

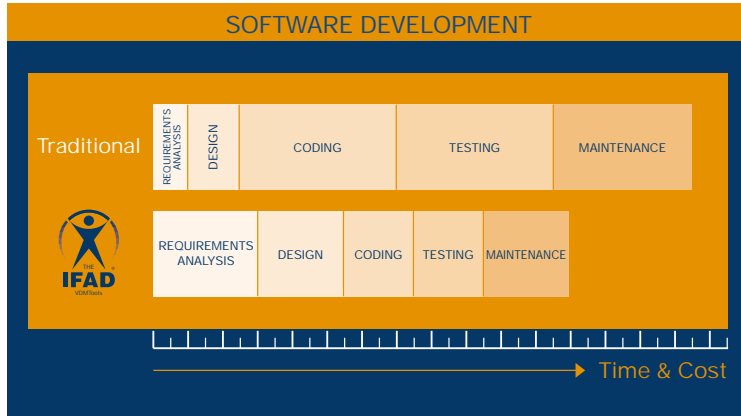
IFAD

VDMTools<sup>®</sup>  
-for Quality Software  
on Schedule

IFAD

# Quality Software within Budget

BUSINESS



VDMTools® provides a low-cost add-on solution that yields a great technology improvement for any development team.

## Reducing Risk

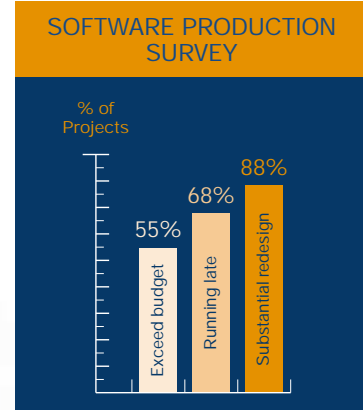
Software development is a challenging and risky business because software is notoriously prone to errors. An IBM survey of 24 leading US companies in software production showed that 55% of projects exceeded budget, and 68% of projects were running late. The survey hinted at the source of the problem: it found that 88% of solutions had to undergo late and substantial redesign.

## An Easy-to-use Environment

VDMTools® is an easy-to-use, powerful software development environment that integrates a collection of sophisticated tools and features to achieve the

highest quality and productivity in software development. VDMTools® supports all stages of the software life cycle, from early requirements analysis, via design, implementation and testing, to life-long maintenance of the delivered product.

Through its gradual introduction into existing work practices,



Requirements analysis and design errors are up to 100 times more expensive to correct in the testing phase of a project than if they are detected closer to the point where they are introduced.

VDMTools® aims to eliminate this late and expensive error correction by providing state-of-the-art technology for managing complexity in requirements analysis and design. VDMTools® greatly reduces the incidence and severity of late rework so that products can be delivered on schedule and within budget.

## Increasing Productivity

VDMTools® provides a structured way of expressing system models used in requirements analysis and

# Easier Development of Better Software

TECHNOLOGY

## Flexible Integration

VDMTools® offers a wide collection of advanced analysis and debugging tools to aid in software development. The central idea is to automate as much as possible of the usually manual checking of design documents in order to avoid the common problems of substantial redesign at a late stage. VDMTools® allows flexible integration with almost any development environment and provides specific support for visual modeling through round trip engineering with market leading UML tools, including Rational Rose.

## Precise Modeling

Most of the quality problems in software development arise due to the use of ad hoc methods in the early stages. Usually these are based on notations such as natural language and diagrams, which support only manual inspections. Therefore these methods are expensive to use and less effective in locating errors.

VDMTools® supports precise modeling in structured and well-defined notations: the ISO Standard specification language VDM-SL and its object-oriented extension VDM++. These enable automatic analysis to ensure that models are consistent and complete. Moreover, the VDM notations support developers in focusing on high-level conceptual questions concerning data and behavioral aspects of the system rather than

low-level implementation details. Software development becomes productive and intriguing!

## Automatic Checking

VDMTools® provides powerful and easy-to-use facilities for systematic analysis based on standard software engineering practice such as testing. The core technology is an advanced interpreter that performs automatic consistency checking during execution of a model. Testing can be conducted both in

Through its unique support for automatic checking, VDMTools® goes way beyond traditional methods in allowing developers to get direct feedback on their understanding of a system. VDMTools® acknowledges the importance of not only being able to describe one's understanding in a model, but also being able to demonstrate this understanding, even in front of a client who has no prior experience with VDMTools®.

Additional features are available to support such "rapid prototyping". These include a dynamic link facility and a Corba compliant API facility, which allow any piece of code such as a graphical front-end or existing legacy code to be executed together with a VDM model. Through these facilities, VDMTools® enables invaluable feedback to be obtained from a client early in the development, before expensive commitment is made to an implementation.

## Code Generation

VDMTools® supports automatic code generation from design models to implementation languages, including C++. This eliminates the tedious coding work in software development and makes it easy to keep documentation and code in conformance with each other. The tools generate fully executable code, so most models can be translated without human intervention if desired. The tools provide facilities for including user-defined code for non-executable parts of a model.



an interactive fashion and by running a test environment. VDMTools® also provides a powerful interactive debugger that offers the usual functionality at the model level such as breakpoints and stepping.

