

## **How performance indicators and maintenance will become project managers' best assets in the industry 4.0<sup>1, 2</sup>**

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### **ABSTRACT**

The technological and organizational effervescence of both companies and state governments toward the 4.0 Industry is a source of finance and jobs. The purpose of this work is to get an overview of decision-making tools of this new era and how to face the automation in factories. First, I have used a Multi-Attribute Decision Making and second, a compensatory model for weighting the result. My work has highlighted the importance of bringing the maintenance activity in house and the flexibility of the ad-hoc report. To conclude, I would advise to closely follow the modularization trend in the construction and auto sector.

**Keywords:** 4.0. Industry, Virtual team, Decision maker, Problem solver, Knowledge sharing, Management tools

### **INTRODUCTION**

The concept of 4.0. Industry or the industry of the future represents a new way of organizing the means of production in a factory. This new industry is emerging as the convergence of world digitalization and consumption growth. The great promises of this fourth industrial revolution are to seduce consumers with unique and personalized products, and despite lower manufacturing volumes, to maintain high gains. With the use of the Internet of Things and cyber-physical systems, that is virtual networks used to control physical objects, the intelligent factory is characterized by continuous and instant communication between the different tools and integrated workstations in production and supply chains. In the context of industrial automation, it is described by the addition of sensors that are the essential elements of data acquisition and

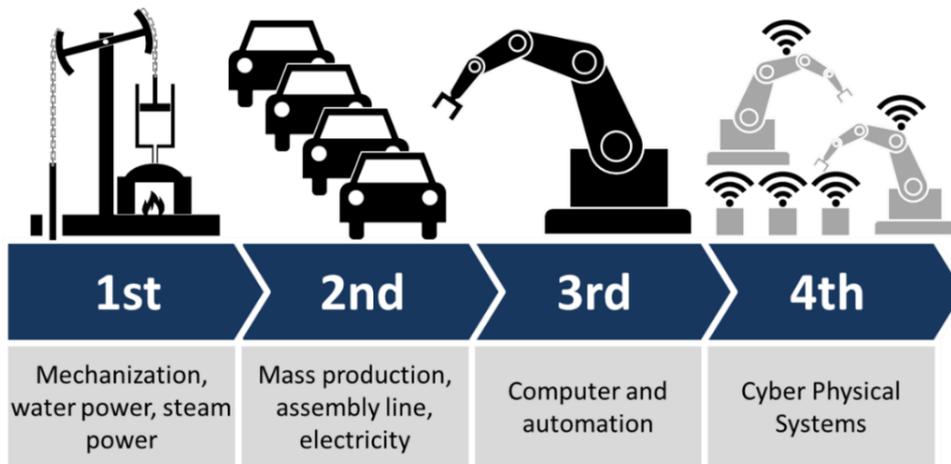
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control systems. Many different aspects of our modern societies are affected by this fourth industrial revolution. New issues emerge through this new way of producing.

The image below shows the main characteristics of each evolution of the industry. It goes from the creation of steam engines to nowadays cyber-physical systems.

