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ARPA

Appendices

Reference ARPA Contract #MDA972-92-C-0022

HARRIS

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Austin, TX 78759

MCC

Appendix

A. DICE Concurrent Engineering Environment Overhead Presentation

B. STEP Tools, Inc. Presentation Materials

B1. The Standard Data Access Interface

B2. Implementing AP Inter-operability using STEP-VIEWS

B3. STEP Software for World-wide Manufacturing

C. Detailed Description of CFI DR 1.0

D. DIE Information Exchange (DIE) Format Reference Manual (Chapter 1)

E. ASEM CAx Interface Specification Alliance Program Plan and Roadmap

F. Market Study Telemarketing Survey

F1. EDA DICE Market Study Telemarketing Program

F2. Marketing Survey List

F3. Basic Statistics

G. EDA Commercial Vendor List

A. DICE Concurrent Engineering Environment Overhead Presentation

DICE CONCURRENT ENGINEERING ENVIRONMENT

- An environment for concurrent engineering
- Supports multiple applications
- A single, hierarchical database
- Limitations caused by applications functionality

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OBJECTIVES

- **Demonstrate current implementation**
- **Stimulate comments and recommendation**
- **Ideas for further development**

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SOFTWARE APPLICATIONS

■ FINESSE MCM	MCM Design
■ OPUS	IC Layout
■ ALLEGRO	MCM Layout
■ AUTOCAD	Mechanical Design

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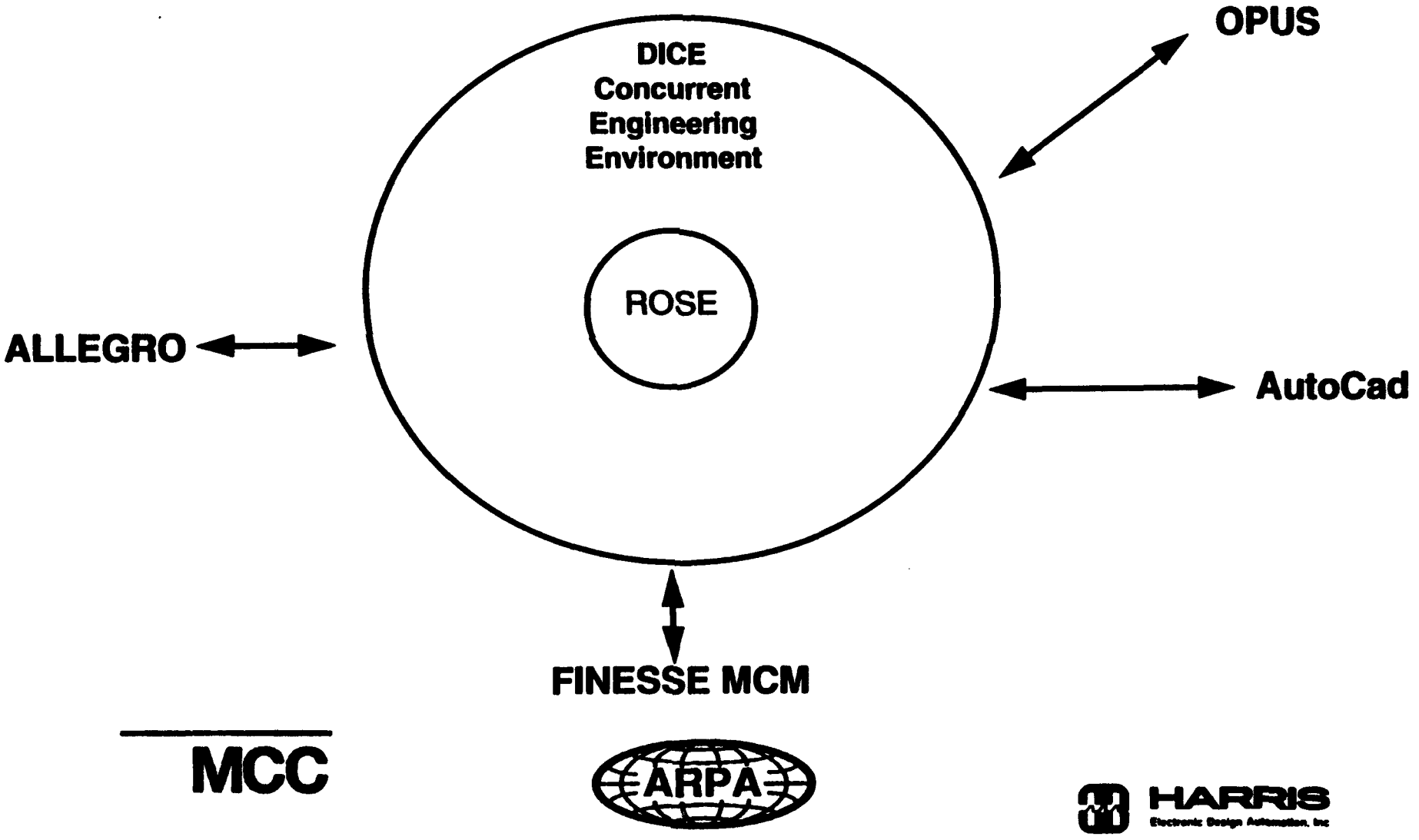
DEMONSTRATION



IMPLEMENTATION

- **Use available interface methods**
- **FINESSE MCM command stream ASCII format**
- **OPUS SKILL**
- **Allegro IGES 3.0 with extension**
- **AutoCAD C++ Program**

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B. STEP Tools, Inc. Presentation Materials

B1. The Standard Data Access Interface

Raytheon
LAMS
RPI
STEP Tools

The Standard Data Access Interface (SDAI)

Presentation by Martin Hardwick of work performed by WG7 of ISO/STEP

Contributions by

Jim Fowler, NIST
Jan Van Mannen, Rutherford
Werner De Bruijn, TNO
Dave Price, IBM
Martin Hardwick, RPI/STEP Tools
Chia-Hui Shih, SDRC
Ernst Schlectendahl, RPK
Dave Nixon, DEC
Randy Watler, Auto-trol

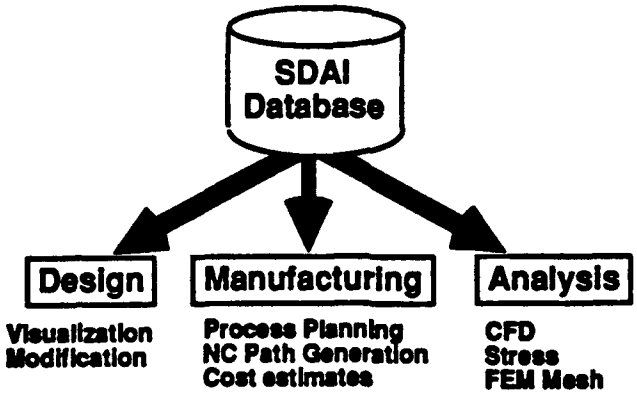
Roger Burkhart, Deere
Frank Demasek, EDS
David Briggs, Boeing
Steve Clark, NIST
John Halbert, PAFEC
Rob Howard, British Aerospace

