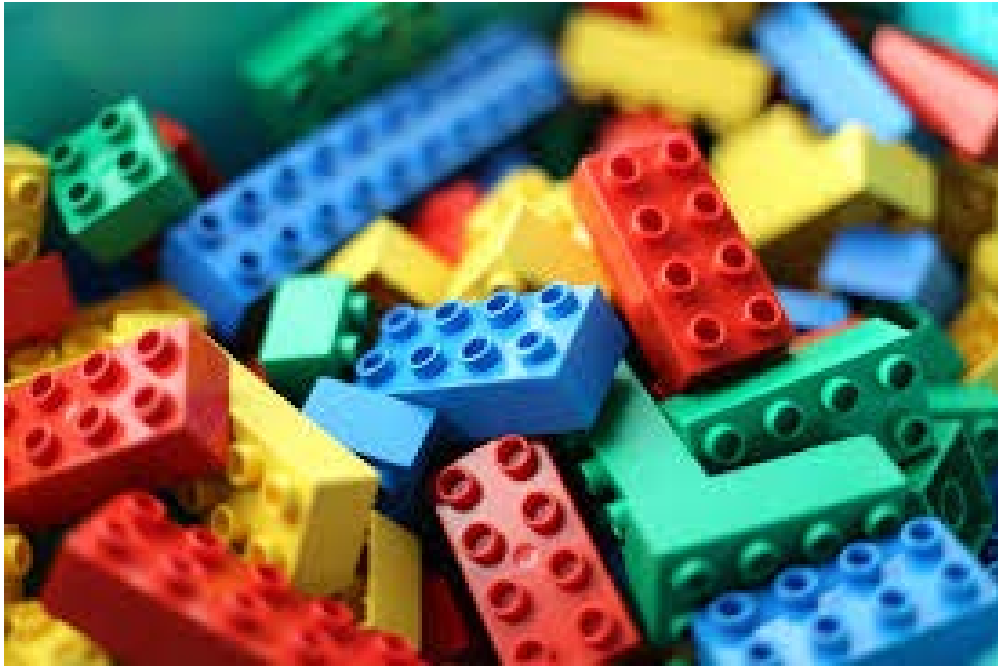


PRODUCT LIFE-CYCLE MANAGEMENT

LEGO-GAME



TEAM 1

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OUR RESULTS



#sbcegame
#leanisfun



Lessons learned -phase 1-

1. Which strategy did you follow?

We started from the body of the airplane in order to define the right number of passengers and the highest contribution to the weight. Hence, we move to the cockpit and we adjusted the wings and tails for the different alternatives.

2. Which was the main challenge you faced?

Satisfying together different requirements, in particular when they give us design constraints

3. What did you do wrong?

At the beginning we didn't ask for design constraints

4. Were you successful why?

Yes, because we worked together and in this way we found different acceptable solutions

5. Do you know how many options you have, if any?

We didn't know the number of possible solutions but we found 3 possible alternatives

6. Was it difficult? Why?

A little bit, in particular at the beginning when we had to decide how to organize the work

7. How would such a behaviour impact product development? (*Time, cost..*)

We spent more time in finding the alternative solution because we thought that was necessary to change the body. Instead we know that keeping the same body and only changing wings and tails it was possible to find different alternatives.

Lessons learned -phase 2-

1. Do you know how many options you have, if any?

At the end we found 5 options

2. Was it more difficult/easy? Why?

More easy because we worked in a structured way, but in the first part working with intuition we come up with the first solution in a shorter time.

3. Which are the main differences with Phase 1?

In the first phase we worked with trials and errors using intuition, while in the second one we worked in a structured way using computations and methods

4. How would such a behaviour impact product development?

We saved time because we were more efficient, in particular it was easier to find out all together different alternatives.