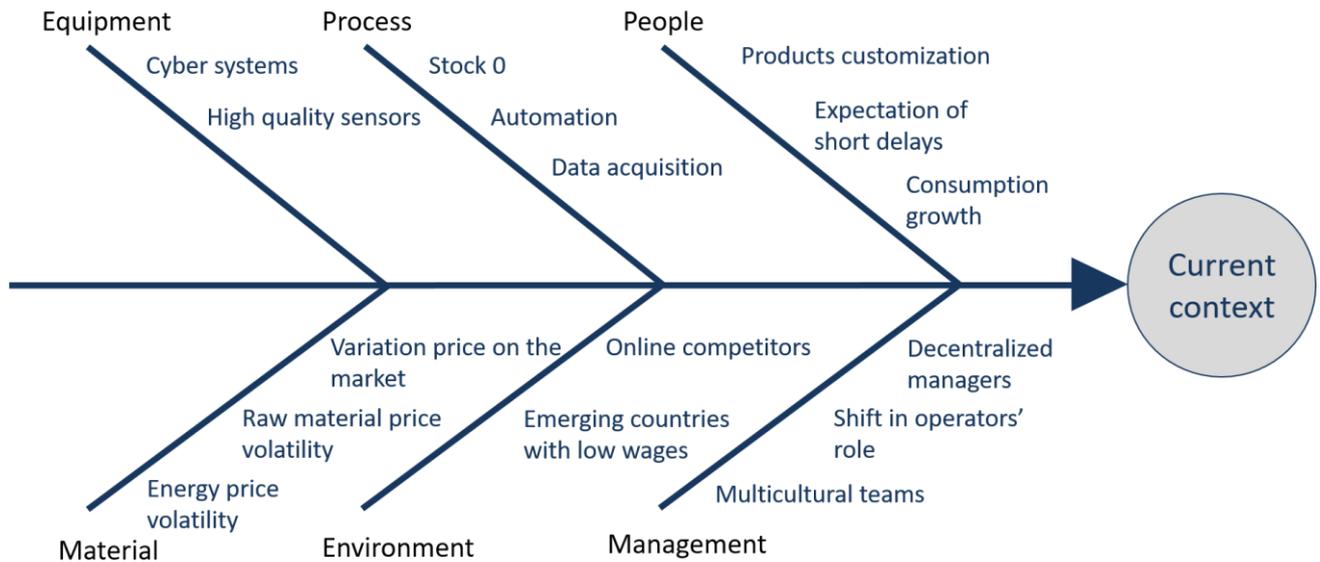


1/ Industry evolution<sup>3</sup>

Nowadays, the interconnection and the importance of information transparency allow the industries to make day to day decisions both from inside and outside of production facilities. The process of decision making is entirely decentralized. At the same time, we need to consider the local and global information. Furthermore, the industry of the future changes human roles in a factory from an operator to a problem solver. Workers get the help of assistance system software to solve urgent problems in short and medium notice. These two changes in the role of a worker in a plant, from an operator to a decision maker and problem solver.

The current context of the industry of the future can be sum up in the root cause analysis below.

<sup>3</sup> Christoph Roser. (n.d.). Illustration of industry 4.0. Retrieved from [https://en.wikipedia.org/wiki/Industry\\_4.0#/media/File:Industry\\_4.0.png](https://en.wikipedia.org/wiki/Industry_4.0#/media/File:Industry_4.0.png)



*2/ 4.0. Industry 4.0 root cause analysis<sup>4</sup>*

The 4.0. Industry brings with it new challenges both managerial and legal. Indeed, on the one hand, the change of operators' role described previously imposes a shift in project management. The manager is no longer necessary on the operation site. It will enable him to get closer to the board of direction geographically as well as strategically speaking. We will talk about the necessity of digital communication and virtual teams. The skills required for this new type of manager will be in line with the communication style, we can mention the ability to make people work together, people whose cultures are different and whose time frames are dissimilar. The focus will be on the skill to collaborate and improve knowledge sharing. The importance of training will be higher than ever. Managers will, therefore, use different tools that will be detailed in this paper. On the other hand, legal issues also arise with the emergence of the 4.0. Industry. The necessity to produce more and more personalized products or services requires automation in the industrial sector. As many tasks as possible are predefined and optimized which implies the dependency and reactivity of the system to software. When all is well, human nature is complacent in the established functioning. However, when problems occur, for example, a software shut down in a factory, new questions will come. Who holds the fault? Who needs to set up back up? The software contractor or the owner? Should we switch to 100% digital?

In the construction sector, the Project and Program Management are toward the trend of modularization. It is a "functional partitioning into discrete scalable, reusable modules consisting

<sup>4</sup> By the author

of isolated, self-contained functional elements”<sup>5</sup>. The prefabricated modules allow the fast implementation of a fully functional construction site. All of this would not be possible without a strong and well-managed upstream project management. Modularization is also widely used in the industrial sector like the automobile industry<sup>6</sup>.

The 4.0. Industry leads the way to new challenges. As his definition shows “the purpose of the Managing People is to introduce the tools, techniques and methodologies”<sup>7</sup>, and this paper will describe the tools, techniques, and methodologies for the project management and decision making of the industry of the future. As for any new topic without enough use cases, the lack of information and data only allows us to reckon on what kind of problems could occur and what in a managerial and legal way could be done to prevent it from happening. This paper will draw the big picture of what kind of legal problem could arise and what question needs to be asked before writing a contract. This paper will illustrate the big picture of:

- project and program management in the Industry 4.0
- the shift of human roles in a factory from an operator to a problem solver and decision maker,
- performance indicators,
- decision tools in the 4.0 industry,
- productivity issues.