## Technical Information

VDMTools® includes the following products: The IFAD VDM-SL Toolbox, The IFAD VDM++ Toolbox, The Rose-VDM++ Link (for Rational Rose), Dynamic Link Facility, Corba Compliant API, Code Generators, and Document Generators (Microsoft Word). VDMTools® runs on Windows and a number of Unix platforms.

design. This allows engineers to shift the focus of development from low-level implementation details to conceptual questions at higher levels of abstraction, concentrating on "what" instead of "how". As a consequence the development team becomes more productive.

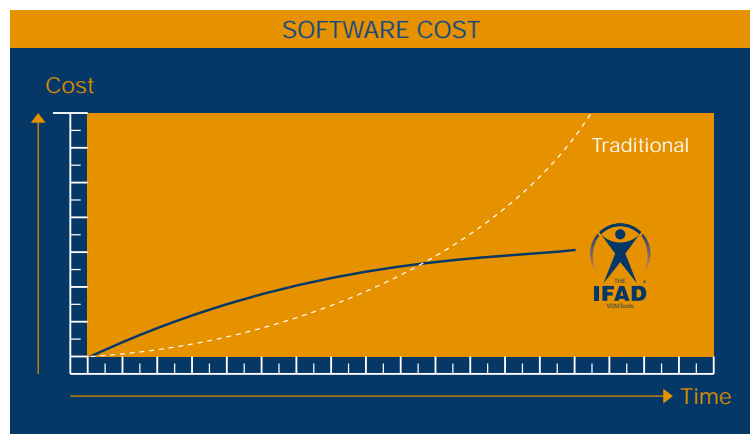
The structured approach also makes inspections of analysis and design documentation more effective and reliable. Sophisticated tools support such inspections and allow automatic checks to be performed on

models in order to validate a designer's understanding of the requirements. Moreover, distinguished support for visualizing and testing models enables early feedback from a client. In this way, errors are discovered when cheap to correct, and they are not carried through to the time-consuming and costly error correction in the testing phase. With VDMTools® the development team achieves the best conditions for delivering quality software on time and at a low cost.

For further reduction of development costs and time-to-market, VDMTools® provides automatic code generation to implementation languages directly from design models. This saves expensive human resources and eliminates the potential introduction of errors during implementation.

**Quick Return of Investment**

With VDMTools® it takes only a few weeks to substantially improve the existing development practices in an organization. The user-friendly technology allows flexible integration in any business environment. VDMTools® builds on more than ten years of research and development and more than five years of professional experience at industrial sites world-wide. With a one-week training course in VDMTools®, your development team takes a jump into the next millennium of software development.



# User Experience

"VDMTools® supports the production of high-quality software, reduction of development costs and shortening of time-to-market."

DASSAULT  
ELECTRONIQUE,  
FRANCE

"VDMTools® has been used in order to increase quality and reduce development risks on high complexity products."

BAAN FRONT OFFICE  
SYSTEMS,  
DENMARK

"VDMTools® provides unparalleled support for design abstraction ensuring quality and control throughout the development life cycle."

GAO,  
GERMANY

"Engineers can learn the technique in one week."

"The VDM technology can be integrated gradually into a traditional, existing development process."

BRITISH AEROSPACE  
SYSTEMS & EQUIPMENT,  
UK

"Using VDM-Tools® we have achieved a productivity and fault density far better than industry norms for safety related systems."

ADELARD,  
UK

Selected references world-wide

- France · Aerospatiale Espace et Defense · Dassault Aviation · CISI CEA et Defense · CEA Leti et Defense · Matra BAe Dynamics · UK · British Aerospace Systems & Equipment · ICL Enterprise Engineering · Adelard
- Italy · ENEA · Ansaldo · The Netherlands · Dutch Dept. of Defense · Origin
- Denmark · Baan Front Office Systems · Odense Steel Shipyard · DDC-I · Canada · Formal Systems Inc.
- Japan · RTRI (Japan Railways) · Germany · GAO



IFAD is a private company established in 1986. Our main business is a collection of unique software development tools that aims to improve quality and reliability in software solutions, while reducing cost of development. We have been particularly careful in designing a suite of tools that is easy to use and allows a gradual introduction into existing development processes. Today our state-of-the-art products and services are chosen by leading companies world-wide. IFAD is the world-leading VDM technology provider.

IFAD supports all aspects of introducing a new technology into an organization:

- The software development environment VDMTools® (sales and support).
- Introductory courses in VDMTools®.
- Consultancy (first project and technology introduction assistance).
- Subcontracted development.

New clients choosing VDMTools® and our services give us a continuing measure of our success. Additional proof was given when we were elected "Company of the Year" in 1997. Among other things, the motivation for this price was IFAD's ability to convert science to practical usage.

*Rational Link Partner*



*Company of the Year '97*



Agent: