work environment or quality, whereas others achieve financial gains through increasing their production capacity.

The automation potential for each process depends on the load rate and the complexity. A process with high load rate and low complexity will have a high automation potential.

By employing a structured process to finding your robot potential, you increase the chances of yielding a profit from robot projects. Falling in love with new technology and trying to force it into production can be risky. Most of the time, an initial analysis of the needs in the production followed by a search for technological solutions that match these needs, is the best way to gain form robot technology.

Disclaimer

The information contained has been obtained from sources that Gain & Co believe to be reliable. Gain & Co disclaim all warranties as to the accuracy, completeness or adequacy of such information and shall have no liability for errors, omissions or inadequacies in such information. See: https://howtorobot.com/node/24

Appendix

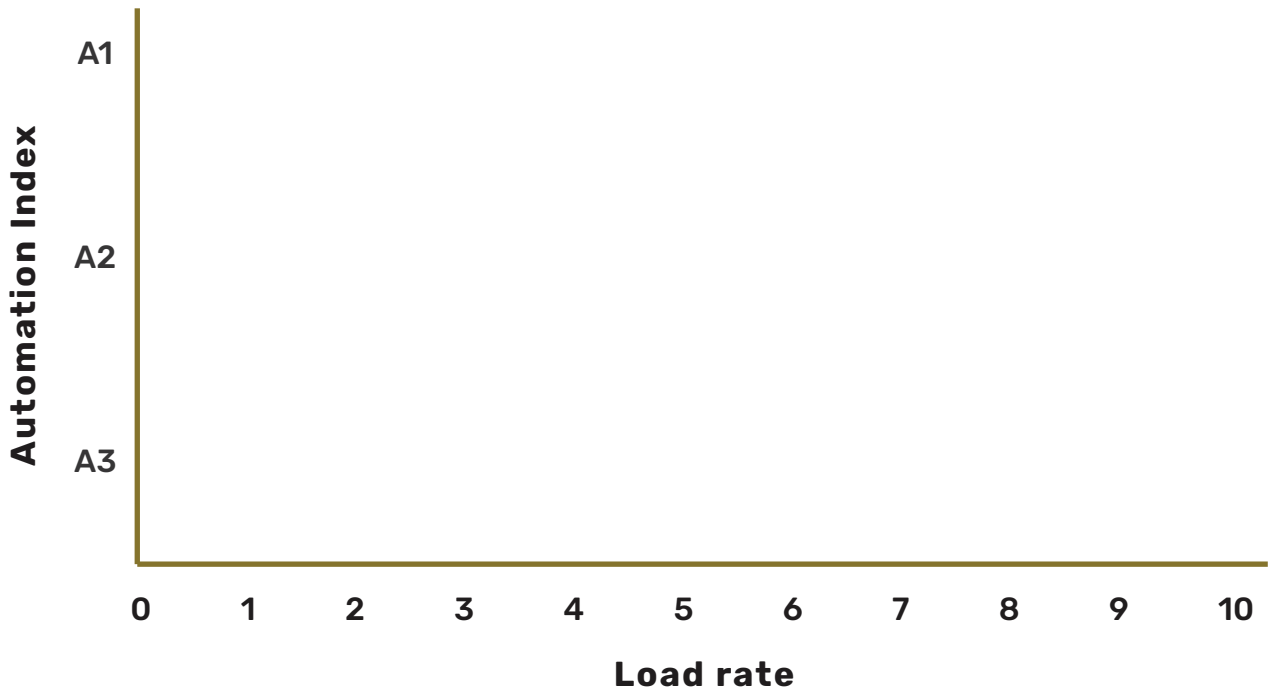
Template to finding your robot potential

Appendix: Template to finding your robot potential

Appendix 1:
Template for documenting and calculating load rate and Automation Index value

Priority	Process ID number	Category	Load rate	Emphasis	Total load rate	Automation Index value
		Productivity				
		Quality				
		Working environment				
		Resources				
		Productivity				
		Quality				
		Working environment				
		Resources				
		Productivity				
		Quality				
		Working environment				
		Resources				
		Productivity				
		Quality				
		Working environment				
		Resources				

Appendix 2:
Coordinate system for illustrating automation potential



#HowToRobot

Connecting the World of Robots

www.howtorobot.com
hello@howtorobot.com