## **METHODOLOGY**

### **Step 1 – Summarize**

As presented earlier, the 4.0 Industry brings new challenges, and I will be here focusing on finding the best way to improve:

- Responsibility of controlling machinery breakdown in 4.0 Industry factories
- Display performance indicator in factories of the future

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<sup>5</sup> Wideman Comparative Glossary of Project Management Terms v5.5. (n.d.). Retrieved from [http://www.maxwideman.com/pmglossary/PMG\\_M04.htm#Modular%20Design](http://www.maxwideman.com/pmglossary/PMG_M04.htm#Modular%20Design)

<sup>6</sup> Takeishi, A., & Fujimoto, T. (2001). Modularisation in the auto industry: interlinked multiple hierarchies of product, production and supplier systems. *International Journal of Automotive Technology and Management*, 1(4), 379. doi:10.1504/ijatm.2001.000047

<sup>7</sup> GUILD OF PROJECT CONTROLS COMPENDIUM and REFERENCE (CaR) | Project Controls - planning, scheduling, cost management and forensic analysis (Planning Planet). (2015, November 2). Retrieved from <http://www.planningplanet.com/guild/gpccar/introduction-to-managing-people>

## Step 2 – Identify the feasible alternative solutions

In a context of 24/7 production and automation, each pause in fabrication costs a fortune. Processes tend towards effectiveness and optimization. Nowadays, tools allow men to control, monitor and repair machines remotely. We can distinguish three main categories of maintenance:

- Computer-aided maintenance management (CMMS)<sup>8</sup>: this tool is full of data analytics on the onsite machinery and helps to prevent breakdowns by planning preventive maintenance<sup>9</sup>, and thus avoid the unexpected shutdown of a production line for repair. The information provided helps in decision making.
- Supervision software<sup>10</sup>: they display incidents in real time and can help with maintenance. For example, if they are connected to CMMS software, they can trigger a maintenance order for a robot if a fault occurs on a product too many times.
- Digital control<sup>11</sup>: used to program and drive machine tools, it also analyses data from engines to inform about their state of degradation and therefore to predict their replacement.

In the first part, we are going to wonder who would be the best choice to be assigned machine maintenance for an industry 4.0 company. Should the company do it in-house? Should the machinery supplier be responsible for his products from the beginning to the end? Should we hire a third party?

Moreover, in the second part, we are going to look at what tool can be used to display knowledge about the current performance indicator of the factory. The point of view of decision-makers will be taken for this approach. What tool is best suited for supervisors to take an accurate and viable conclusion?

Performance, as the definition shows, is “how fast the product responds to input”<sup>12</sup>. We will here make the distinction between Performance Measurement Techniques which is “used to estimate earned value”<sup>12</sup> and Performance Reporting which represents “the collection of project

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<sup>8</sup> What is a Computerized Maintenance Management System (CMMS)? - Definition from Techopedia. (n.d.). Retrieved from <https://www.techopedia.com/definition/25281/computerized-maintenance-management-system-cmms>

<sup>9</sup> Hohmann C. (2017, September). La maintenance préventive. Retrieved from <http://christian.hohmann.free.fr/index.php/portail-maintenance-productive/les-basiques-de-la-maintenance-productive/508-la-maintenance-preventive>

<sup>10</sup> Rodriguez M. (2015, April 30). Production Monitoring | Supervise product process. Retrieved from <http://supervision.clever.fr/production-monitoring/>

<sup>11</sup> Katz, P. (1981). *Digital control using microprocessors*. Englewood Cliffs, NJ: Prentice-Hall.

<sup>12</sup> Wideman Comparative Glossary of Project Management Terms v5.5. (n.d.). Retrieved from [http://www.maxwideman.com/pmglossary/PMG\\_P01.htm#Period%20of%20Performance](http://www.maxwideman.com/pmglossary/PMG_P01.htm#Period%20of%20Performance)

performance information”<sup>12</sup>. Performance Measurement Techniques is about planning, forecast, and progress whereas we will here be interested in presenting the past and current state of performance indicators as in Performance Reporting.

To measure performance in the industry, we use Key Performance Indicators<sup>13</sup> also called KPIs. They are both a tool for measuring the health of the business and a tool for decision support. They are the synthesis of the key data of the company. With these indicators, the leader will quickly know if his business is doing well or not. Then he will be able to act effectively to correct the errors that have been revealed or continue and to increase his development. They are therefore concrete and operational information.

Improving the performance of a project or a program includes a vast work on the premises. Pre-project phase is highly monitored especially for modularization (an early module definition, applying lessons learned, apply engineering analysis<sup>14</sup>). “The most important driver to current usage of prefabrication and modularization is its ability to improve productivity”<sup>15</sup>. There are proven quantitative impacts on Project Schedule, Project Budget, and Installation Costs<sup>15</sup>.

### Alternative Solutions

- Responsibility of controlling machinery breakdown in 4.0 Industry factories

One can wonder who would be best suited to be assigned machine maintenance for an industry 4.0 company. Legally, contracts bind people together. A contract is “an agreement between two or more persons, which creates an obligation to do or not to do a particular thing”<sup>16</sup>. Where should the contract end? Let’s take here the example of a robot supplier for our automated food processing company. Should the supplier be in charge of his robot lives all along or do the contracts end after the delivery? The choice is ours but where should we stand?

