LEAN and A3 Approach to Supporting Processes

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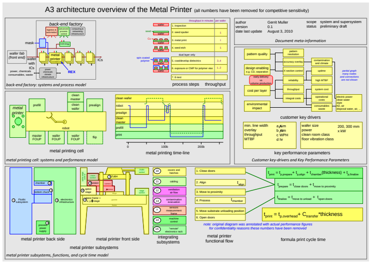

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Abstract

LEAN product development is in the process and means area pragmatic. Low tech tools, such as paper, pen and magnets, with very direct interaction are used. For communication the use of single A3-size documents is promoted, because this is a manageable amount of information.

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1 Introduction

LEAN manufacturing is a manufacturing approach based on Toyota's successes, as described by researchers who observed and analyzed Toyota. LEAN product development is building on LEAN manufacturing, where the ideas from the repetitive production environment are transformed for use in the creative product development environment. Likewise LEAN product development is based on observing Toyota product development.

LEAN at slogan level is sold as "avoid waste". For the purpose of this chapter we characterize LEAN by the following elements, loosely based on [1]:

A holistic, systems approach to product development including people, processes, and technology.

Multi-disciplinary from the early start, with a drive to be fact based.

Customer understanding as the the starting point.

Continuous improvement and learning as cultural value.

Small distance between engineers and real systems, including manufacturing, sales and service and the system of interest.

2 LEAN and Supportive Processes in General

LEAN product development delegates responsibilities as much as possible to the experts. The management facilitates and stimulates the experts to operate towards the goals using the LEAN principles. The way of working is highly pragmatic, where the goal dominates over the means. In many cases no complicated computer tools and repositories are used.

Co-location in a larger room is common. In this room wall space is used to visualize plans and schedules, with low-tech means such as paper, pens, or magnetic boards. The components or a prototype of the system can be present in the room (keep the distance small!).

In LEAN manufacturing and LEAN product development A3's are used to document and communicate, as discussed in the next section. A3 is an European standard paper size of $297 * 420mm$.

3 A3 Essentials

An A3 contains a "human friendly" amount of information. The size permits some depth and facts in the information, while at the same time the size forces the author of the A3 to select and process the information carefully.

We have the following guidelines when using A3's as the unit of documentation and communication:

Capture "hot" topics that are currently under discussion. when topics are under discussion, then explicit diagrams facilitate the discussion. The active use of the A3 will stimulate the evolution of the A3 itself.

One topic per A3 so that every A3 is homogeneous. The requirements for documents, defined in **??** also apply for A3 documents.

Show multiple related views. The strength of the A3 format is that several diagrams can be shown at the same time. These diagrams are different views on the same topic. These views will be related. These relations should be present in supportive, non-dominating, way, e.g. by the use of colors, shapes, lines, labels, or naming conventions.

Make the A3 digestable by limiting the amount of content. Note that the size limitation forces the authors to limit the amount of information.

Make the diagrams and information specific, for example by quantification. Note that the risk of the size limitation is that too "empty" or too glossy posters are made. Good A3's have substance; specific information helps to make the A3 substantial.

Practical visualizations close to the experience of the stakeholders. Good A3 documents engage the stakeholders helped by instant recognition of the visualizations.

Note that the granularity and structuring guidelines of **??** are applicable on A3 based documentation as well, where the pay load size is limited by the A3 dimensions.

4 Example of an A3

Figure 1 shows an example of an architecture overview shown on a single A3. This A3 shows the "super-super" system: the wafer back-end factory, where nearly finished wafers are processed and where Integrated Circuits (ICs) are produced. Part of the process at factory level is the metal printing. The metal printing related process steps are shown at factory level, both visually, as work flow steps, as well as quantifying the throughput in minutes per wafer.

The next layer in Figure 1 shows the "super" system: the cell. In factories all equipment related to a process step is organized in cells. A cell is a self sustained unit in the factory that can perform all operations required for this specific process step. The core entity of the cell is the wafer handling robot. This robot transports wafers from the containers with wafers (so-called FOUPs) to the functions in the cell, such as pre-fill, clean and print. The flow of the wafers through the cell is visualized at the right hand side for one master and one wafer. The previous and next wafers are simultaneously in the cell; the cell is processing wafers in pipelined mode.

The third layer shows the decomposition of the metal printer, the system of interest. These subsystems are shown as back side and front side views plus 7 integrating subsystems. Next to the subsystem decomposition the work flow of the metal printer is shown. This work flow is used to create a simple cycle time model as formula. Note that in the original A3 the formula was annotated with actual performance numbers to provide numerical insight in the cycle time.

At the top right hand side of the A3 a customer key driver graph is shown and below the graph the key performance parameters are summarized.