5. What if you have to satisfy a different customer?

Exploit the same tool used for this second part

6. Why do you think is important to have/use/reuse formal knowledge?

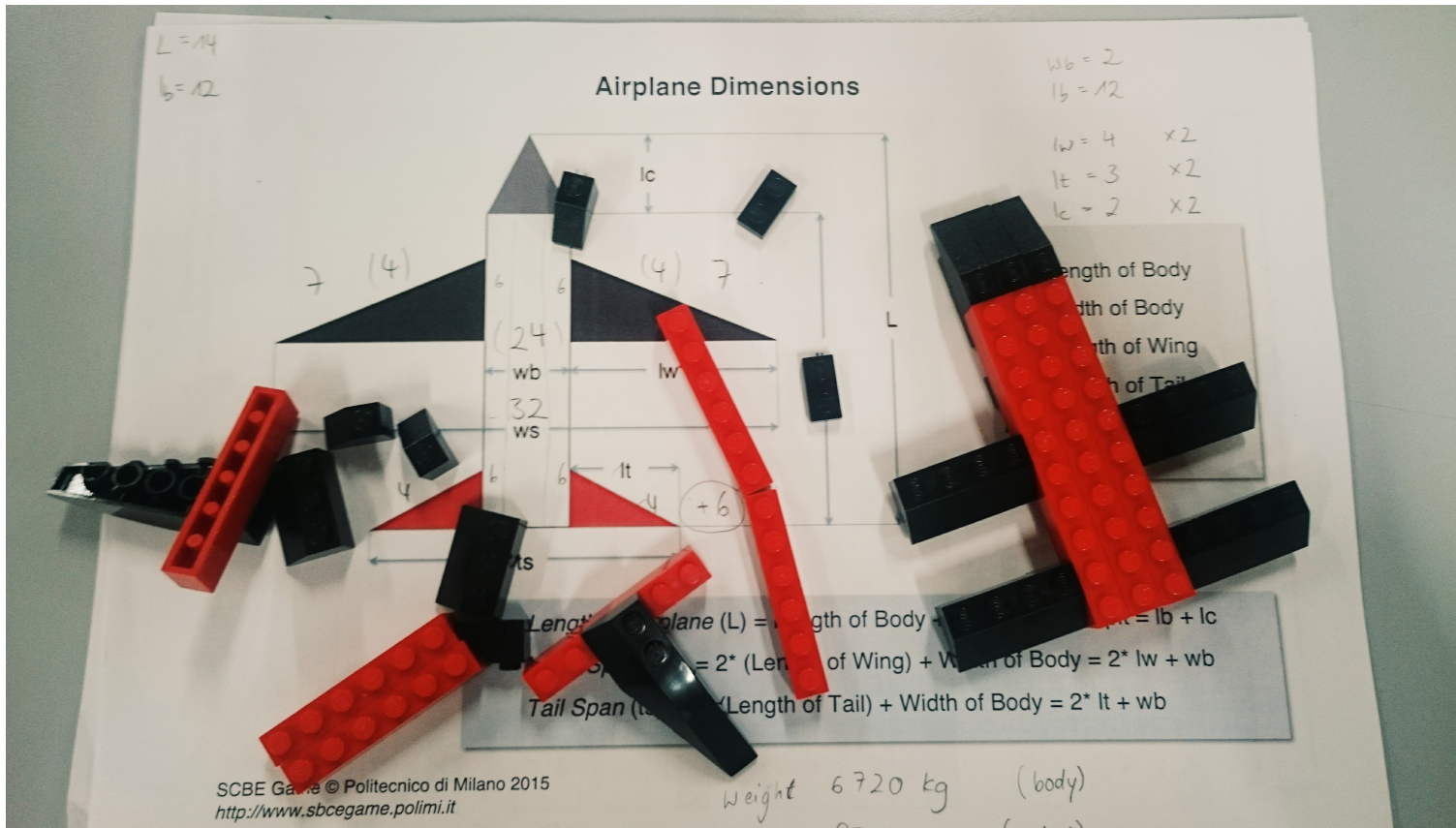
It's important because it gives us a way of proceeding, this is a key aspect if, for example, we have to modify something: because we know exactly how to come back and identify what to change

SBCCE GAME

Lessons Learned

Team 4

Product Lifecycle Management - Academic Year 2016/2017



Lessons Learned | Phase 1

Which **strategy** did you follow?

- ▶ We started with a single part, trying to make it fit customers' requirements. This part was usually the body of the plane since it influenced most of the requisites.
- ▶ Then we tried to choose the other parts in order to meet the requests. Usually the wings of the plane were the last choice because they were the most flexible part.
- ▶ Then we checked all again and made some changes if necessary.

Which was the main **challenge** you faced?

- ▶ To deal with all the different numbers, data and requirements at the same time.
- ▶ To use an effective communication.

What did you do **wrong**?

- ▶ Filling the table with wrong data.
- ▶ Not asking for other constraints - “Can the plane fly?”.

Were you **successful**? Why?

- ▶ Yes, we were. We built 3 correct airplanes.
- ▶ We reached our success mainly because we had a very good team spirit.

Do you know **how many options** you have, if any?

