Appendix A: An Overview of Early Product Data-Exchange Standards

1. **IGES - Initial Graphics Exchange Specification**: IGES is the most widely used format for CAx data exchange and was developed by the IGES organization, which consisted of representatives of the CAD vendor and user communities. The development of IGES can be traced back to 1979, and several versions have been published since publication of the first draft in 1980. Most major CAD/CAM systems support IGES, and IGES has been accepted in many major companies and projects. However, over the years the shortcoming of IGES have emerged, and include issues such as large file sizes and processing times, and the lack of a rigorous technical architecture. Nonetheless, IGES provided a practical first solution for CAD data exchange. (Zhang and Warren 2003; Kemmerer 1999)

2. **SET - Standard d'Echange et de Transfert**: The French Standard d’Echange et de Transfert (SET) was a French effort to create a standard to exchange CAD data. The project was started at Aerospatiale in 1983, and initially they did a formal test of IGES. From this test, Aerospatiale concluded that it was the IGES specification that did not work. The result was a French effort to write a specification, standardize it, implement it, test it, and support its use in production. These efforts were driven by French industry, most notably the automotive and aerospace industries. SET, like IGES in the U.S. A., became a French national standard, and Association GOSET is an organization established by industry and government in France to support continued development, maintenance, and implementation testing of SET. GOSET representatives are also active
contributors to developing STEP and testing services to conformance test ISO 10303. (Zhang and Warren 2003; Kemmerer 1999)

3. **VDA-FS - Flachenschnittstelle des Verbandes der deutschen Automobilindustrie**: The Germans standardized Flachenschnittstelle des Verbandes der deutschen Automobilindustrie (VDA-FS) in response to the data-exchange requirements of their automobile industry in the 1980’s. VDA-FS was based on IGES but offered a competing exchange file format to that of IGES. VDA is the German automotive industry trade association, and was the principle developer of the VDA-FS standard. The VDA was created in 1982 to increase the efficiency of the design process and usefulness of CAD/CAM systems. The Germans brought VDA-FS to the international table to contribute toward the international product model data standardization effort, and the Germans are now also directing their data exchange standards development efforts to STEP. (Zhang and Warren 2003; Kemmerer 1999)

4. **CAD*I - CAD Interfaces**: CAD*I standard emerged as a result of a European Commission funded ESPRIT project called CAD Interfaces (CAD*I), with twelve participating organizations from six European countries. The project began in 1984, and worked mainly in product model data exchange and on data exchange for finite element analysis. Kemmerer (1999) explains that as in STEP, the transfer of data was based on the use of schemas defined formally using a data modeling language. In 1987, the project achieved the first ever transfer of boundary-representation solid models between different CAD systems. CAD*I participants were involved in the development of STEP from the beginning of the work of ISO TC184/SC4, and much of the shape modeling capability of STEP is based on CAD*I work and the project also had a significant influence on STEP developments in the finite element area (Kemmerer 1999).

**REFERENCES**
