

ST Microelectronics Maximizes Feature Content Within a Tight Development Timeline



In Brief...

The Challenge

Reliably plan and deliver six or seven new IC's every year into highly diverse and competitive consumer markets.

The Solution

Apply the NMX-ERP tools suite and Industry Project Database to analyze and optimize ongoing product plans, while providing a comprehensive planning capability for new projects.

The Impact

Numetrics' unique integration of information from ST and industry chip designs allow feature and performance criteria to be planned using objective analysis of resources and product complexity.

The Value

More accurate planning ensures engineering resources are used more fully, and the best possible feature sets are delivered to customers on time each year.

Consumer markets bring special challenges in which only the most effective semiconductor companies can thrive. Relentless competition, ever-changing consumer fashions, continual pricing pressure, and ever-more complex functional requirements challenge R&D teams to innovate and perform to a rigorous schedule. Companies in these segments must have a robust and objective methodology for product planning and execution.

ST Microelectronics' Home Entertainment and Displays (HED) group builds complex semiconductor products for these consumer markets. Products range in scale from 2M to 15M gates, with a wide range of functional requirements, implementation technologies, and clock speeds. This requires a flexible and diverse engineering force that is able to complete complex designs on time and on budget.

Maurizio Paganini is the Director of R&D for the TV & Monitor Division, within HED. He is responsible for a team of several hundred engineers and planners, working on all aspects of product specification, design, and implementation for six or seven products simultaneously.

The Numetrics tools came to Paganini through ST's Central Engineering group, that provides methodologies and tool flows to all of ST. A presentation of Numetrics capabilities intrigued him because of their potential to improve a critical part of the product planning and project estimation process within his group.

Planning for Success

Paganini immediately applied Numetrics' industry database and tool suite to investigate a project that was in trouble. By entering the core project information that captures complexity, and describing the resources made available to the project, the planning team could see that Numetrics' NMX-ERP™ solution correctly predicted the problems that the development team was in fact experiencing.

They could clearly see how the improved planning information that emerged from the Nu-

metrics toolset would have made it possible to avoid their current problems. This served to confirm the accuracy and relevance of Numetrics' analysis and proprietary database of over 1400 IC designs. Armed with this confidence in the tools and data, the team was ready to extend their use of the technology.

When applying NMX-ERP to new design projects, ST's goal is to identify the optimum feature set for delivery at a particular time. The annual product cycle, dictated by the consumer electron-

ics OEMs, demands that new products can be demonstrated at CES in January each year. Hitting this milestone is absolutely critical to winning sockets and therefore generating revenue.

As a result, the key tradeoff is to combine available technologies into compelling products that can be delivered on time. Too many features in the specification, and the product misses CES. Too few, and the product fails to win in the marketplace.

Paganini describes it this way: *“Either you hit that week in January, or you're out for a year. There is no in-between, it's quite binary. So the pressure is very high ... when you're quite close to a deadline because for any project there is a lot of active management to get from what the product was initially conceived to be, to what in the end is delivered.”*

Numetrics has come to play an important role in these decisions, because NMX-ERP's complexity calculation engine accurately estimates the impact of different feature sets and implementation strategies at planning time. The quantitative nature of the methodology makes these tradeoff discussions between marketing, engineering, and management easier and more objective.

In addition, the ability to carry out interactive *what-if* analyses facilitates exploration of multiple product specification sets in the context of available resources.

Focusing on the business

Historically, the TV and Monitor Division has demonstrated excellent research strengths. These have led to significant innovation within the group. However, Paganini identified a need to increase the level of focus on product and business issues. This would enable a better match between investment and return, and would more closely align the division with the stringent requirements of their customers.

Recognizing that accurate product planning requires different skills from innovation at the technical level, Paganini saw the NMX-ERP toolset as a way to significantly boost his team's planning capability. The Numetrics tools replaced an *ad hoc* set of spreadsheets and project plans implemented internally, with a powerful and complete set of tools to optimize specification, resources and schedule based on business goals. The new solution proved to be both more robust and more capable than the tools it replaced.

“Looking at Numetrics' capabilities, I thought, here is a possibility to have a different interface to do our planning and possibly add something more,” Paganini explained. *“So instead of focusing on the data entry we can focus really on analyzing the data and making the decisions we need.”*

Paganini found data entry requirements to be well below the levels required by the previous toolset. In addition, once the data is entered into NMX-ERP, the analytic and presentation capabilities far exceed those available previously. This resulting productivity increase is especially valuable when the product is undergoing changes of plan.

The net benefit of the new tools and database is that there is now a well-developed and transparent methodology for planning that allows for accurate tradeoffs between features, cost and time. These planning decisions can be made early enough to influence product development activities, while being accurate enough to be useful for resource planning.

Paganini states, *“There are quite a few metrics you can extract from the tools that provide you good indications of the actual performance of the teams. So it's providing quantitative information that you can use to set your targets and really measure your progress.”* This combination of accuracy and timeliness is a major benefit of the Numetrics tools to a company like ST Microelectronics, given the challenging nature of their market windows.