Another option for us would be to do it in-house. It is always possible to integrate skills, tools, and manpower to be able to self-manage. On the one hand, this represents a strong investment in entry because the acquisition costs are high. On the other hand, it is difficult to be faster than an entirely dedicated team trained for specific equipment. Do the benefits outweigh the cost?

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<sup>13</sup> ECKERSON, W. W. (2009). How to create effective performance metrics. *Performance Management Strategies*, 197-222. doi:10.1002/9781119199984.ch11

<sup>14</sup> KBR. (2016). The modularization option. Retrieved from [https://www.kbr.com/Documents/Brochures/2016\\_modularization\\_brochure\\_LNG18\\_FINAL.pdf](https://www.kbr.com/Documents/Brochures/2016_modularization_brochure_LNG18_FINAL.pdf)

<sup>15</sup> Bernstein, H. M., Gudge, J. E., & Laquidara-Carr, D. (n.d.). Prefabrication and modularization: increasing productivity in the construction industry. Retrieved from <https://www.nist.gov/sites/default/files/documents/el/economics/Prefabrication-Modularization-in-the-Construction-Industry-SMR-2011R.pdf>

<sup>16</sup> Wideman Comparative Glossary of Project Management Terms v5.5. (n.d.). Retrieved from [http://www.maxwideman.com/pmglossary/PMG\\_C09.htm#Contract%20Form](http://www.maxwideman.com/pmglossary/PMG_C09.htm#Contract%20Form)

Lastly, hiring a third party could promote competition by calling for bids<sup>17</sup>. On top of that, a bidding process is beneficial to compare offers. Most of the time, it brings along news ideas you at first did not come up with. The purpose is here to make the maintenance prices drop by making many negotiation rounds as possible.

To sum up, in step 3 we will discuss the advantages and drawbacks of doing maintenance:

- ✓ In-house,
  - ✓ By the supplier,
  - ✓ By a third party.
- Display performance indicators in factories of the future

One of the strategic key drivers to continuous improvement in a factory is to meliorate communication<sup>18</sup>. It is essential to have the best possible tools in order to save time, not to lose information, and thus to improve productivity. Here, we will but communication medium to display KPIs in the heart of the decision-making process.

The first one we are going to introduce here is Production Reporting<sup>19</sup>, also called Enterprise Report. It is a method used in companies to distribute information among employees. This tool is often automated to be generated automatically from day to day and can be shared with stakeholders. It is a static document that is mainly composed of text, table, and some visual graphics. It is a document consisting of several pages. This represents the standard method of reporting. It is a major source of data but not real-time data as it often represents the day before.

The second medium is a dashboard<sup>20</sup>. It is very colorful, simple and everything should be displayed on the same screen. The values shown represent the current state of the studied system. The beginning of the data analysis is known. Often this represents the KPIs from the beginning of the shift to the present moment. For a manufacturing plant, we can find for example the rejection rate of the day at present or the progress in comparison to the objectives.

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<sup>17</sup> Daniel, H. (2011, April 16). Benefits of bidding. Retrieved from <http://benefitof.net/benefits-of-bidding/>

<sup>18</sup> ECKERSON, W. W., & TDWI. (2006). *Performance dashboards: measuring, monitoring, and managing your business* [PDF document]. Retrieved from <http://download.101com.com/pub/TDWI/Files/PerformanceDashboards.pdf>

<sup>19</sup> Zenko, J. (2016, May 30). Dashboards vs. reports: which one should you go with? | blog. Retrieved from <https://www.dundas.com/support/blog/dashboards-vs.-reports-which-one-should-you-go-with>

<sup>20</sup> Chiang, A. (2011, November 28). What is a dashboard? Retrieved from <http://www.dashboardinsight.com/articles/digital-dashboards/fundamentals/what-is-a-dashboard.aspx>

At last, we will be focusing on ad-hoc report<sup>21</sup>. Ad-hoc means “made or happening only for a particular purpose or need”<sup>22</sup>. Ad-hoc reports are the creation of decision-making reports by users and not by IT. The user will be able to create a report from scratch or to complete an existing report. It works on the principle of drag and drop to create a custom report. This can be simple and consist of only one page or many cross-tabs. The main purpose is to customize and empowers the decision maker to ask his own questions about the business.

In step 3, we will assess a comparative of:

- ✓ Production report,
- ✓ Dashboard,
- ✓ Ad-hoc report.

