TEX*connect*:

An Open Communication & Information Infrastructure

for the Textile Supply Chain

P. Baumann, M. Blaschka, G. Höfling

FORWISS
(Bavarian Research Centre for Knowledge-Based Systems)
Munich, Germany
Dial-up: voice +49-89-48095-200, fax –203
Email:
{baumann,blaschka,hoefling}@forwiss.tu-muenchen.de

G. Kartsounis

ATC
(Athens Technology Centre)
Athens, Greece
Dial-up: voice +30-1-68 55-560
fax +30-1-68 55-564
Email: gkart@atc.gr

Abstract

TEX*connect* addresses one of the main obstacles towards fully electronic commerce: the lack of interoperability and integration of applications. The project will improve electronic business-to-business commerce along the textile supply chain by providing an open information and communication infrastructure. With repository-based data access and Web/EDI-based communication as integration platform, logistics and manufacturing tools provided by IT vendors in the consortium will be integrated. An adapted decision support tool will demonstrate the integration capabilities. Multimedia teachware will ensure on-site textile staff training.

The outcome will be a complete business solution concisely focused on the textile and garment sector, consisting of a demonstrator of the complete workbench which will be marketed by the IT vendors together with well documented best-practice knowledge. End-user evaluation through a large garment producer and several textile SMEs will ensure scalability. Participation of national European textile organisations (like EURATEX and EDITEX Europe) will guarantee effective communication and dissemination.

TEX*connect* is sponsored by the European Commission in the ESPRIT IV Programme, area Electronic Commerce, under Project Number 27083. Project start will be March 1, 1998.

The electronic version of this paper is available at the URL:
http://www.forwiss.tu-muenchen.de/~blaschka/public/publications.html

1 Introduction

Managing information and communication is becoming a task of vital importance in particular for the fashion industry with its fast-moving market, the high quality requirements on production and service, pressing schedules due to fair-oriented ordering business, and the tight competition with low-cost economies. On the other hand one of the main obstacles towards fully electronic commerce is the lack of interoperability and integration of applications. In order to bridge the gap between the present business reality and the upcoming business needs, there is an urgent need for an optimal exploitation of the existing information asset within textile enterprises and improvement of the information flow between the different applications as well as among trade partners. If up-to-date, complete, and correct information is available, this enables textile organisations

- to integrate production and business processes;
- to improve control over schedules and production quality (wrt. Quantity, models, sizes, colours, etc., but also wrt. Personnel and machine scheduling);
- to achieve availability of production/distribution resources (e.g. by accurate personnel and machine scheduling) for quick and flexible response manufacturing;
- to minimise stock costs through exact disposition and trace of goods;
- to decrease dependency on particular suppliers (as frequently production know how associated with staff at particular supplier);
- to make business processes comprehensible which traditionally lack written documentation due to tight schedules;
- to reduce the cost of communication by reducing travels necessary to exercise control and overcome language barriers.

Notably, this problem addresses an important part of the European economy. In Europe, there are about 600 small fashion companies with less than 20 employees in the small enterprise segment, about 5,000 medium enterprises with more than 20 and less than 200 employees in the medium enterprise segment and about 1,000 large enterprises with more than 200 employees in the large enterprise segment. (Source: ITEX)

Therefore, the TEXconnect project has been granted by the European Commission to address one of the main obstacles towards fully electronic commerce: the lack of interoperability and integration of applications. It will improve electronic business-to-business commerce along the textile supply chain by providing an open information and communication infrastructure. Specifically, a garment CAD/CAM system (Investronica s.a. (E)), and a textile/ garment logistics system (Fashion Software GmbH (DE)) will be integrated through the TEX*connect* framework (see Figure 1). Core of the TEX*connect* integration platform will be a repository (to be developed by FORWISS (DE)) enabling uniform cross-tool/cross-vendor (off- and online) data access whereas an EDI / WebEDI interface will allow smooth intra- and inter-company communication. Due to its integration capabilities the TEXconnect repository forms the ideal data source for an EC database containing the data visible, shared & communicated through EDI. A business data analysis tool (UCL (UK)) on top of the repository will demonstrate the integration capabilities by combining and consolidating both CAD and logistics data into concise, up-to date management information e.g. used for enterprise resource planning. Multimedia teachware (to be provided by ATC s.a. (GR)) will ensure appropriate on-site textile staff training. Particular emphasis will be put on the scaleability of the TEX*connect* solution for both

