

Cooperative Software Development with [TIS] – Time Intelligence Solutions

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Abstract. Analyzing historical data and forecasting future personnel demand as well as patterns of work is highly complex and situation dependant and calls for ongoing adaptation, e.g. due to changes in environment or behavior. [TIS] eases such software development by providing adaptable building blocks within a framework that deals with general software issues (data management, security, translation, ...). Furthermore it provides an infrastructure that facilitates cooperative software development as well as sharing and reuse of building blocks.

Application domain and existing technology

Service related industries like Call Centers, Retail facilities, Airports etc. only work when customer demand is met timely by staff to delivers the service. Staff planners as well as Consultants typically analyze (“mine”) large amounts of historic “time stamped” transaction data to find pattern, foresee future demand lines and to optimize staff attendance, working times and consequently service levels.

Time stamped data carries a multitude of information but also calculation problems: It comes in different structures that change over time, it is erroneous (e.g. missing data) and has to be validated and corrected and it comes in large volumes. Spreadsheets are one way to address these issues. However, there are several shortcomings e.g. handling large data volumes, dealing with time, reusability and scenario management. Database solutions lack the flexibility that is needed and Business Intelligence systems lack computational depth.

[TIS] – Time Intelligence Solutions

[TIS] was specially developed to handle issues of time stamped data. It currently provides more than 100 highly specialized calculation functions called “operations” to deal with many aspects of time related data calculations (e.g. import, summation over time, sorting or visualizations). Users control operations with parameters and Programmers can easily add operations for public or private use. Chains of operations are grouped into “data nodes”, refer to other data nodes for input and deliver result tables and visualizations for output. An example data node to analyze Blood Pressure data is shown in Figure 1.

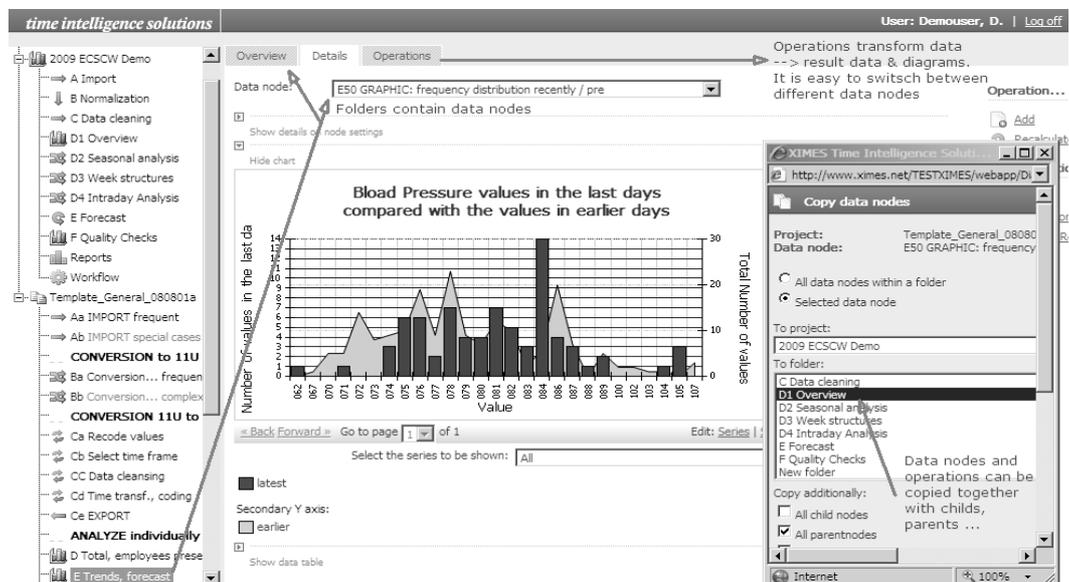


Figure 1. Screenshot of [TIS]. A template data node that compares and visualizes blood pressure time series is copied into a new solution.

A set of data nodes typically forms a “solution”, a sometimes complex network of data nodes, which addresses a particular problem field. Data nodes as well as solutions can be transformed into “Templates” to be easily copied, combined and reused. A wiki based knowledge base classifies typical problems of time based calculations and helps to select operations and templates to solve problems.

The [TIS] framework provides storage, import export of whole solutions, security, support for translation, etc. Debugging is supported strongly. [TIS] facilitates joint development and sharing of templates as well as the underlying knowledge.

Critical research questions are: How to organize and support users in finding existing know-how stored in templates? What are – ideally automatic – ways of describing and organizing collections of templates? How to support revisions of solutions developed by end users that are used by others? What are options for organizing support structures?

References

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