CASE STUDY

About the Client

Nestlé Pakistan is an $800 Million revenue subsidiary of Nestlé SA, the global food giant. Nestlé Pakistan today is the leading Food & Beverages Company in Pakistan with key focus on Nutrition, Health and Wellness and reaching the remotest of locations throughout Pakistan to serve consumers. Its primary product lines are milk based products, beverages, bottled water and other food products.

Techlogix helps Nestlé innovate in Milk Production Planning

Nestlé Pakistan operates the biggest milk collection operation in Pakistan. Currently, Nestlé milk is collected from an estimated 190,000 farmers spread out over the provinces of Punjab and Sindh. It produces a full range of dairy products including milk, powdered milk, cream, tea whiteners and yoghurt.

While the demand for its milk products is relatively constant throughout the year, milk production varies very significantly from season to season. A further complication is that the content of milk obtained from farmers also varies. Hence Nestlé is faced with the problem of managing its production capacity in the most efficient way based on both major supply side constraints and demand side variations.

Despite significant investment in ERP systems, Nestlé was unable to automate its highly complex milk production planning process. There was also a strong realization of the limitations of the manual planning that was being used. Nestlé decided to see if a customized planning system could be developed. Techlogix was engaged and an ambitious two year multi-phase project was launched.

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The Challenge

A large majority of products produced by Nestlé Pakistan are milk based. While the sales forecast of Nestlé products remains fairly stable throughout the year, milk supply and composition (fat content etc.) varies significantly over the year. To manage this variation, Nestlé prepares a production plan every month based on a number of estimates and assumptions. A typical production plan, created in Microsoft Excel by a Production Planner, attempts to achieve a set of objectives while following a large number of rules and constraints. Some of the objectives that a production plan hopes to achieve are:

◉ Minimizing milk wastage
◉ Achieving predetermined level of production quantities for each SKU
◉ Producing some material which will be used as stock for future months where fresh milk supply is insufficient
◉ Efficiently using imported material
◉ Generating import requests in case of material shortage well in time
◉ Efficiently using available plant capacity for bulk production

Some of the rules and constraints that have to be followed are:

◉ While increasing or decreasing productions, production ratios between products have to be maintained. No product is to be given priority over another
◉ Plant and Line capacities and their maintenance schedules
◉ Raw material availability and stock expiry dates
◉ Selecting the most appropriate BOM (from a large of number of potential "recipes") depending on raw material and fresh milk availability

Although Nestlé has implemented SAP as its ERP, the complexity of the milk production planning problem was not captured in the ERP and hence the reliance on manual planning: a process with multiple known flaws:

Sub-optimal Plans

The production planning process produced suboptimal plans. This was a result of trying to solve a complex multi-constraint optimization problem mainly relying on expert instinct and approximations and heuristics based on past experience. Sub-optimality was clearly evident in line capacity remaining idle, the use of less desirable BOMs etc.

Time Consuming and Repetitive

The end-to-end planning process, that included coming up with multiple plans to perform what-if analyses and choosing a final plan to be executed on the production floor, took a significant amount of time. Since production planning is done each month, the activity had to be repeated each month and consumed a significant portion of the month to complete.
Error Prone
Production planning for milk based products is an inherently complex problem. The production planner had to keep a large number of conditions, rules and constraints in mind while coming up with a production plan. With multiple plans being generated monthly, errors and oversights were not unexpected.

Expert Dependent
The production plan, a core artifact of Nestlé’s production planning process, is dependent on a very small number of experts, a situation that was risky and undesirable. Because the domain is complex, training new resources is difficult and time consuming.

All of these reasons resulted in Nestlé deciding to develop an automated solution that could be used to simulate multiple what-if scenarios and based on the rules and constraints, prepare a production plan that met all relevant parameters.

Implementation Methodology
Acknowledging the complexity of the project, Techlogix proposed a multi-phased approach. The first phase was part feasibility study and part high level solution design. The next phase involved detailed design, build and delivery of the solution whereas the final phase was maintenance and ongoing support.

The first, feasibility phase, worked well for both Nestlé and Techlogix as the team was able focus on understanding the domain and propose a solution without being distracted by a delivery deadline. This model also helped Nestlé gain confidence in Techlogix’s ability to correctly model a complex solution and deliver the product.

Solution Design
To automate the above mentioned process, Techlogix designed and delivered a web application built on the Microsoft .Net stack which would invoke a simulation engine as a separate OS process. Each process took in metadata as input and ran an iterative algorithm to produce a production plan along with variety of reports. The reports helped the planner visualize different aspects of the production plan.

The production planning algorithm, which is the core of the solution, has two distinct aspects: planning and scheduling. The planning aspect of the algorithm uses fresh milk quantity, raw material stock quantity, and other inputs to iteratively converge to optimal production of bulk material. This quantity is handed over to the scheduling algorithm which attempts to schedule production on plants within specified capacities. If required production capacity is not available, the planning algorithm adjusts production and attempts a reschedule. This back and forth between planning and scheduling converges to the best possible fit. The algorithm generates reports that allow a production planner to view productions in terms of bulk produced, SKUs produced, plant and line capacities used and other relevant parameters.

Testing and Validation
The key challenge for the project was to pass a very rigorous validation exercise since the ultimate goal was to manage multiple production lines based on the system output. Five months of parallel runs were conducted where the system output was compared with both the manual plan as well as checked against all constraints. Due to the complexity of the problem, initial planning runs revealed subtle complexities which had not been fully captured within the system. Eventually, with a measureable increase in plan quality over multiple months, the system was able to consistently generate plans that met all criteria and significantly improved upon the manual plan. This led to the adoption of the system for actual production planning usage in April 2013.

Results and Conclusion
The automation of the production planning process allows Nestlé to achieve in a few hours what would take days of effort resulting in a lot more maneuverability. Also, the resultant production plan is far more precise and accurate as the algorithm takes into account all factors that may impact a potential production in any way. A precise plan helps reduce costs and eliminate wastage.
About Techlogix

Techlogix is an IT Services, Consulting and Business Solutions company that helps its global clientele achieve enterprise transformation by harmonizing people, process, and technology. Techlogix builds high performance solutions using practice-specific delivery methodologies that utilize its globally distributed development teams. Our people combine the spirit of engineering excellence with a strong commitment to end-to-end customer experience. Techlogix employs approximately 300 people in 5 delivery centers worldwide.

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