SMEs and larger companies and their changing information needs as well as the openness for further data sources and upcoming standards.
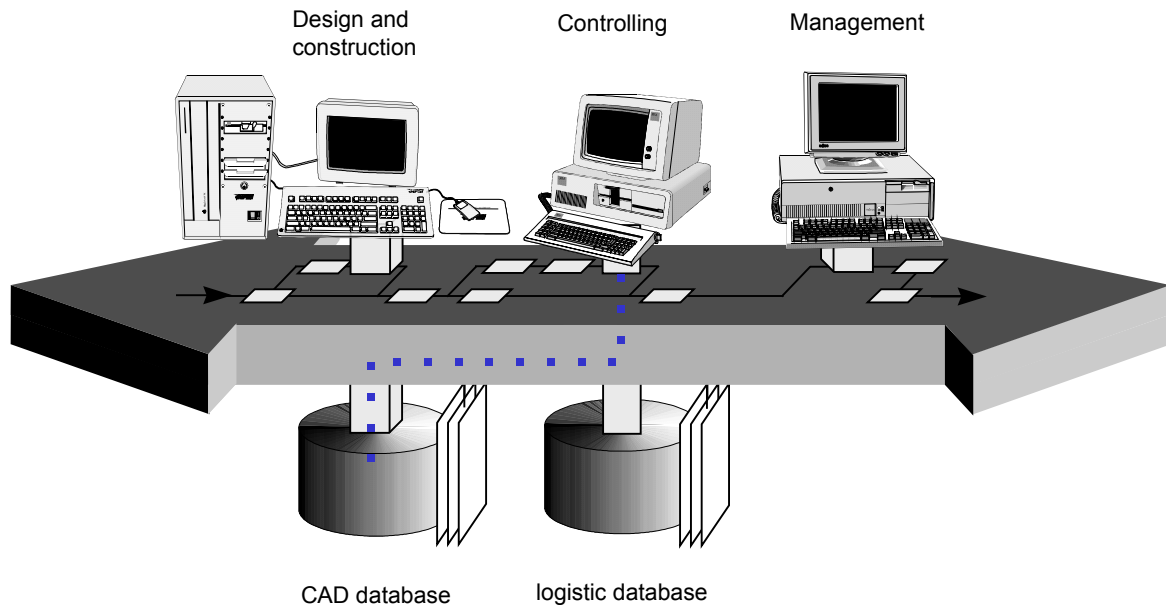

Figure 1: TEX*connect* open framework for smooth intra- and inter-company information flow

TEX*connect* will achieve these objectives by co-ordinating, extending and focusing IT products through innovative technology like a common fashion repository and standards becoming established like EDI following its specific objectives:

- to enable the participating textile IT suppliers to enforce their market position in electronic commerce products based on WWW, EDI and advanced database technology;
- to increase the selected end users' competitiveness through adding Web/EDI-based electronic commerce facilities to their existing IT infrastructure;
- to demonstrate that repository/middleware technology is scaleable to be useful not only for large companies, but also for SMEs;
- to demonstrate the integrative capabilities of this technology through a tool which processes information generated by different products;
- to raise awareness among textile industry of the benefits that can be gained through uptake of IT technology;
- to acquire and disseminate best practice knowledge on the introduction of integration frameworks in the textile sector, similar to the introduction of such technology in automotive/engineering industry two decades ago.

The remainder of this paper is structured as follows. In the next Section, the project results are described. An overview on the consortium structure is given in Section 3, followed by the workplan layout in Section 4. Section 5 concludes the plot.

2 Project Outcome

TEX*connect* will implement a seamless information flow between all instances of a textile/garment company as well as along the textile supply chain based on the socalled *Common Fashion Repository* (CFR) as integration platform. This will be demonstrated by

- the information exchange between a CAD/CAM system and logistics software (as CAD/CAM systems often lack logistics functionality),
- an Internet/EDI-based data communication facility, and
- a further tool for data analysis making the cross-tool consolidated information available for the management.