### **Attributes to measure, assess or evaluate each alternative**

We need to measure which alternatives are best suited for our case. Multi-Attribute Decision Making (MADM) will be used here to evaluate each alternative in order to take a side. We will be taking the same example as before:

We are a highly-automated food processing company that prepares convenience food. The trend is now about healthy food whereas not long ago it was just about being cheap. We are launching a new product line with low carbs. We need to know accurately how good our process is and take a decision on the operation side. We will discuss the point of view of decision makers. Also, our machine is new but soon they will need maintenance, and we wonder what would be the best practice.

Below are the ranking criteria to evaluate each alternative.

- Responsibility of controlling machinery breakdown in 4.0 Industry factories
  - ✓ Cost control<sup>23</sup>: Do we control labour, maintenance and travel cost?
  - ✓ Investment<sup>23</sup>: How costly this solution is going to be for implementing?
  - ✓ Downtime/Response time<sup>24</sup>: How fast can we act when needed?

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<sup>21</sup> Roth, E. (2017, July 24). What is ad hoc reporting - and do i need it? I sisense. Retrieved from <https://www.sisense.com/blog/ad-hoc-reporting-need/>

<sup>22</sup> Ad hoc | signification, définition dans le dictionnaire anglais de cambridge. (n.d.). Retrieved from <https://dictionary.cambridge.org/fr/dictionnaire/anglais/ad-hoc>

<sup>23</sup> To have maintenance performed in-house or by outside vendors? (2014, May 12). Retrieved from <https://fleet-maintenance.com/have-maintenance-performed-in-house-or-by-outside-vendors.html>

<sup>24</sup> Wilson, G. (2017, March 9). Choosing between in-house maintenance vs. third-party vendors. Retrieved from <https://blog.servicechannel.info/7-factors-impacting-in-house-third-party-technician-choice>

- ✓ Managing risks<sup>25</sup>: Do we control cybersecurity and intellectual property risks?
  - Display performance indicators in factories of the future
- ✓ Easy to use/Visualization<sup>26</sup>: Is it easy to make your point using this tool? Is it understandable by a glance?
- ✓ Flexible/Robust<sup>26</sup>: Does it contain interactive features like advanced sorting and filtering?
- ✓ Scope<sup>27</sup>: Is the scope fitted for a decision maker? Is it global enough?
- ✓ Actionable information<sup>28</sup>: Does it allow the decision maker to take action?

### Step 3 - Development of the Feasible Alternatives

In this part, we are going to perform our MADM for the two improving points. We first need to rank the chosen criteria and give some input about what is a good situation and a bad situation for each criterion. This will constitute marking greed. Second, we will mark each criterion by following our marking greed.

- Responsibility of controlling machinery breakdown in 4.0 Industry factories

Ordinal ranking		Possible mark from the best to the worse		
1	Downtime/Response Time	Short	Medium	Long
2	Investment	Small	Medium	Big
3	Cost control	High	Medium	Low
4	Managing risks	Low	Medium	High

3/ Ranking and marking greed, responsibility of maintenance<sup>29</sup>

Criteria/Solutions	In house	By the supplier	By a third party
Downtime/Response Time	Short	Long	Long
Investment	Big	Medium	Small
Cost control	High	Low	Low
Managing risks	Low	Medium	High

4/ Marking, responsibility of maintenance<sup>30</sup>

<sup>25</sup> Boughton, P. (2017, March 9). Maintenance: in-house or outsource? | Engineer live. Retrieved from <https://www.engineerlive.com/content/maintenance-house-or-outsourcing>

<sup>26</sup> Ad hoc reporting explained. (n.d.). Retrieved from <https://www.logianalytics.com/resources/bi-encyclopedia/ad-hoc-reporting/>

<sup>27</sup> Blitz, S. (2018, May 3). Dashboards vs. reports? Which do you need? | Sisense. Retrieved from <https://www.sisense.com/blog/dashboards-vs-reports-need/>

<sup>28</sup> Reporting tools: everything you need to know | JReport. (2018, August 9). Retrieved from <https://www.jinfony.com/resources/bi-defined/reporting-tools/>

<sup>29</sup> By author

<sup>30</sup> By author

- Display performance indicators in factories of the future

Ordinal ranking		Possible mark from the best to the worse		
1	Actionable information	Yes	Partially	No
2	Easy to use/Visualization	Yes	Partially	No
3	Scope	Large	Medium	Small
4	Flexible/Robust	Yes	Partially	No