others

The SDAI

Raytheon
LAMS
RPI
STEP Tools

- An <u>OPEN, STANDARD</u> database for product data



Requirements

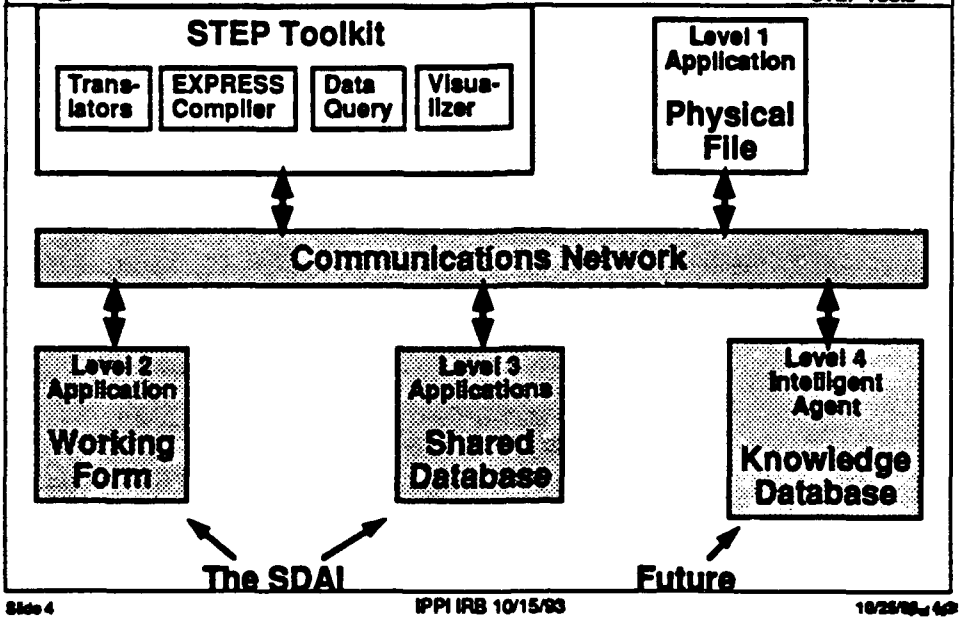
Raytheon
IAMS
RPI
STEP Tools

- Let applications access databases of STEP data.
  - CAD style concurrency.
  - EXPRESS driven (applies to all STEP models)
  - Early and late binding
  - Database = (data dictionary + data instances)
  - Define path to STEP data that works for any database

    relational, file, OO and CAD system specific

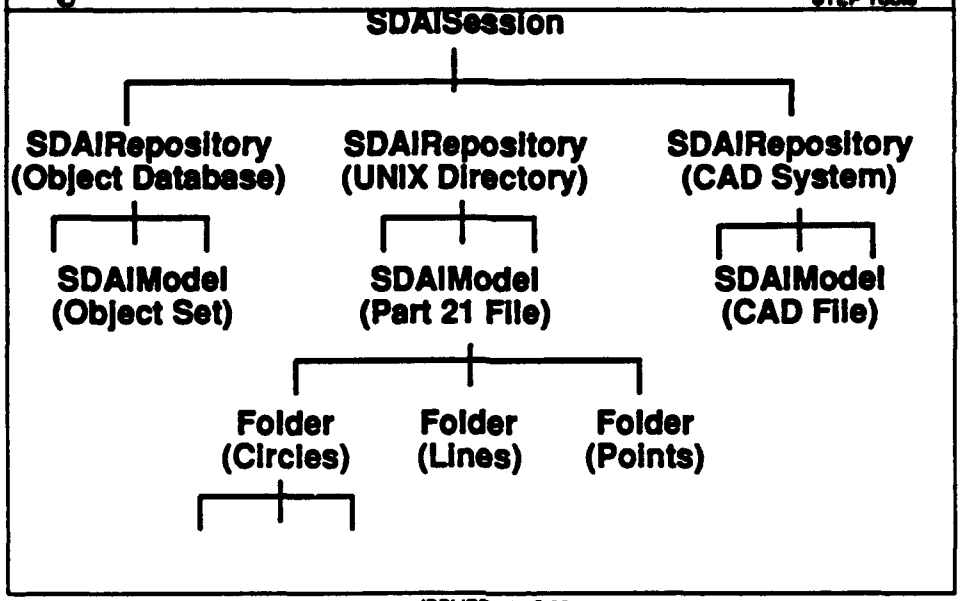
Role in STEP

Raytheon
IAMS
RPI
STEP Tools



Concepts

Raytheon
LANS
RPI
STEP Tools



Concluding Remarks

Raytheon
LANS
RPI
STEP Tools

- The SDAI is an API for EXPRESS.
- The SDAI lets applications execute against multiple CAD databases.
- The Commitee Draft ballot version of the SDAI was delivered to ISO STEP in September 1993.

Using PDES/STEP to Implement CONCURRENT ENGINEERING

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Matt Dinmore
Jochen Fritz
Tom Liberty

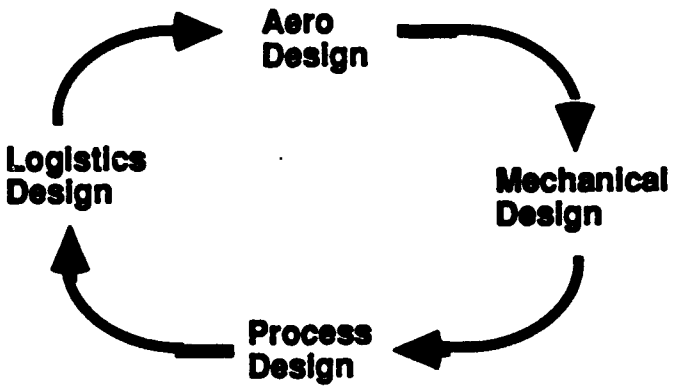
Partially funded by the DARPA Initiative in Concurrent Engineering (DICE)

Overview

- Using STEP to implement concurrent engineering
- Extensions to the standard

Concurrent Engineering

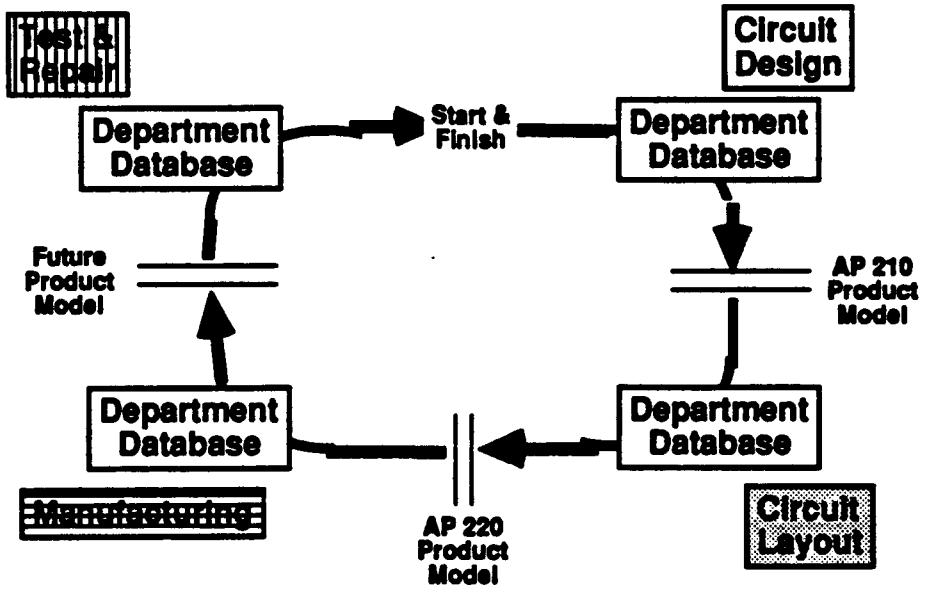
RPI & STEP Tools, Inc.

