

## NXP Bridges Engineering-Culture Divide to Drive Complex Software-Development Project on Predictable Schedule

### In Brief...

#### Challenge

NXP combined its best people and leading-edge technologies with those from a newly acquired small company to design a fully-featured, high-end digital set-top box solution for the market. Management challenges included integrating different design cultures, building on unfamiliar technology and communicating across multiple time zones, cultures and continents.

#### Solution

Use the NMX Software Project Planner™ to generate fact-based estimates of the minimum staffing needed to meet development schedule targets.

#### Action

Software Project Planner quantified project complexity and enabled “what-if” scenario analysis.

#### Impact

NXP revised its staffing plan in response to unforeseen changes in complexity and contained risk to manageable levels. Engineering managers used this information to avoid schedule slips.

#### Value

NXP improved productivity and scheduling accuracy.

Most mergers struggle to live up to expectations. Cultural differences among freshly paired teams can prompt confusion and miscommunications, leading to missed schedules and project delays. Market opportunities rarely pause to let organizational changes catch up. For semiconductor companies, each week of schedule slip can mean more than a million dollars in lost revenue opportunity, shrinking what should be at least a 10x return on R&D investment into a 2x return—or worse.

At NXP, staying on schedule and exploiting a new market was a top concern when the company leveraged a newly acquired software team from Conexant, located in two primary sites (Austin, Texas, and Hyderabad, India), to develop an exciting new set-top box product.

In 2008, the digital set-top box market was growing around the world. The United States, in fact, was just months away from halting analog broadcast, which would force lingering analog holdouts to convert to digital set-top boxes. NXP and its newly acquired team had limited time to get its product to market.

The combined team would be spread across seven sites spanning three continents and was tasked with building one of the most robust, fully-featured systems available on the market—one well on the road to integrating all home electronics control into a single box.

The management challenges were as significant as the product goal was ambitious. The lead software teams in Hyderabad and Austin (totaling more than 100 engineers) were being managed by the program manager in Austin, and the new NXP owners were overseeing things from Eindhoven. Culturally, however, there are significant differences between a smaller company—with the R&D culture and processes of a startup company—and a stable, mature corporation boasting more than 50 years of semiconductor experience. (*Note: both NXP & Conexant have design operations in India.*)

## The Challenge

Leading-edge development is challenging in the best of times, but in this case, project success would be based on three major factors: quantifying development complexity, building confidence and fostering excellent communications.

### Complexity

The newly acquired team would obtain and integrate new software and hardware technologies from NXP. How could they determine the complexity of building on code that is not their own? How could they accurately forecast the delivery timetable and resource requirements if the complexity is not well understood?

### Confidence

Could NXP rely on this new team to develop a predictable schedule and make the necessary staffing tradeoffs to achieve its goals? Could this new group persuade the new owner that, despite being a small group of newcomers, it can deliver?

### Communications

Could NXP—a sophisticated, experienced global electronics company with established processes and methodologies—cultivate a common language with the set-top box development team to manage both the deliverables and expectations? Could the new group satisfy the information needs of a big company? After all, a startup's interpretation of "low risk" may be intolerably high to a large company.

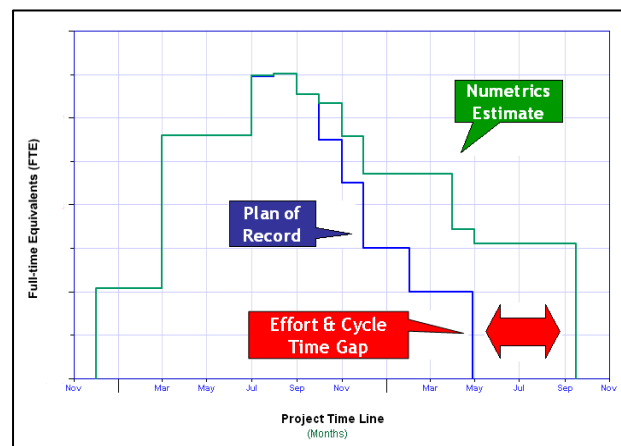
### Early Expectations

NXP began the project with a schedule that assumed considerable re-use of software code to speed the design process. But in the months that followed, the project's complexity mushroomed. Changes emerged to the architecture and the way in which components from different groups would be managed. Even the core processor was changed.

This significantly increased the complexity of integration. No one had anticipated that.

Despite the increase in project complexity, NXP still hoped to finish the project with the same engineering effort and cycle time.

This situation, in which engineering culture and technology differences were poised to collide, required a methodical approach and high integrity to avoid collision.



**NMX Software Project Planner calculates staffing and cycle-time requirements based on measurements of the project's complexity and team's productivity.**

Enter Numerics and its fact-based project planning tools.

*"Numerics' fact-based analysis showed that the complexity is higher than what we had anticipated at the outset of the project,"* says Sujatha Alluru, Software Project Manager. *"The complexity that the team initially thought had doubled had actually tripled."*

Numerics had been deployed on a number of NXP projects in previous engagements with the company.