5/ Ranking and marking greed, display performance indicators<sup>31</sup>

Criteria/Solutions	Production report	Dashboard	Ad-hoc report
Actionable information	Yes	Partially	Yes
Easy to use/Visualization	No	Yes	Partially
Scope	Large	Small	Large
Robust	Partially	Partially	Yes

6/ Marking, display performance indicators<sup>32</sup>

#### Step 4 - Selection of the Criteria

The result will be given in the next part called Findings. The minimum acceptable level to continue the analysis of the alternatives is for a solution not to be the worst for each criterion. We can wonder if the solution "by a third party" has to be eliminated. It seems worse on every criterion except savings. This can be explained because the competition will bring the price down, so the investment will be small in comparison to doing it in-house and buying maintenance tools, workforce and providing training. We will now refer to the studied case. We are a big and fully automated processing food company so we can consider that funds can easily be unlocked for this investment. This way, the investment sum is not a burden, and the alternative by a third party can be ignored to narrow down our choices.

### FINDINGS

#### Step 5 - Summarize

To clearly show the rank order, we will use the compensatory model for weighting the result. First, I will give a grid for the adaptation of the color to the weight attribute.

Color			
Attribute weigh	1	0,5	0

7/ Adaptation grid<sup>33</sup>

<sup>31</sup> By author

<sup>32</sup> By author

<sup>33</sup> By author

Second, we will assess a relative weighted result. A high grade will mean that the alternative solution is healthy for our use case. On the contrary, a low mark will indicate the incompatibility.

- Responsibility of controlling machinery breakdown in 4.0 Industry factories

Criteria/Solutions	In-house	By the supplier	By a third party
Downtime/Response Time	1	0	0
Savings	0	0,5	1
Cost control	1	0	0
Managing risks	1	0,5	0

8/Weighting grid, responsibility of maintenance<sup>34</sup>

Attribute	Normalization				In-house		By the supplier	
	Relative rank	Normalized weight (A)			(B)	(A) * (B)	(C)	(A) * (C)
Downtime/Response Time	1	4/10	=	0,4	1	0,4	0	0
Savings	2	3/10	=	0,3	0	0	0,5	0,15
Cost control	3	2/10	=	0,2	1	0,2	0	0
Managing risks	4	1/10	=	0,1	1	0,1	0,5	0,05
Total	10			1,0	SUM	0,7	SUM	0,2

9/ Relative weighting, responsibility of maintenance<sup>35</sup>

- ➔ The best alternative is the in-house solution.
- ➔ The second alternative solution is by the supplier.

- Display performance indicators in factories of the future

Criteria/Solutions	Production report	Dashboard	Ad-hoc report
Actionable information	1	0,5	1
Easy to use/Visualization	0	1	0,5
Scope	1	0	1
Flexible/Robust	0,5	0,5	1

10/ Weighting grid, display performance indicators<sup>36</sup>

Attribute	Normalization				Production report		Dashboard		Ad-hoc report	
	Relative rank	Normalized weight (A)			(B)	(A) * (B)	(C)	(A) * (C)	(D)	(A) * (D)
Actionable information	1	4/10	=	0,4	1	0,4	0,5	0,2	1	0,4
Easy to use/Visualization	2	3/10	=	0,3	0	0	1	0,3	0,5	0,15

<sup>34</sup> By author

<sup>35</sup> By author

<sup>36</sup> By author

Scope	3	2/10	=	0,2	1	0,2	0	0	1	0,2
Flexible/Robust	4	1/10	=	0,1	0,5	0,05	0,5	0,05	1	0,1
Total	10			1,0	SUM	0,65	SUM	0,55	SUM	0,85

*11/ Relative weighting, display performance indicators<sup>37</sup>*

- ➔ The best alternative is the as-hoc report.
- ➔ The second best alternative solution is the production report.
- ➔ The last alternative is the dashboard.

### Step 6 - Selection of the preferred choice

During step 5, we have elected the best alternative for each challenge. They will be reviewed in detail in this part.

- Responsibility of controlling machinery breakdown in 4.0 Industry factories

The in-house solution has been preferred for our use case<sup>38</sup>.

- ✓ Cost control: This option allows the company to have full control of costs spent on maintenance. This option gives control over the money you spend on labour, maintenance, and tools. It helps to monitor the progress and track record of what was done.
- ✓ Investment: The investment cost is enormous at first for the solution to be implemented. A brand new organization is costly, and training must be provided on top of all the material investment<sup>39</sup>.
- ✓ Downtime/Response time: As discussed earlier, preventive maintenance can be anticipated, so the question of downtime is not accurate, but there still are unforeseen machinery breakdown. Having an internal dedicated service allows the response time to be very short.
- ✓ Managing risks: An internal department gives a full control over cybersecurity risks and intellectual property risks.