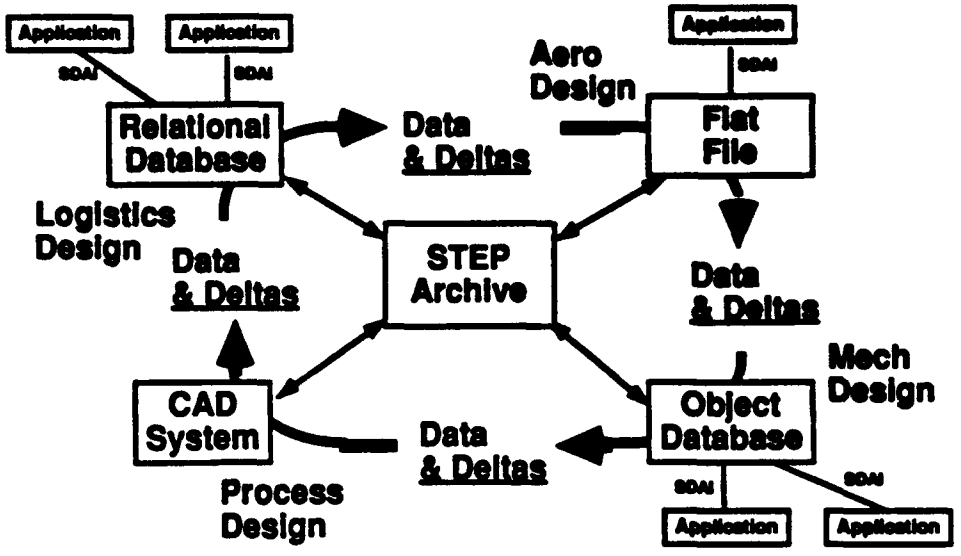


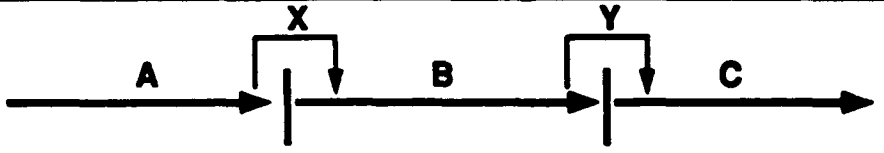
"Reduce design time by improving communication"	
Computer Tools	Management
• Shared Database • Designer's note book • C3I Tools	• Reward structure • Organization • Meetings

Concurrent Engineering 1

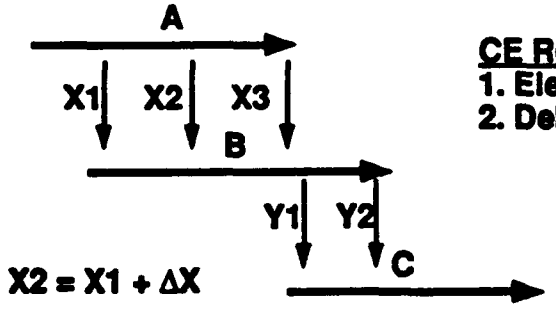
RPI & STEP Tools, Inc.







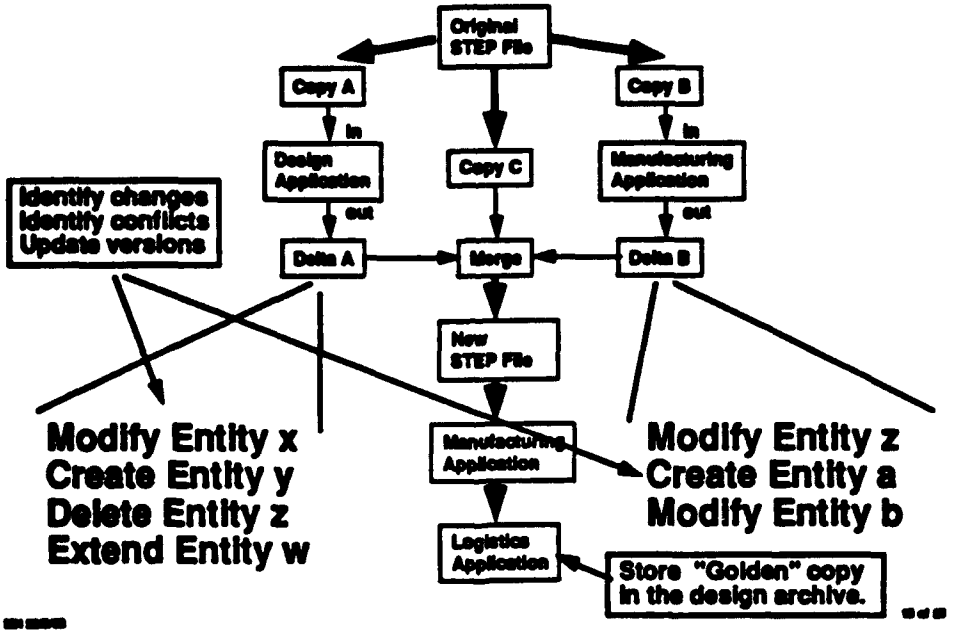
Serial Engineering



CE Requirements
1. Electronic Commerce
2. Delta files

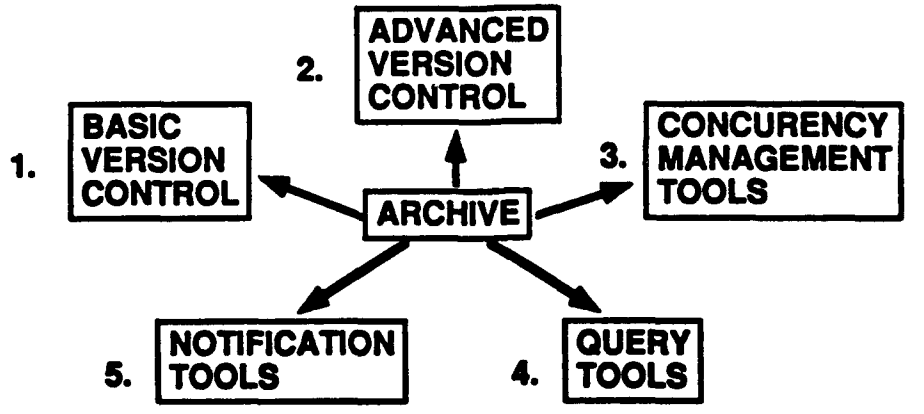
Concurrent Engineering

Concurrency Using Delta Files — RPI & STEP Tools, Inc.



SECS/CE — RPI & STEP Tools, Inc.