As both chosen products – the CAD/CAM system of Investronica s.a. and the easy-to-handle textile logistics software of Fashion Software GmbH – already make use of relational database technology, a sound basis is given for an information-driven integration. The central activity of TEXconnect will be the development of a demonstrator following the architecture shown in Figure 2 below.
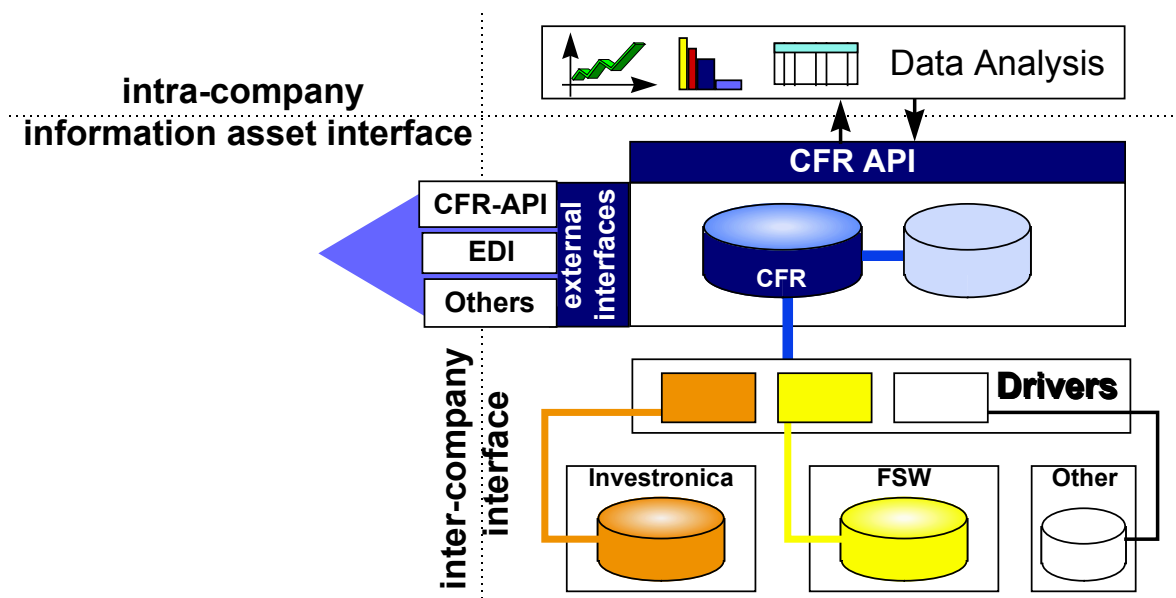

Figure 2: TEX*connect* pilot workbench architecture

At the core of the TEX*connect* framework is the Common Fashion Repository (CFR) which integrates all available information maintained by the various tools used along the textile supply chain. CFR will enable for a uniform, application-independent access to all business data without compromising existing applications. CFR relies on a global, platform-independent database schema covering the whole information spectrum of these applications. Additionally, CFR contains an index indicating where which information can be found; transformation and access methods to obtain the canonical CFR representation from the proprietary structures; a list of all authorised users' access rights and priviledges.

On top of the CFR, both intra-company and inter-company flow of information will be accomplished. Intra-company exchange between the integrated tools is done via CFR, thereby allowing to couple further tools – such as business data analysis and workflow control – spanning several data sources. Inter-company exchange is achieved through a WebEDI-based interface to CFR which covers all structures the EDIFACT standard can

describe; further interfaces (e.g., a STEP processor for product data like garment pattern designs and cloth textures) and upcoming standards can easily be added. Consequently, CFR acts as a multiplexer between applications – all tools attached via CFR automatically have all interfaces offered by CFR.

A business data analysis tool combines and consolidates CAD and logistics data into concise, up-to-date management information for informed decision making. The tool set will include facilities to discover relationships in data, to detect market trends, to spot patterns indicating potential problems in production, for business forecasts, and to provide useful insights for future product development. Moreover, the data analysis tool fulfils a central task in that it demonstrates access to different data sources through the unifying CFR API, thereby proving the approach.

In summary the implementation result of TEX*connect* will be an integrated pilot textile workbench consisting of
- the scaleable TEX*connect* CFR:
    - the CFR schema, mapped to a suitable commercial DBMS platform (to be developed);
    - the CFR API providing integrated, uniform data access (to be developed);
- drivers to couple proprietary information sources to CFR (to be developed);
- the enhanced and adapted Investronica garment CAD tool palette (existing product);
- the enhanced and adapted Fashion Software PPS/logistics package (existing product);
- EDI-based exchange facilities operating on the CFR (WebEDI / EDI product to be adapted);
- a business data analysis tool for management decision support (to be developed);
- multimedia teachware for textile staff training, both on-site (CD-ROM) and Internet-based (to be developed).

A major technical achievement will be the integrated coexistence of hitherto completely independent products under the unifying TEX*connect* framework.

Besides the technical solution of TEXconnect, by the end of the project, well-documented in-depth experience will be available about steps and effort for textile tool integration, both technically and organizationally; in detail:
- which information is relevant and must go into the common schema?
- what kind of organizational obstacles must be overcome to obtain access to relevant operational data?
- who needs what particular information when in the business process?
- what kind of momentarily unavailable information should be merged to support business?
- How can the knowledge gained through advanced data analysis tools be exploited to improve management decisions?