In this case, NXP chose to deploy the Numetrics NMX Software Project Planner™ to assess project complexity, make staffing and technology tradeoffs and develop a predictable schedule.

## Project Planning – Making (and Meeting) Commitments

### Quantifying Risk

The development team had produced an early estimate of the cycle time and resource requirements to deliver this product. But how risky was it? What level of productivity was required to achieve these targets? Could the team convince its management that their commitments were trustworthy?

The solution lay in using Numetrics Software Project Planner database and tools to benchmark the underlying assumptions in the project plan. The first step was to measure the complexity of the software project using objective measures familiar to NXP. Because this same complexity measurement is used across NXP—and in fact by other leaders in the semiconductor industry—there was high confidence that the results were reliable.

### Managing Change

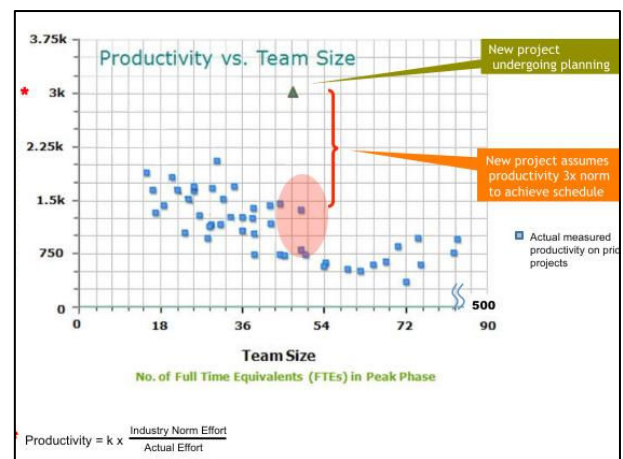
Although the team’s first estimates were reasonable, the changes—the new architecture and new core processor—introduced significantly more complexity into the project. The key question was how much?

Using Numetrics’ complexity calculation engine, the team measured exactly how much additional complexity engineers faced.

Using NMX Software Project Planner, they were able to revise their headcount requirements to respond to these changes and maintain confidence they could deliver on time.

### Scenario Analysis

But there were other potential changes for which contingency plans were needed. For example, resources planned to work on this project might have had to be moved to other projects, and additional changes potentially could have introduced even more complexity into the scope of the project. These contingency plans were developed as “scenarios” or “what-if” simulations in the software planning tool, preparing the team to respond to multiple possible outcomes.



**Engineers use Software Project Planner to compare plans against measurements of what their team can actually accomplish. Overly aggressive development targets are quickly exposed.**

## Conclusion

Software Project Planner enabled NXP's Hyderabad team to compare different project scenarios based on alternative assumptions. For example, if the total number of lines of software code doubled and the project deadline remained fixed, what would that mean for staffing and productivity?

*"Numetrics Software Project Planner showed how our staffing would increase or the project would slip its schedule in various what-if scenarios," says Sujatha. "This visualization gave the development teams an increased confidence in their plans. Based on these tradeoff analyses, we quickly developed mitigation strategies for each scenario and each potential outcome."*

## Communications and Culture

Numetrics helped ensure all engineers and managers were on the same page, building understanding and trust in a time of transition by delivering to NXP:

- An analysis of project complexity, in an industry-standard manner familiar to NXP
- Estimates of resources and cycle-time requirements based on facts and data
- Benchmarks of the project execution assumptions to ensure that they were very aggressive but fully achievable
- Fact-based updates of schedule and resource estimates at key milestones and when significant changes occurred.

Software Project Planner helped the NXP team understand complexity and communicate effectively during a complex undertaking.

Quantification of complexity together with "what-if" scenario analysis helped NXP revise its staffing plan in response to unforeseen changes in complexity and contain risk to measurable, manageable levels. Engineering managers embraced the results of the fact-based plan and used this information to avoid schedule slips.

NXP used the Numetrics tools to replace ambiguity with facts and data and in the process bring together two distinct engineering cultures.

Numetrics' NMX Software Project Planner allowed the software team to communicate with NXP management using facts and data they both understood. It measured project complexity and schedule risk and presented results in absolute terms. NXP engineering managers moved quickly from not understanding the new group's capabilities and scheduling prowess to having a qualified and accurate view of exactly how much risk the team might face and the probability it could achieve schedule.

NXP has learned throughout its history how careful attention and use of the right metrics can increase not just development maturity and productivity, but also how effectively diverse teams can work together. The development team understood the benefit of leveraging their historical data to make future projects successful and the importance of fact-based planning as part of a long-term commitment to continuous improvement.

*"We are applying this planning methodology on all our software projects," says Rajat Mishra, Quality Manager for the set-top box businesses. "Only by maintaining and leveraging key performance metrics can we improve our productivity and scheduling accuracy."*