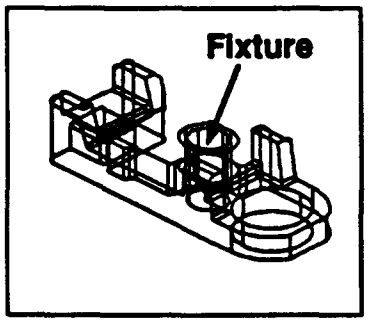
"STEP Entity Control System for Concurrent Engineering"



Funded by the DARPA Initiative in Concurrent Engineering (DICE)

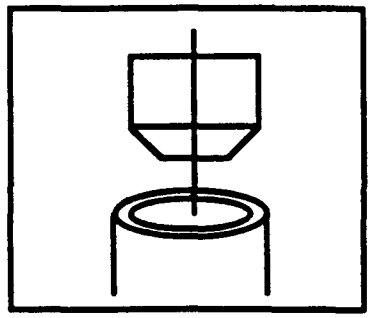
Demonstration — RPI & STEP Tools, Inc.

Part Design



ACIS
on a SUN

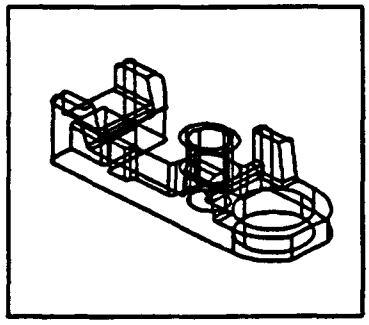
Fixture Design



CATIA
on a RS/600

V1 and V2 — RPI & STEP Tools, Inc.

Part Design

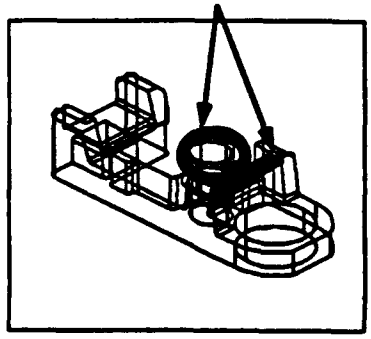


ACIS
on a SUN

V1
(STEP file)

V2
(Delta file

Highlighted Changes



CATIA
on a RS/600

Overview

RPI & STEP Tools, Inc.

- Using STEP to implement concurrent engineering
- Extensions to the standard

Delta file standards

RPI & STEP Tools, Inc.

1. An identity standard

So that we know when two entity instances describe different versions of the same thing.

2. A file format that understands the identity standard

So that we can exchange data without loosing identity.

3. A delta file Application Protocol

So that all applications can process engineering changes.

4. New SDAI Operations

So that delta files can be computed and applied.

New SDAI Operations — RPI & STEP Tools, Inc.

- Diff function to compute the difference between two SDAI models.
- Sed function to apply a diff to an SDAI model

and optionally

- Conflict function to analyze the quality of a diff with respect to an SDAI model

Diff — RPI & STEP Tools, Inc.

- Produces a change record for each difference between two files.

  Edit attribute value of instance
  Delete instance
  Create instance
  Add type to instance
  Delete type from instance

  <Edit, OID, attribute_name, new_value>
  <Delete, OID>
  <Create, OID>
  <Add type, OID, type>
  <Delete type, OID>

- Format of the change record may need to be agreed with a future "change control" AP.

Sed

RPI & STEP Tools, Inc.

- Sed applies a file of change records to an SDAImodel
- If a record does not make sense for a model

  (for example the instance to be edit has been deleted)

  then Sed ignores this record and moves on.

Conflict

RPI & STEP Tools, Inc.

- Analyzes the quality of a delta file with respect to an SDAI model

  or with respect to an SDAI model and another delta file

- Can produce

  List of records that will not do anything
  List of records that change the same entity instance

User Interface Issues

RPI & STEP Tools, Inc.

- Identifying and resolving conflicts requires user intervention
- This means the conflicts must be presented to the user in a form that he or she can understand
- For example, an edit to the center of a circle must be presented to the user as a change to the circle not a change to the point.
- In other words changes to the AIM entities must be presented to the user as change to ARM entities

Conclusion

RPI & STEP Tools, Inc.

- STEP is a key technology for concurrent engineering
- Support for delta files should be added to STEP
- This requires

  a standard for identity
  an AP for change control
  SDAI support for computing and applying diffs
  support for Views so that conflicts are meaningful

B2. Implementing AP Inter-operability using STEP-VIEWS

Implementing AP Inter-Operability using STEP-VIEWS

Dr. Martin Hardwick
RPI & STEP Tools, Inc.
hardwick@steptools.com

Partially funded by the DARPA Initiative in Concurrent Engineering (DICE)

Overview

- Applications of STEP-VIEWS
- EXPRESS-V A View Definition Language (input to Version 2 of EXPRESS)
- SDAI-V A View Definition Architecture (input to Version 2 of the SDAI)

STEP-VIEWS = EXPRESS-V + SDAI-V

Why STEP-VIEWS

STEP Tools, Inc

STEP-VIEWS contribute towards

- **AP inter-operability**
- **Making STEP more affordable**
- **Making STEP easier to understand**

AP Interoperability

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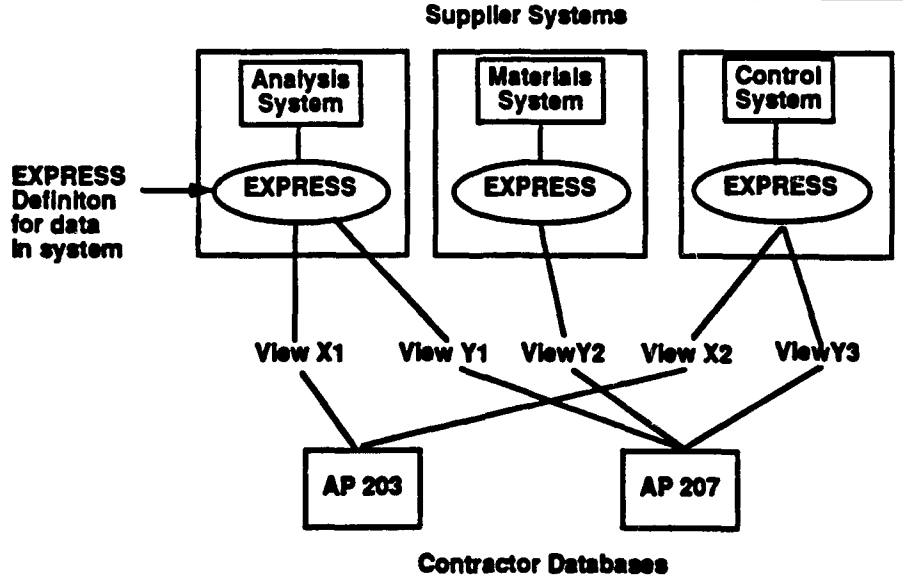
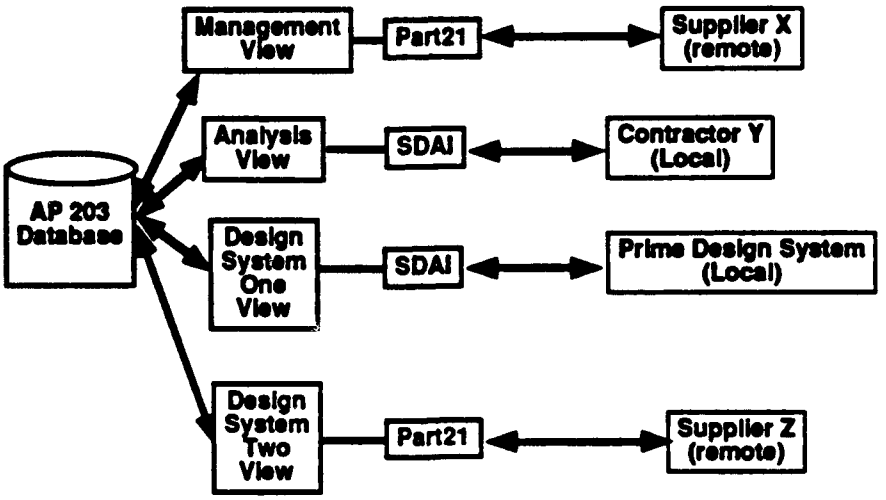