This single A3 shows the system, the system context and the first level of decomposition. Physical views and functional views are shown. Quantifications are given at all three levels as time-line, as table or as formula.

References

[1] James Morgan. Applying lean principles to product development. `http://www.sae.org/manufacturing/lean/column/leanfeb02.htm`, 2010.

[2] Gerrit Muller. The system architecture homepage. `http://www.gaudisite.nl/index.html`, 1999.

History

Version: 0.1, date: September 8, 2010 changed by: Gerrit Muller

- textual updates.
- increased size of the A3 example.
- changed status to draft

Version: 0, date: August 3, 2010 changed by: Gerrit Muller

- Created, no changelog yet.

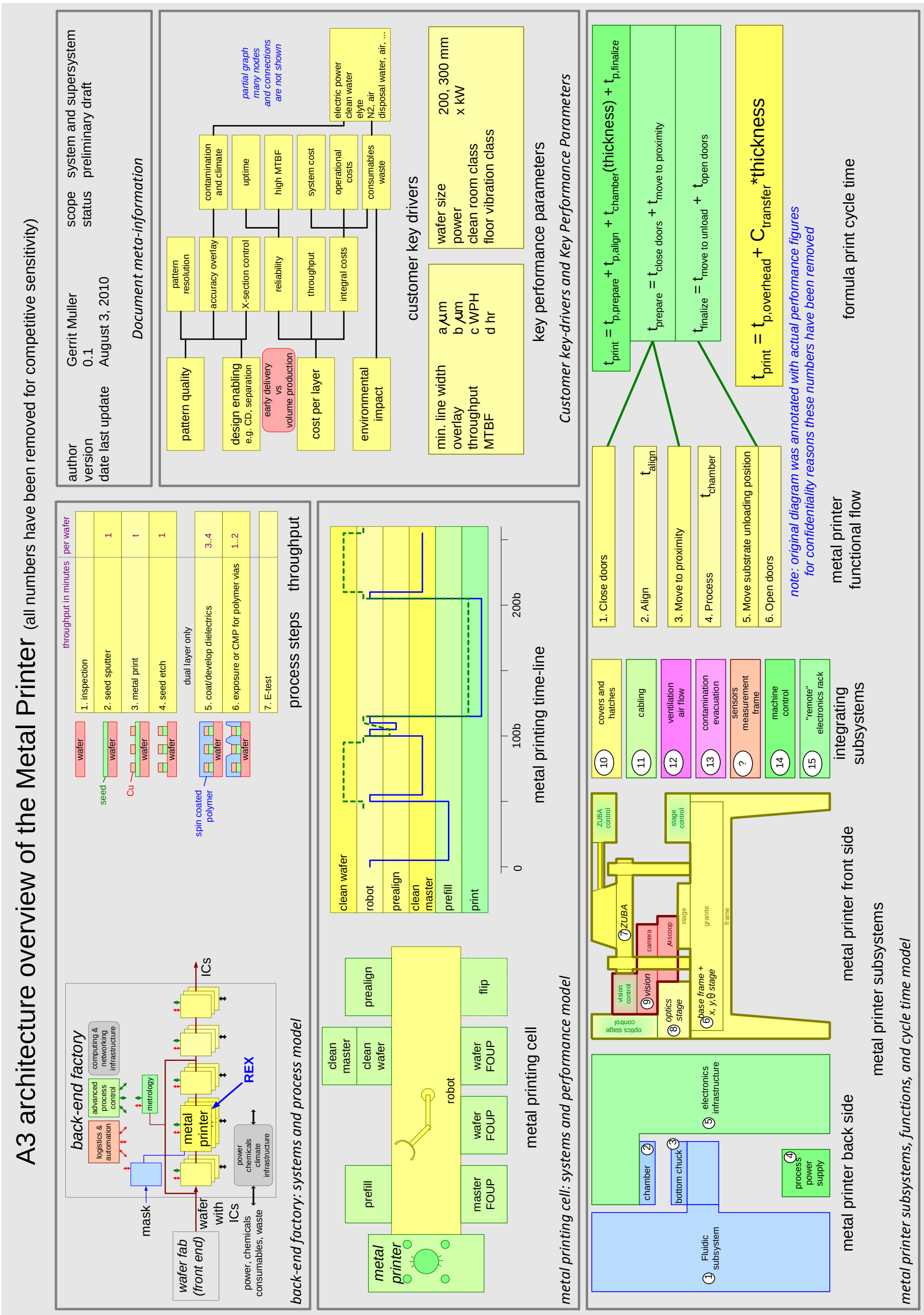

Figure 1: Example of an Architecture Overview on one A3