- Display performance indicators in factories of the future

<sup>37</sup> By author

<sup>38</sup> Moriarty, T. (2011, June 4). Where is biggest benefit: in-house or outsourced maintenance? Retrieved from <http://alidade-mer.com/biggest-benefit-house-outsourced-maintenance/>

<sup>39</sup> Pros and cons of in-house maintenance | Truckee Meadows Property Management. (2011, December 17). Retrieved from <https://truckeemeadowspropertymanagement.com/2011/12/17/pros-and-cons-of-in-house-maintenance/>

The ad-hoc report is preferred as a tool for decision-makers in a factory<sup>40</sup>.

- ✓ Easy to use/Visualization: An ad-hoc report can be composed of many tabs, so you need to navigate a little. On the other hand, it is very visual.
- ✓ Flexible/Robust: It is a very flexible tool that can be personalized for each occasion<sup>41</sup>. You choose the information you want to display. It is very free.
- ✓ Scope: As the tool can be personalized, the scope is always fitted to what you want to demonstrate. Here, we took the point of decision makers. The scope needs to be high-levelled.
- ✓ Actionable information: This report permits the decision maker to directly take action? It does not need any further audit or inquiries.

### Step 7 - Tracking

Those chosen alternatives answer the current context of the industry of the future. Automation and the shift of the role of humans in a factory from operator to decision maker forces companies to take actions. This situation can be controlled with correct implementation and fitting tools. To demonstrate that our recommendation considerably reduces the challenges of the changing environment, we will conduct a before and after Pareto Analysis. According to the Pareto Law, "80% of the problems come from 20% of the potential causes"<sup>42</sup>. We will be focusing on the company efficiency or here inefficiency main causes<sup>43</sup>.

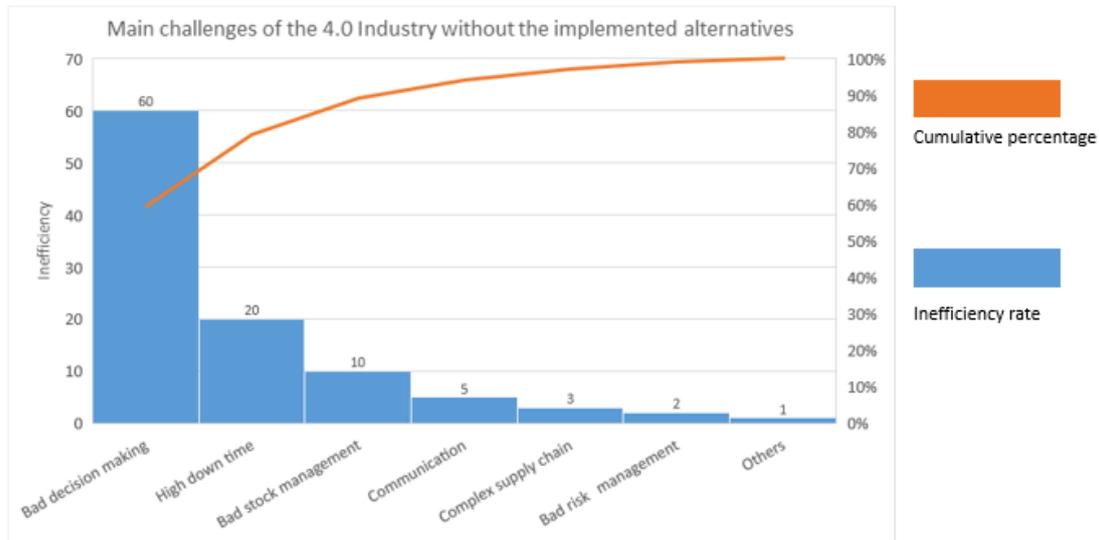
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<sup>40</sup> Goewey, B. (2015, September 18). The benefits of using ad hoc reporting in a business. Retrieved from <https://www.datamensional.com/the-benefits-of-using-ad-hoc-reporting-in-a-business/>

<sup>41</sup> Bornak, K. (2012, February 15). The benefits of ad hoc reporting. Retrieved from <https://www.jinfont.com/blog/benefits-ad-hoc-reporting/>