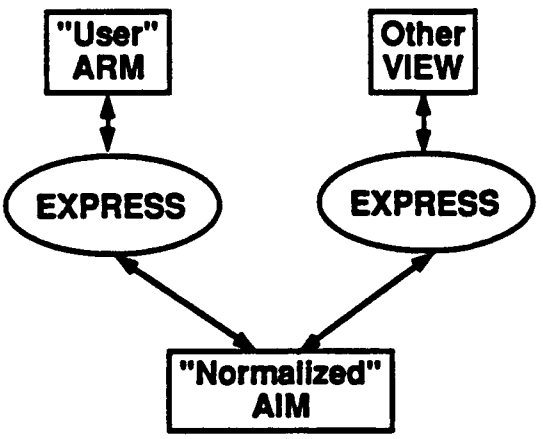
Making STEP affordable

STEP Tools, Inc



Making STEP easier to understand

STEP Tools, Inc



Easy to understand definitions

Complex, internal definitions

Desirable Features

STEP Tools, Inc

- Do not loose accuracy or completeness of STEP
- Make it possible for a tool vendor to implement one interface to multiple AP's
- Make it possible for AIM entities to be mapped into ARM entities.
- Allow a common model to be computed from many AP models

Goals

STEP Tools, Inc

- To meet the requirements given the STEP-VIEWS must be able to
  - select the entities to appear in a view
  - simplify the definition of those entities when desirable

EXPRESS-V Example

STEP Tools, Inc

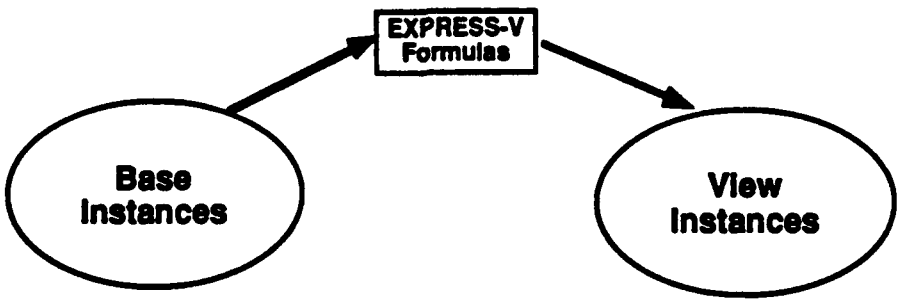
```
(* cube defined in the normal way using EXPRESS *)
ENTITY cube;
 x: REAL;
 y: REAL;
 z: REAL;
 size : REAL;
END_ENTITY;

(* Cube defined to be an view entity for block using SVDL *)
VIEW block AS cube
WHEN  block.x = block.y AND block.y = block.z;
x := block.position.location.coordinates[1];  (* local origin *)
y := block.position.location.coordinates[2];
z := block.position.location.coordinates[3];
size := block.x;
END_VIEW;
```

Cube is simple, block is complicated - see Part 42

Illustration

STEP Tools, Inc



SDAI Database

SDAI Database

Basic Features

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VIEW <base entity> AS <view entity>

WHEN <condition_on_base_entity>;

<attribute> := <expression>; *

(* other features not yet described *)

END_VIEW;

Some Refinements

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VIEW <entity_a> AND <entity_b> AS <view_entity>

the view entity is contructed from two base entities (similar to joins in relational databases)

VIEW <entity_a>:<name_a> AND <entity_a>:<name_b>

the base entity is used twice and renamed at each occurence (similar to SQL)

VIEW <entity_a>;

the base entity is copied into the VIEW as is

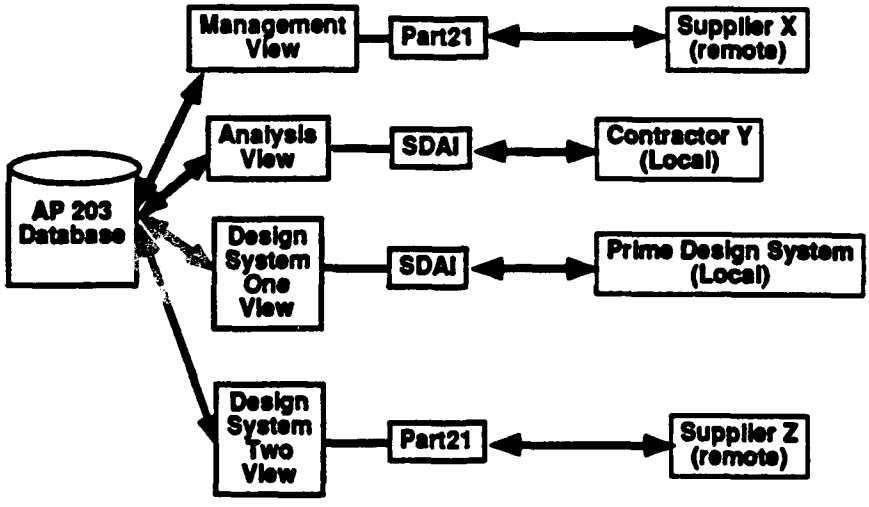
SDAI-V Requirements

STEP Tools, Inc

- An architecture is needed to describe how applications can use views
- The architecture must be compatible with long transactions

Long transactions

STEP Tools, Inc



Approach

- One approach might be to compute view updates by inversing the view definition as in relational databases.

  Advantage- the user only has to describe how the View is constructed

  Disadvantage- View updates are a problem in relational databases for complex views.

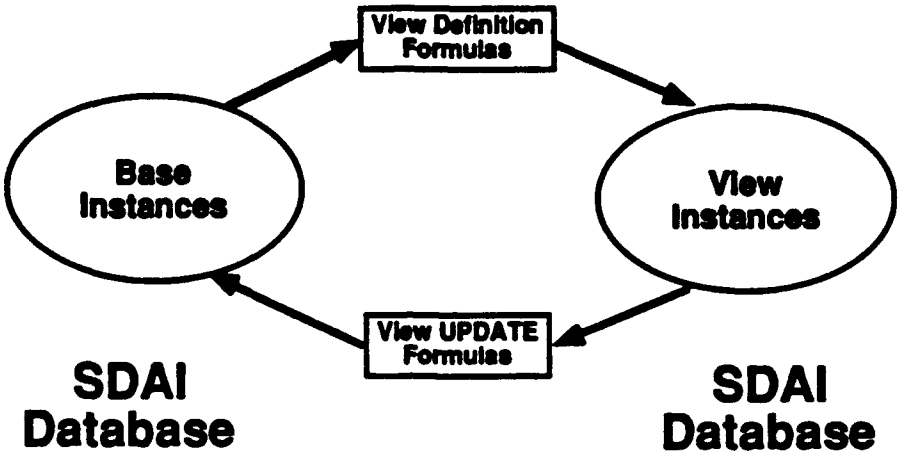
- Our approach is to ask the user to describe an algorithm to implement the view update.