Chart 1



As a concrete example of these benefits, **Chart 1** shows the challenging yet very realistic cycle time goals of a new project: the complexity is higher than the previous design and the targeted duration is shorter, but within the boundaries of team possibilities.

Chart 2

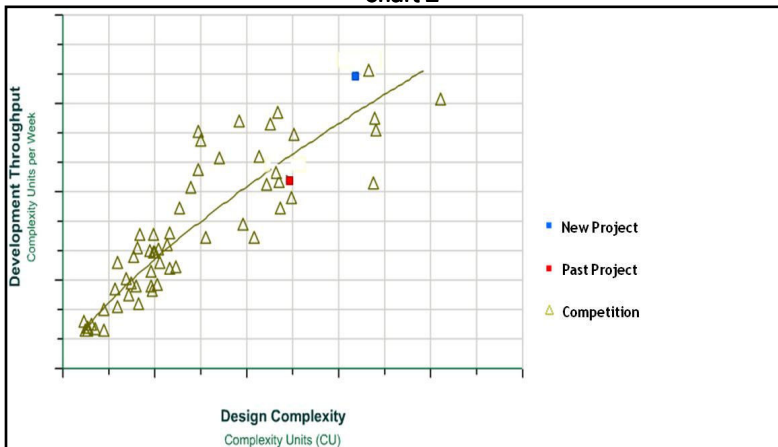
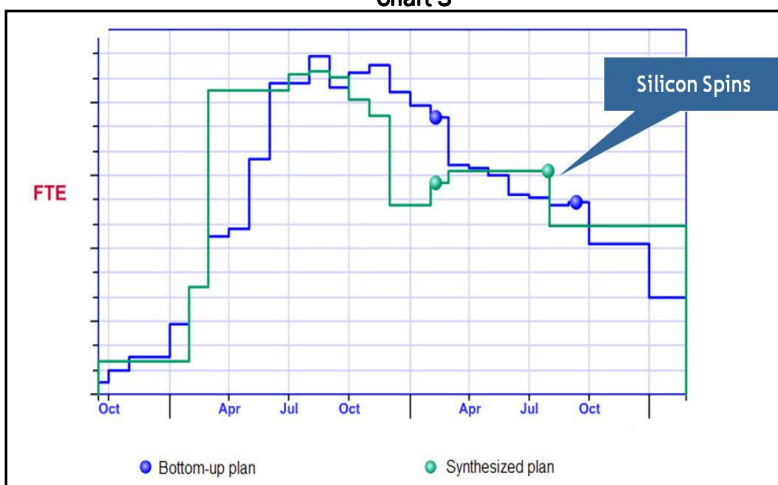


Chart 2 shows this level of excellence can be achieved by measuring and optimizing the throughput (Complexity/Cycle Time) of the development teams and comparing it with past achievements.

Chart 3



Finally, **Chart 3** shows the reconciliation of the bottom-up plan (i.e. program manager plan assumptions) with the Numerics top-down plan, generated from a calculation of the new design's complexity and expected team performances. This envelope of reality around the new project plan gives the development teams confidence in the goals they are asked to achieve, and gives the program manager the opportunity to easily catch unrealistic or non-optimized project plans.

Managing Change

Under Paganini's leadership, the Numerics tools are being applied in a consistent cycle: *planning*, *snapshots*, and *corrective action*. In the *planning* phase, the characteristics of the design are established through a series of what-if analyses. They are ultimately fixed and the design starts.

At any point during the design, the team can *snapshot* the design—in other words, enter up-to-date design status information and generate new estimations for resource and schedule. These can be used to apply *corrective action*. This allows the design and program managers to monitor the risk associated with the project schedule and resources, whenever actual staffing data is entered or the design complexity is altered. These changes might for example be the result of a change to the IC specification.

This methodology allows not only good initial planning, but also a level of responsiveness to the realities of an ever-changing business and technical environment. Paganini explains: *"There is much more opportunity to do tradeoffs between what you're going to deliver in terms of features and when you have to deliver it, and how much the cost must be for it."* *The result is a more agile company—a key differentiator in a fast-moving market.*

One of the challenges in any planning environment based heavily on intuition is that the initial estimates of resources tend to be low and, therefore, optimistic. This is a natural phenomenon in which the engineers tasked with scheduling have a tendency to set themselves high standards. They tend to plan for the best case both because of a desire to do well and because there is a resistance to predicting problems in advance of their occurrence.

Yet change is a constant. Projects experience change in specification, feature set, resource availability, schedule, and in many cases more than one of these. A realistic plan will account for the likelihood of changes, while still being aggressive. The implementation of the Numerics tool suite and methodology has allowed Paganini's TV & Monitor Division to develop better schedule predictability, because the models are correlated both with the performance of his own teams and projects and with industry norms that provide a much larger data set.

The availability of better data, coupled with effective presentation of the issues, encourages a richer discussion between the members of the planning teams. A richer discussion means more of the issues are considered, more scenarios are analyzed, and the outcome is a better product