Furthermore, textile enterprises will be able to quantify improvement gained through a seamless information flow – inhouse wrt. timeliness, quality, effectivity & efficiency, flexibility, forecasting quality; external wrt. correctness of information, timeliness. By demonstrating a solution integrating standard-based EDI data exchange, standards awareness will be increased among both textile end users and IT vendors, thereby encouraging take-up of the standard. An important feedback for the IT suppliers is given by the textile end user acceptance of the integrated workbench and the data analysis tool.

Likewise, field test of the multimedia teachware in different industrial environments will result in best-practice knowledge about its usefulness and applicability in this „eye-oriented„ industry, in particular on the following questions:

- how can multimedia teachware and manuals contribute to increasing acceptance of new technology among textile end users?
- to what degree is it possible to substitute external staff training by on-site training using multimedia teachware?

Finally, recommendations will be possible concerning improvements in the existing IT infrastructure and business processes. The best-practice report will point out necessary adaptations of the organisational structure in order to fully exploit the optimisation potential.

3   The Partners at a Glance

Investronica s.a. (E), a major European garment CAD vendor with experience in electronic commerce solutions, integrates its CAD/CAM system into the TEX*connect* framework; its customer **Ittierre** (I) evaluates it. **Fashion Software GmbH** (DE) integrates its textile/garment logistics system. **ATC s.a.** (GR) develops multimedia teachware for textile staff training. **FORWISS** (DE) contributes online-database and repository know-how to accomplish the integration platform. **UCL** (UK) adapts its business data analysis tool. **CFI** (E), an association for companies in Catalunya and Southwest France, leads the User Interest Group and, together with EURA (DK), selects the SME end user sites for beta evaluation.

The User Interest Group (UIG) will be set up as a contact forum for presenting technical results, discussing them with end users and obtaining feedback from them. Led by the Spanish/French textile association CFI, the User Group will have pan-European members. Together with the textile companies of the TEX*connect* consortium they form the „senior members„[1]. Further candidate members are the IT vendors' customers and the ITEX user group. Membership will be open and free of cost (during the initial EC funded period) for European enterprises and institutions. In the last stage of the project, the UIG will be made permanent.
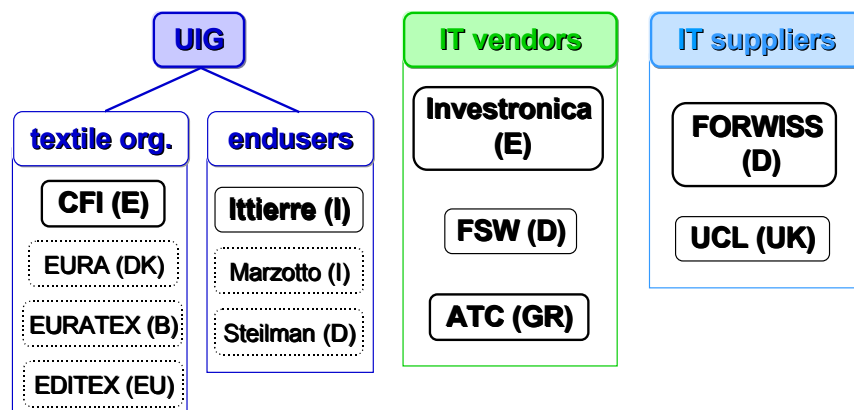

Figure 3: TEX*connect* consortium

---

[1] At the time of this writing, several Hungarian companies have applied for membership and are now members of the UIG.

4 Planned Work

4.1 Work Phases

To obtain an integrated, exploitable textile workbench with interoperable tools based on a common information and EDI-based communication middleware, technical work is structured into three phases:

- **Analysis and specification phase**.
- · After inspecting the end user sites and collecting their requirements, a specification of the CFR interface will be set up. This will serve as the common technical basis for subsequent development work, guaranteeing that the tools adapted in Phase 2 will be coherent with the integration platform implemented in Phase 2. The analysis and specification also serves to coagulate the consortium by assuring mutual understanding – all partners will be involved in this WP – as well as a uniform technical communication infrastructure.
- **Tool adaptation and implementation of the integration platform**.
- · FSW's PPS system and Investronica's CAD/CAM system will be adapted to the CFR interface specified, as well as UCL's data analysis tool. In parallel, the CFR will evolve, using standard database products and libraries, and the multimedia teachware for on-site workbench training.
- **Pilot evaluation and enhancement**.
  - · The resulting demonstrator will undergo alpha tests and evaluation at Investronica's customer Ittierre and, at a later stage in the project, beta tests at four end user sites. Two Catalan beta tester SMEs will be selected by CFI and two Danish beta tester SMEs by EURA; CFI and EURA will assist the SMEs in their resp. region. The workbench multimedia training system will be evaluated to check its effectivity in on-site textile staff support. The feedback and experience previously gained will be cast into enhancements and a generalised solution.