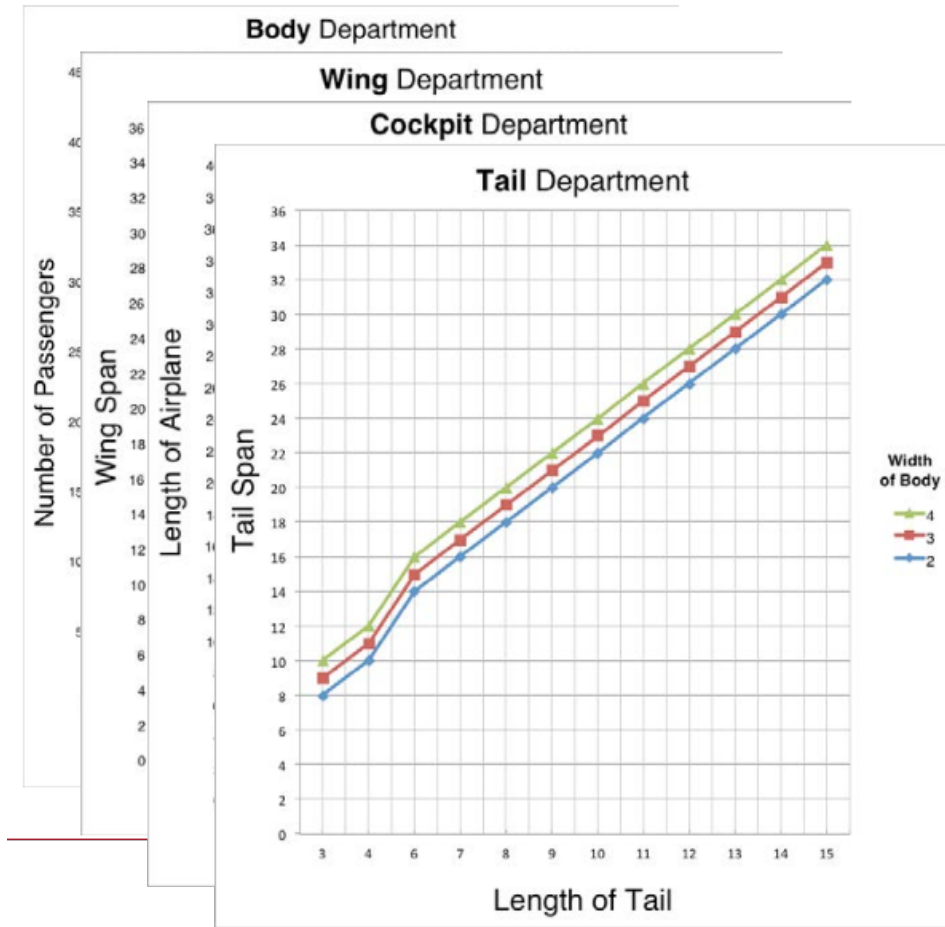
- ▶ We had for sure three options, but we think there might be some others more. However, we can only make a supposition of this number. We think something like six options in total.

Was it **difficult**? Why?

- ▶ It required some effort but it was not that difficult. Maybe at the beginning it was a little bit more difficult because we had to understand the logic of the game. For sure in a real case with a lot of more constraints and data it turns out to be very difficult.
- ▶ The main problem was to set parameters in order to meet all the different requirements at the same time. This difficulty comes from the fact that we did not have a proper method, but it was just a “trials and errors” process.

How would such a behaviour **impact product development**? (*Time, cost, ...*)

- ▶ With such an unstructured process, we were not sure to be able to arrive to a solution. Our success was depending only on the number of trials and errors and our perspicacity in finding the right solution. For these reasons this approach might take a lot of time to give some results.
- ▶ It might also imply high costs because, in order to know if our solution was correct, every time we had to prototype and test our plane.



Lessons Learned | Phase 2

Do you know **how many options** you have, if any?

- Yes, we know the right number for sure. They were 3.

Was it **more difficult/easy**? Why?

- ▶ It was easier because it was only a matter of mechanical computations and we had all the possible solutions displayed on one single paper.

Which are the **main differences** with Phase 1?

- ▶ We had a structured and precise method to follow, it was not a matter of “trials and errors”.
- ▶ We were sure to arrive to a solution (if any) and, moreover, to know all the possible solutions of the problem.
- ▶ We could focus on one issue at time and only in a second moment combine the different results in order to find a comprehensive solution.

How would such a behaviour **impact product development**? (*Time, cost, ...*)

- ▶ This method was less time consuming because it led directly to a certain solution without all the process of “trials and errors” and we didn’t have to build different planes before arriving to the final solution.
- ▶ However, if the options and the requirements are several, compiling the list of all the possible solutions might take a lot of time. In this case, there should be a way to limit the number of possible solutions.
- ▶ This method was also less costly, since before building the plane we were more sure about the success of our solution.