Updates


```
VIEW cube OF block
WHEN block.x = block.y AND block.y = block.z;
(* view attribute definitions previously shown *)

UPDATE
 block.position.location.coordinates[1] := x;
 block.position.location.coordinates[2] := y;
 block.position.location.coordinates[3] := z;
 block.x := size;
 block.y := size;
 block.z := size;

(* other features not yet shown *)

END_VIEW;
```

Illustration

STEP Tools, Inc



SDAI-V Algorithm

STEP Tools, Inc

1. A private copy is made of a set of entity instances.
2. A set of view instances is created from the instances selected in Step 1.
3. An application or user edits the view instances for a (possibly) extended period of time.
4. The new values of the view instances are used to update the instances selected in the Step 1.
5. The view instances are deleted.
6. The instances copied in STEP 1 are merged back into the database.

Issues

STEP Tools, Inc

- The VIEW database creates or deletes entity instances

  see enhancements on next slide

- The UPDATE formulas cause side effects on each other

  user responsibility to make the formulas side effect free

- The base entities may be locked for a long time

  a good version control mechanism is need in STEP

Creating and Deleting Instances

STEP Tools, Inc

```
VIEW block as cube
     WHEN block.x = block.y AND block.y = block.z;..
(* Definition and Update formulas not shown *)

CREATE
     block.position := axis2_placement;
     block.position.axis := direction([0.0,0.0,1.0]);
     block.position.ref_direction := direction([1.0,0.0,0.0]);
     block.position.location := cartesian_point ([0.0, 0.0, 0.0])

DELETE
     block.position.location;
     block.position.ref_direction;
     block.position.axis;
     block.position;
     block;
END_VIEW;
```

Refinements

STEP Tools, Inc

- Update, Create and Delete blocks may need to be conditional
- For example, to create a product version instance in AP 203 it may be necessary to create a product instance first.

```
CREATE WHEN SIZEOF (QUERY (t <* product | TRUE)) = 0
(* code to create the product instance *)
```

- Error conditions may be raised.

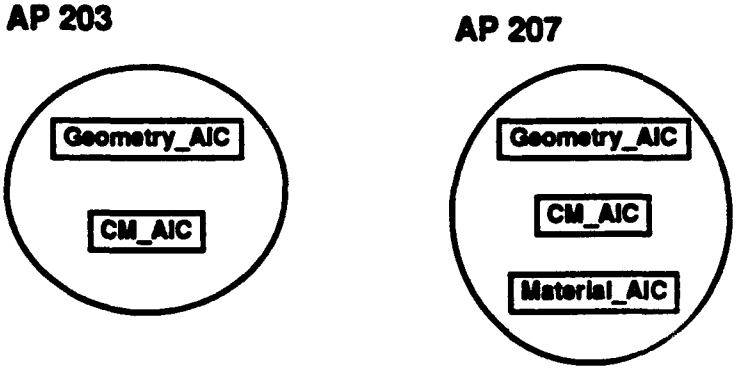
BNF Outline

STEP Tools, Inc

```
VIEW <base_entity> AS <view_entity>

{WHEN <condition_on_base_entity>};

(<attribute> := <expression>;) *

{UPDATE {WHEN <condition>}
  (<base_entity>.<expression> := <expression>;)*
}*

{CREATE {WHEN <condition>}
  (<base_entity>.<expression> := <expression>;)*
}*

{DELETE {WHEN <condition>}
 (<base_entity>.<expression>;)*

END_VIEW;
```

Application Interpreted Constructs

STEP Tools, Inc



AIC's are "standard" partitions of the AP's

AIC's and STEP-VIEWS

STEP Tools, Inc

- AIC's make views easier to define
- Views do not need AIC's.
- Views can be used when AIC's are not available.
- Views do not have to be defined by STEP.
- Views are a solution to AIM to ARM problems.
- Views and AIC's make STEP easier to implement

Conclusion

STEP Tools, Inc

- STEP-VIEWS facilitates

  AP inter-operability
  More affordable STEP interfaces for suppliers
  Model sharing between AP's
  Easier to understand interfaces

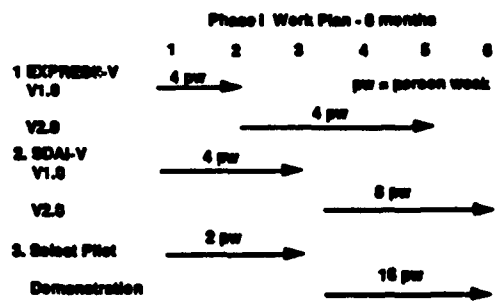
- We have presented

  EXPRESS-V to select and simplify instances
  SDAI-V to support long transactions

Schedule

STEP Tools, Inc

Goal: Demonstrate Viability of Concept



36 Weeks Total

26 Weeks = STEP Tools Class II Membership

B3. STEP Software for World-wide Manufacturing

STEP Software for World-wide Manufacturing

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Overview

- Why STEP
- Software products for STEP

STEP Software for World-wide Manufacturing

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Overview

- Why STEP
- Software products for STEP

What is STEP

STEP Tools, Inc.

- An information modeling language called EXPRESS
- A methodolgy for creating product models
- Product models in place or under development for

  Configuration Controlled Design (AP 203)
  Associative Draughting (AP 202)
  Sheet Metal Die Design (AP 207)
  Circuit Assembly Design (AP 210)
  many others

- Methods to access EXPRESS data in files and databases

Why STEP

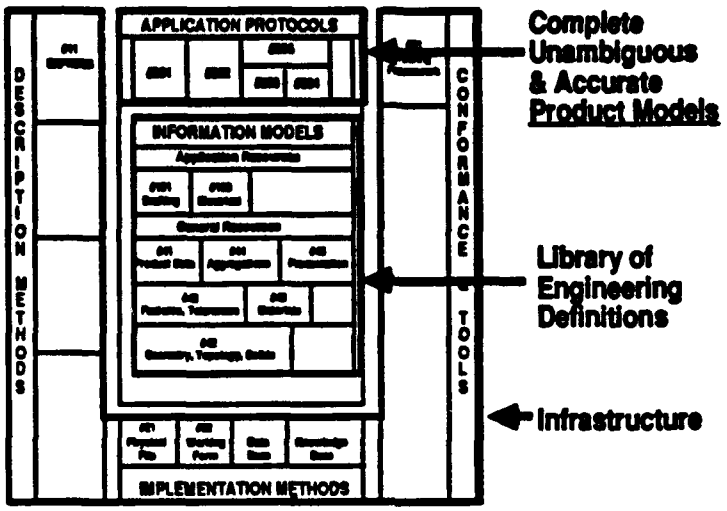
STEP Tools, Inc.

- Better communication
- Better databases
- Reduced design times

Better communication

STEP Tools, Inc.

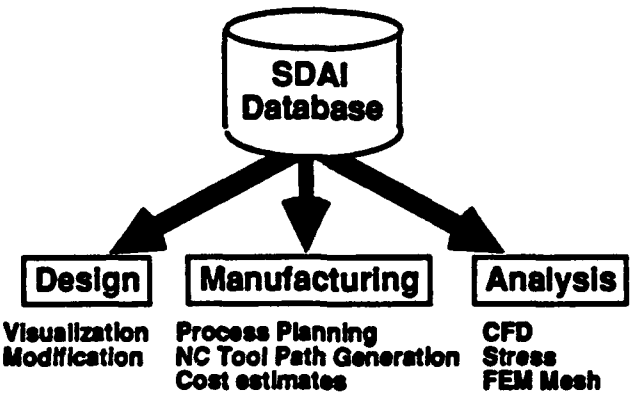
- STEP is international, modular and extensible.



Better Databases

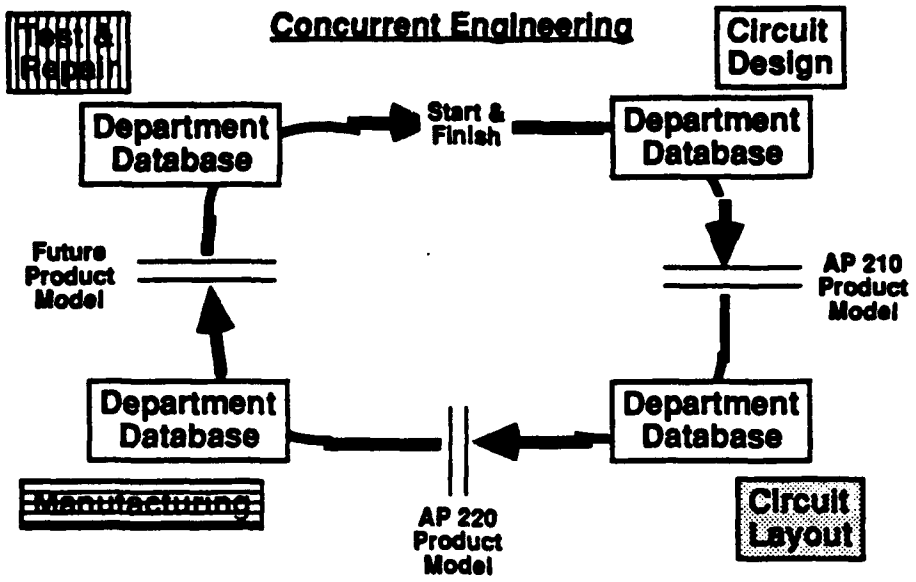
STEP Tools, Inc.

- The CAD system of choice changes every 5 years
- Products can last for 30 years



Reduced Design Times

STEP Tools, Inc.



STEP Software

STEP Tools, Inc.

- Information Modeling Tools
- Application Development Tools
- Database Management Tools

ST-EXPRESS

- EXPRESS is a great way to model technical data
- EXPRESS is system and technology independent
- EXPRESS can help you understand the information requirements of your enterprise
- EXPRESS can help you plan your new systems and understand your old ones.
- EXPRESS has been used by STEP, CFI, POSC and others

What you need

STEP Tools, Inc.

- Tools to help you understand EXPRESS models
- Tools to help you verify EXPRESS models
- Tools to test your models
- Tools to develop new models

ST-EXPRESS

STEP Tools, Inc.

- An EXPRESS compiler
- An EXPRESS interpreter
- An EXPRESS to EXPRESS-G translator
- A instance editor and checker

Check the EXPRESS

STEP Tools, Inc.

Use the EXPRESS compiler:

```
% expfront -c AP_schema.exp
```

An Information Model

```
SCHEMA BTree;
USE FROM external (Data);

ENTITY Btree;                                  <-- An Entity defines a record
 size: INTEGER;
 root: RootNode;
END_ENTITY;

ENTITY Node
 ABSTRACT SUPERTYPE;
 keys : SET [0:?] OF STRING[5];
WHERE                                          <-- WHERE defines a constraint
 keys_not_ascending: keysAreAscending (keys);
END_ENTITY;

ENTITY RootNode SUBTYPE OF Node;               <-- Inheritance
 pointers:SET [0:?] OF internalNode;
 parent:Btree;
WHERE
 node_is_an_orphan: parent.root :=: SELF;
 tree_is_not_balanced: balanced (self);        <-- Function call
END_ENTITY;
```

Create EXPRESS-G

STEP Tools, Inc.

Put the EXPRESS file through the layout tool:

```
% express2expg AP_schema.exp
```

View the result with the EXPRESS-G display tool:

```
% express-g AP_schema.expg
```

Browse, rearrange, and print the EXPRESS-G diagrams.

- MS Windows platforms Q1 of 1994

ST-DEVELOPER

(The STEP Programmers Tool Kit)

Reasons to buy

STEP Tools, Inc.

- You need to exchange data between CAD systems
- You want to link an application to a STEP database
- You want to write a new CAD application
- You need a custom application for STEP or EXPRESS

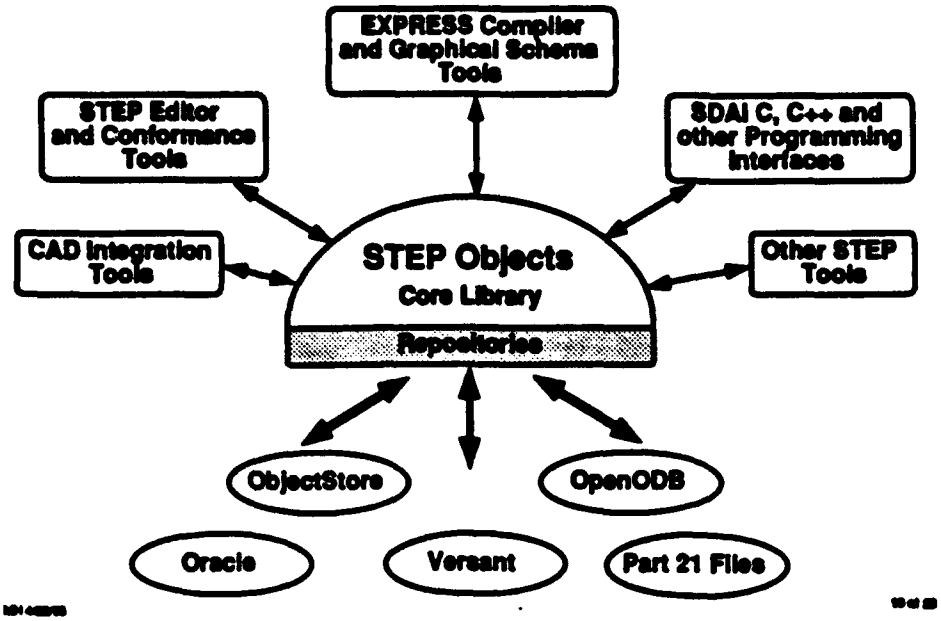
What you need

STEP Tools, Inc.

