

Our perspective on engineering

History

In my 30+ years of experience in engineering the world has changed a lot, as with change there are always positives and negatives to be noted. In this document I would like to emphasize on what we are capable of today, but also what we can't deliver or at the very least not within reasonable cost of our hour/rate for engineering. I think it's important to have a clear understanding on what we think is reasonable, I like to see this document as part of our expectation management.

Core business

Our core business is mechanical engineering, the scope that we offer is development of technical solutions to our customer request. What we mean with this is that based on a few lines of product description by our customer, we are capable of generating, requirements, concept designs up to production drawings. Please refer to our website to see what we can offer.

Expectation management

We have a high level of focus on expectation management

Key topics in our expectation management

- CTQ's – these key requirements need special attention. In principle a technical solution that is spot on the CTQ is best, however under or over performance is in anyway costly. During or development we rapport on our expectation of the CTQ in relation to its baseline
- Alignment with the stakeholders
- Alignment on engineering efficiency
 - Preliminary Design Reviews
 - Critical Design Reviews
 - mdTPD (minimal dimensioned TPD)
 - Test plans
 - Product documentation
- Change management during the course of the project
- Inform in case of variation studies are required
- Inform if proof of concept is required

The rational for expectation management is to monitor during the course of the project the alignment with our stakeholders.

Trend in the industry

We see a couple of (growing) trends in the industry that have impact on all facets of our work, those that we like to point are

- Intellectual Property (IP)
- Patents
- Standards and Norms

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Intellectual Property (IP)

We understand that our customers want to protect their products / investments and we will always keep customers projects to ourself. As you've might have seen on our website we don't publish pictures of projects, this is because of respecting IP. Having said this, we also see a trend that "everything" becomes an intellectual property, to our opinion this is not maintainable. Mechanical engineering is based on knowledge gained, in university, years of experience in executing projects, internal research, studying literature, etc. This combination of gained knowledge is intellectual property of the engineer. To clarify our customers projects will be kept private and will not be shared in any way with other customers, but our way of working and technical knowhow can't be restricted by any IP

Patents

For new developments the infringement of patents, especially in this growing world of patents, becomes an increasing risk. We are unfortunately not capable of patents investigation and infringement assessments, this is the responsibility for our customers. The main reasons behind our statement are

- We have no experience in patent research and especially not in a full-proof search
- We have no experience in patent assessments. Our view is that patents are very hard to read and understand, needless to state is that full-understanding is a must to do a meaningful infringement assessment

Norms and standards

Reading norms and standards we do have some experience with, however this is not our daily business, in most cases of (new) product developments it is not required. Next to this is that we don't own any norms and standards, there are simply too many and they are expensive. As with patents we state that this is the responsibility of our customer to investigate which norms and standards he / she want his / her product to be compliant with. In these cases the norms and standards required should be made available to us by our customer.

Why excluding patents, norms and standards?

In the past I have done investigations in these areas, from that I concluded that it's at the very least hard to find out what is applicable. The research required to find out what is applicable and valid will take a tremendous amount of time and it is something that has to be redone for every project. The amount of information to digest is not something that a human is capable of reproducing. The projects we do vary such that, unfortunately, it is not a generic stack of documents that we have to our disposal where we can refer to each time we think it is applicable.

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Responsibility and insurance

Another trend we have seen at some of our customers is the request of insurance with regards to deliverables which means a professional liability insurance. Investigation so far has been unsuccessful to find insurance companies who what to ensure this risk. To us this makes sense since it will turn quickly out of control, for instance the SEMI-conductor industry, parts are more expensive than similar parts for regular industries. We don't offer the responsibility of full functional hardware, simply because we cannot ensure this and even if we could, it would be very expensive and in the end it will settle in the hourly rate.

In general we always work on new technical solutions, which has inherent risk of not meeting expectations at first built. This is one of the main reasons that, in our way of working, expectation management has such an important role.

With new products always comes a next step in the process, 'first time right' simply doesn't exist to our opinion, it's a terminology that is often used but the full meaning is not supporting the following

- **Proto phase**, the main reason for building protos is to test the first revision of the product against its expected specifications.
- **Improvement phase**, this is the phase where learnings of the proto are implemented in the next revision of the product
- **One off's**, for these projects is "first time right" quite important. However with one off's, there is often a balance between "under" performance risk and engineering effort. "First time right" has the tendency of disproportional increase in development time
- **Product dependency**, high complex (innovative) projects are more prone to improvements than less complex projects. In less complex projects the terminology "first time right" becomes a bit more valid
- **Cost of goods projects**, projects we have run, especially for big companies often are followed up with a cost of goods project to shave off costs. To our experience these projects, almost always, are trade-offs between really required requirements and "nice" to have. New risk are introduced in cost of goods projects, knowing unintentional triggering of "under" performance of the product

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Summary

We hope by explaining our vision and experience that we brought some light to this subject, because it is to our opinion a growing difficulty to align on statements and to have mutual agreement. Having said this we like to emphasize that we will always do our outmost best to deliver quality technical solutions, because it is our passion. We have a high moral with regards to respect customer IP as far as reasonably possible. With regards to responsibilities on project realization in terms of hardware deliverables, product performance and all related topics it's not possible for us to take this (financial) responsibility, therefore we explicitly exclude this by default