What if you have to satisfy a **different customer?**

- ▶ We still have to define our design space and draft the list of options, but we can reuse the same trade-off curves for each department.

Why do you think is important to have/use/reuse **formal knowledge** (e.g. *Trade-off curves*)?

- ▶ It is important because it helps in codifying some knowledge, making it more accessible, easy to use and fast to consult.
- ▶ Moreover, it is possible to use the same knowledge for different cases and different customer requirements.



SBCE- LEGO GAME

Group 5

Group 5, Lessons learned

Phase 1, Customer 3



According to the customer constraints, we analysed the options that respected the technical requirements and presented 3 feasible solutions.

The most challenging part was respecting the Ratio of weight and considering the entire set of requisites.

We made a mistake at the beginning because we didn't know anything about the technical features of the plane and we didn't ask for information.

Our strenght has been dividing different tasks (calculations, construction,..) to different team members.

Group 5, Lessons learned

Phase 2



We had 14 possible solutions that satisfied the customer needs.


Having the **Trade-off curves** made it easy and fast to identify first the possible sets of solutions (alternatives for the body) and, consequently, 14 combinations, including the wings, tail and cockpit.

This structured method allows to have the full **overview of the possible solutions** and to investigate one-by-one their **compliance with technical constraints**.

Product development occurs to be longer at the beginning because data regarding the trade-off curves need to be collected and analysed. While the second part, that deals with the selection of feasible alternatives, is faster.

If we have to satisfy a different customer (e.g. customer 2), the range of alternatives is lower and there is an only feasible solution.

We believe that **formalizing knowledge is essential** to fasten the overall process.



Lego game Team 7 – Customer 2

Lisa Pellegrini
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Lena Duchatel

Politecnico di Milano 4/04/2017



Lesson learned - phase 1

Answer the questions

- Strategy: trial and error
- Simultaneously respect both technical requirement and customer requirement
- We didn't ask for technical requirements → failure test 1
- We have been fast in understanding the technical requirements and the practical implication on the plane. Because the team works perfectly
- In our opinion we have just one option
- At the beginning it has been difficult to recognize the pieces we needed
- Since we didn't consider the technical requirement time and cost increases



Lesson Learned – phase 2

- Yes, we just have one option
- It's more easier, we have a methodology to follow
- We have also the tables, we are sure to have considered all the possible alternatives
- Reduce time, avoid failures, and save money
- Is easy, we have already the knowledge and the table
- Because you save time, able to change customers, it's a replicable process or if needed we can avoid replication
- Warning: the greater the number of passenger the greater the complexity of the system

Lessons Learned

SBCE CLASS

Alexis Montanaro

Lessons Learned:

Which **strategy did you follow?** – *We focused initially on the weight restrictions and tried to minimize the plane's weight and then add parts from there.*

Which was the main **challenge you faced?** – *Too many variables and constraints are hard to coordinate without a clear path or system.*

What did you do **wrong?** – *My group was fairly well-coordinated and we were able to create 4 variations that respected the restrictions.*

Were you **successful? Why?** – *Answered above.*

Was it **difficult? Why?** – *It was somewhat frustrating to manually stack the lego pieces through a trial and error method when we've had the knowledge that you can input restrictions and available options on a program like excel and rapidly generate all the solutions to the problem.*

How would such a behavior **impact product development? (Time, cost..)** *An incalculable amount. If Boeing engineers did this for a month they'd probably bankrupt the company.*

Lessons Learned:

Was it **more difficult/easy? Why?** *It was easier as coordination was further improved and it was less of a trial and error method and more based on calculations and actual math.*

How would such a behavior **impact product development? (Time, cost..)** *It would be a better solution than randomly joining pieces. This would make for a faster R&D and decrease production costs.*

What if you have to satisfy a **different customer?** *By creating a simply, flexible algorithm you could satisfy virtually any customer requirements that could emerge.*

Why do you think is important to have/use/reuse **formal knowledge (e.g. Trade off curves)?** – *Formal knowledge is fundamental to build a concise and clear process like this one. Learning curves might become steeper, but the final product and the process to create it will be much faster in the long run.*