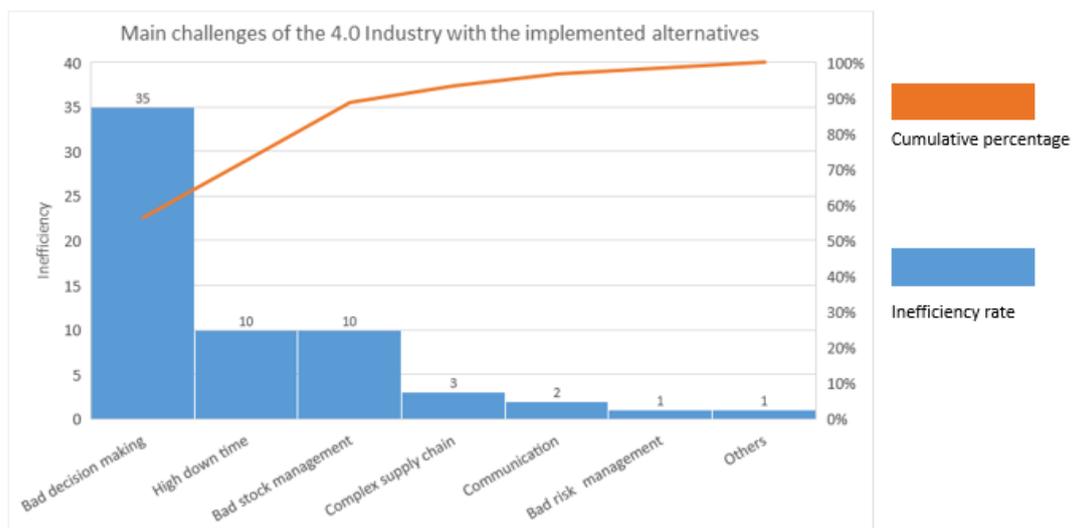
<sup>42</sup> GUILD OF PROJECT CONTROLS COMPENDIUM and REFERENCE (CaR) | Project Controls - planning, scheduling, cost management and forensic analysis (Planning Planet). (n.d.). Retrieved from <http://www.planningplanet.com/guild/gpccar/risk-opportunity-monitoring-and-control>

<sup>43</sup> Holmes, C. (2015). Designing and Implementing the Factory of the Future at Mahindra Vehicle Manufacturers. IDC. Retrieved from <https://www.cisco.com/c/dam/en/us/solutions/collateral/industry-solutions/idc-manufacturing.pdf>



12/ Before Pareto Analysis, main challenges of the 4.0 Industry<sup>44</sup>

In this paper, we have concentrated on solving bad decision making by having a look at the best tools for the managers to get accurate data about the system and downtime. By finding customized solutions, we have reduced the rate of those inefficiency causes but some others like communication (thanks to ad-hoc reports) and risk management (thanks to in house maintenance) as well.



13/ After Pareto Analysis, main challenges of the 4.0 Industry<sup>45</sup>

We have reduced the inefficiency impact by more than 38%!

<sup>44</sup> By author

<sup>45</sup> By author

## CONCLUSIONS

This paper highlights the shift in human roles in the industry of the future. The need for a problem solver and decision maker is huge in this changing era. Product customization is key. The consumer wants an entirely personalized product, which does not look like that of his neighbour<sup>46</sup> and he wants it now.

To answer those factors, we have seen the importance of performance indicators to get the current state of the factory and to showcase performance. This led us to decision tools in the 4.0 industry and the choice of an ad hoc report for his personalization capacities and actionable data. Automation and intellectual risks also brought us the maintenance problem. Operating rate<sup>47</sup> are optimized and any disturbance would ruin the productivity. By improving these two causes, we have meliorated the efficiency by 38%.

In the industry, modularization strategies are essential for achieving performance and managing the challenges associated with product portfolios, costs, time and quality. The trend toward a modularization strategy is brought by the client exigency to have personalized product in short delays. Is modularization the key to performance?

Nevertheless, we have discussed our choices having in mind a huge organization with investment power. This would bring new questions about what decision to make and tools to pick when building a company from scratch. How to manage risks and protect your data<sup>48</sup>? What law can protect me? How to cope with KPIs?

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**Claire Lopez** is a 5th year student at ITEEM, an engineer manager and entrepreneur school which enhances her overall industry expertise as well as develops her background in management strategy. Her school provides her a dual competence in engineering and commerce and allows her to be entirely able to work in a complex environment. The engineering competences are delivered by l’Ecole Centrale de Lille whereas the project and her master “MSc Project and Programme Management & Business Development” is part of SKEMA Business School. She is certified Prince2, Agile and passed the TOEIC (925/990). She integrated Axway Australia and Axway Singapore for her 8-month internship. She assisted the Marketing Department for activities undertaken in APAC region and helped create an Axway Partner Journey and its associated Certification Program.

Through many projects in different fields, she developed a strong experience in project management and business development. She is optimistic, engaged and hard-working. She is a great team member but is also able to manage a long-term project and demonstrate leadership.

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