These three phases incrementally will lead to the full, evaluated demonstrator. The IT supplier companies in the consortium will incorporate the outcome into their resp. product palette, thereby strengthening their market position through leading-edge innovation.

4.2 Dissemination Activities

Focused workshops held by and with the TEX*connect* User Group will serve to directly address the targeted audience. EURATEX, EURA, and EDITEX will disseminate TEX*connect* results to their members. Active contributions are planned at suitable exhibitions, with particular emphasis on events under the patronage of Esprit. To name a few, exhibitions at IT fairs (such as *EITC'98*, *Hannover Trade Fair* and *Systems*) and textile fairs (such as *World Conference of the Textile Institute*) will make the TEX*connect* approach known to the target group. Congress lectures will support this.

Online information will be provided through an own web presence closely linked with the ITEX online information system *TEX-Line*.

5 Summary

Making decisions using incomplete, inconsistent, or invalid data puts a business at a disadvantage versus the competition; similarly, insufficient communication with customers and suppliers easily can push out a company from the market. Managing information and communication is becoming a task of vital importance in particular for the fashion industry with its fast-moving market, the high quality requirements on production and service, pressing schedules due to fair-oriented ordering business, and the tight competition with low-cost economies. Advanced IT support for electronic commerce as an interorganisational information system enabled by EDI, the Internet, and other communication technologies forms a central prerequisite for sustained industrial performance.

The TEX*connect* project addresses one of the main obstacles towards fully electronic commerce: the lack of interoperability and integration of applications. It will improve electronic business-to-business commerce along the textile supply chain by providing an open information and communication infrastructure. Specifically, a garment CAD/CAM system (Investronica s.a. (E)), and a textile/ garment logistics system (Fashion Software GmbH (DE)) will be integrated through the TEX*connect* framework. Core of the TEX*connect* integration platform will be a repository (to be developed by FORWISS (DE)) enabling uniform cross-tool/cross-vendor (off- and online) data access whereas an EDI / WebEDI interface will allow smooth intra- and inter-company communication. Due to its integration capabilities the TEXconnect repository forms the ideal data source for an EC database containing the data visible, shared & communicated through EDI. A business data analysis tool (UCL (UK)) on top of the repository will demonstrate the integration capabilities by combining and consolidating both CAD and logistics data into concise, up-to date management information e.g. used for enterprise resource planning. Multimedia teachware (to be provided by ATC s.a. (GR)) will ensure appropriate on-site textile staff training. Particular emphasis will be put on the scaleability of the TEX*connect* solution for both SMEs and larger companies and their changing information needs as well as the openness for further data sources and upcoming standards.

A TEX*connect* User Interest Group will be set up as an evaluation body ensuring an innovative, adequate solution as well as an active communication and dissemination forum between IT suppliers and textile end users. Key members are EDITEX Europe / COMTEX, European and national textile organisations like CFI (E/F), EURA (DK) and EURATEX, and textile endusers e.g., Ittierre (I), Steilmann (DE), Marzotto (I). As a consequence for the textile IT sector in general, this will raise standards awareness and encourage uptake of these advanced IT concepts leading to more flexible reaction to customers' needs, and higher competitiveness.

Further Reading

- Aldrich, A.: *CAD in Clothing and Textiles*, Blackwell Science Ltd, 1994
- Berkstresser III, G.A., Bachman, D.R., Grady, P.L., *Automation in the Textile Industry*, Textile Institute, 1995
- Stephen Gray: *The Benefits of Computer-Aided Design and Manufacture*, The Design Council, 1992
- George Kartsounis, Markus Blaschka: *The ITEX IT Infrastructure*. Proc. of the 78th World Conference of the Textile Institue, Thessaloniki, Greece, 1997
- Leslie Riley: *Link Up or Loose Out: Can a Company Survive without EDI in the 21st Century?* Proc. of the 78th World Conference of the Textile Institue, Thessaloniki, Greece, 1997
- Padmini Srinivasan, Sam Winchester: *Electronic Commerce Database Design*. Proc. of the 78th World Conference of the Textile Institue, Thessaloniki, Greece, 1997
- S.C. Winchester: *Total Quality Management in Textiles*, Journal of the Textile Institute, Vol 85, No 4, 1994
- *The Textile Institute*, URL: http://www.texi.org
- *TEX-Line: An Online Information System for the Textile Industry*, URL: http://www.texline.forwiss.tu-muenchen.de