SBCE GAME

Ana Chávarri

Product Life Cycle Management

Lessons Learned-Phase 1

- Which **strategy** did you follow?
 - We didn't follow a concrete strategy, we fixed first the number of passengers following the restrictions given and then we focused on the measures of the plane
- Which was the main **challenge** you faced?
 - We weren't following a clear system when deciding the measures each part of the plane should have so it was difficult to try and fit the restrictions of each piece without changing the value of the others previously calculated so we had to do every piece at the same time more or less
- Were you **successful**? Why?
 - We were succesful because we all did the calculatons together taking into account all the restrictions.
- Do you know **how many options** you have, if any?
 - We found 2 options.
- Was it **difficult**? Why?
 - Yes, because of the restrictions

Lessons Learned–Phase 2

- Do you know **how many options** you have, if any?
 - We found 7 options
- Was it **more difficult/easy**? Why?
 - It was easier because we used an excel page and because it was a systematic system
- Which are the **main differences** with Phase 1?
 - Having a system is faster and more efficient.
- How would such a behavior **impact product development**? (*Time, cost..*)
 - It would made the process faster.
- What if you have to satisfy a **different customer**?
 - You would only have to change the data but the system would remain the same

SBCE Game – Team 10, Phase 1.

1. Strategy:

We started by identified the main construction constraint, the length of the body. Then, given some options of body length, we made some attempt by respecting the lower bound given by passenger request. A trial and error approach.

2. Main Mistakes:

We waited for the first test until we found the best fit for our airplane. Then, we discovered the customer put further constraints on our project. We had to re-start from scratch. Furthermore, we did not consider the possibility of different solutions.

3. Development:

We made the typical mistake of the first airplane developers. We designed our concept without considering all the constraints. We could have obtained better results with techniques as the rapid prototyping. Then, we considered the solution as unique, writing down a poor track record of our result.

SBCE Game – Team 10, Phase 2.

1. Options:

We have 5 different solutions. They are all based on the same set, only the wing and tail span change. We could have chosen a lower wing span, which maybe would have implied a cheaper design.

2. Difficulty:

It has been much easier than the first development. When results have been put on the paper, it has become much quicker to discard dead ends. We also discovered that our solution was not providing the minimum allowable dimensions, as we thought before.

3. Development / Customization:

This technique dramatically decreases the cost of the project. Then, knowing all the possible solutions, it is easy to propose different version considering different customer requirement. The modular architecture helps in clearly identifying the main constraints due to different steps in the project.

GROUP 11

METE OSMAN BILGIC • SUVEYDA CENGİZ • ILKER BASARAN • HALUK SAKIR • REZA SEDAGHAT • HARSHA VARDAN

LESSON LEARNED PHASE 1

WHICH STRATEGY DID YOU FOLLOW ?

Firstly, as a group 11 , we started read the customer requirements for Customer 8 . Then, we tried to define maximum number of passengers to reach, due to the fact that we defined different variations of passenger numbers and other(length, weight, wing, tail) requirements combination which are between the range of customer needs . Finally, we determined the possible solutions and tested according to design constraints.

WHICH WAS THE MAIN CHALLENGES YOU FACED ?

In our group, we had some misunderstandings about components specifications. For this reason, at the beginning, we lost too much times to try different combinations. However, we have noticed the mistake and we solved it.

DID YOU KNOW HOW MANY OPTIONS YOU HAVE ?

No, we did not. We have already known that we had to use parametric aproaches to define all options, but, because of the time limits, we have tried trial and error method.

LESSON LEARNED PHASE 2

DID YOU KNOW HOW MANY OPTIONS YOU HAVE ?

Yes we did, thanks to having parametrical graphs, we could define options.

WAS IT MORE DIFFICULT OR EASIER ? WHY?

It was easier, because in this phase, we had some information from different departments to determine possible solutions.

WHAT IF YOU HAVE TO SATISFY A DIFFERENT CUSTOMER ?

In this phase, we had some informations from different related departments , therefore, easily we can analyze the possible solution ranges on the graph.

Set Based Concurrent Engineering (SBCE) Game

04-04-2017

Lessons Learned

Group 11: Customer 8

Phase 1

- **Strategy:** Trial and error
- **Challenge:** Satisfying all the given constraints
- **What went Wrong:** Weight of customers was only included in weight of body but didn't consider the base weight (100kgs) for each point
- **Successful:** Cross checking the given parameters, the mistake was rectified and the task was successful
- **How many options:** As of then we considered only one
- **Difficult:** It wasn't that difficult in understanding the game

Phase 2

- **How many options:** couldn't calculate all the variables due to time constraint
- **Difficult/easy:** well, we would rather answer it as time taking
- **Differences with phase1:** Lot of quantitative work than logical work
- **Different customer:** trial and error with different values
- **Using formal knowledge:** to test the possibilities