- Maximum programmer productivity
- Full, reliable, comprehensive coverage of EXPRESS, Part 21 and the SDAI
- Modularity and flexibility
- Built-in database management
- Interfaces to IGES, DXF and other standards
- Built in support for a wide range of CAD systems

ST-DEVELOPER

STEP Tools, Inc.



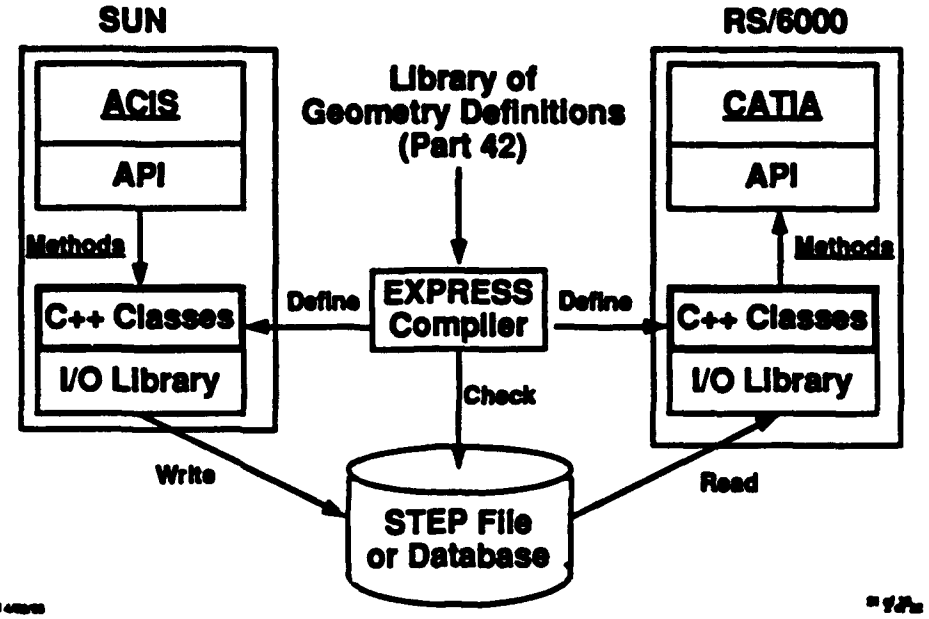
Projects

STEP Tools, Inc.

- WP AFB Geometry Database project for F15, F16 & AF22 aircraft geometries.
- Integrated Process Planning Initiative (IPPI)
- PreAmp SDAI database for circuit boards (AP 210).
- Raytheon – MO DB for electrical manufacturing data.
- Rapid Response Manufacturing.
- GM and Boeing – UG/CGS/CATIA Sheet Metal Project.
- Unigraphics AP 203 interface for the STEP 777 project
- CTC CALS EXPO 93 demo
- Rolls Royce, Applicon, and 80 others in the US, Germany, Japan, UK, Spain and Scandanavia.

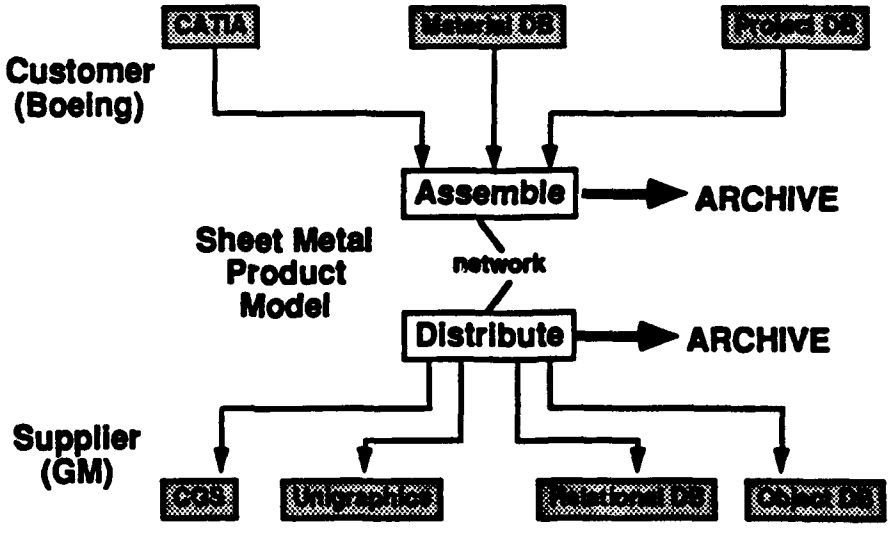
Data Exchange

STEP Tools, Inc.



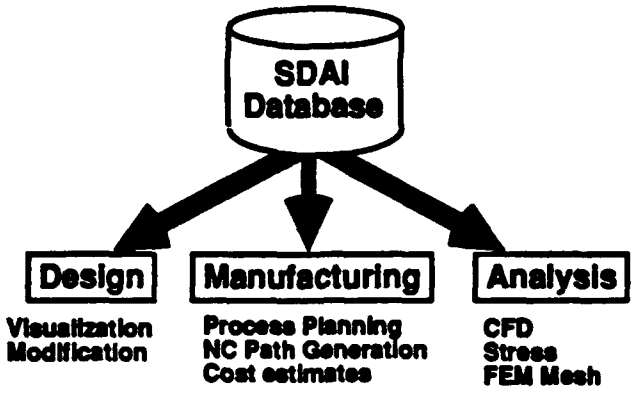
Electronic Commerce

STEP Tools, Inc.



Shared Database

STEP Tools, Inc.



Availability

STEP Tools, Inc.

- UNIX workstations since December 1991

ST-203

- You need an archive of AP 203 descriptionss for your customers and suppliers
- You need to convert to AP 203
- You need to be able to verify the correctness of your AP 203 data sets
- You need to be able to repair AP 203 data

What you need / ST-203

STEP Tools, Inc.

- An archive
- An AP 203 visualizer and data editor
- IGES to AP 203 translation and data entry
- Test and repair tools

Availability

STEP Tools, Inc.

- Silicon Graphics and SUN platforms Q1 1994
- Other platforms as Open GL becomes available
- Demonstrations at AUTOFACT and CALS EXPO

C. Detailed Description of CFI DR 1.0

Detailed Description of CFI DR 1.0

This is a detailed description of the Information Model developed by CFI to represent the hierarchical netlist connectivity of electronic circuits. One of CFI's goals it to represent more aspects of circuit structure in the future.

The Information Model has been partitioned into two sections. The first section is the "Base Object Model", and the second is the "Base Connectivity Model". The "Base Object Model" captures the top of the entity hierarchy used to describe the information model *(see Figure 1)*. The "Base Connectivity Model" represents a high-level abstraction of the base connectivity model for electronic circuits.

Description of the Base Object Model

The entire Design Representation Information Model is derived from a single entity which models the basic, low-level behavior of any entity in the model. This low-level behavior is intended to capture the essence of the notion of an OBJECT. The basic behavior of all objects in the DR model is that they will be TYPED and may have an optional list of properties associated with them. Additionally, many objects have a NAME.

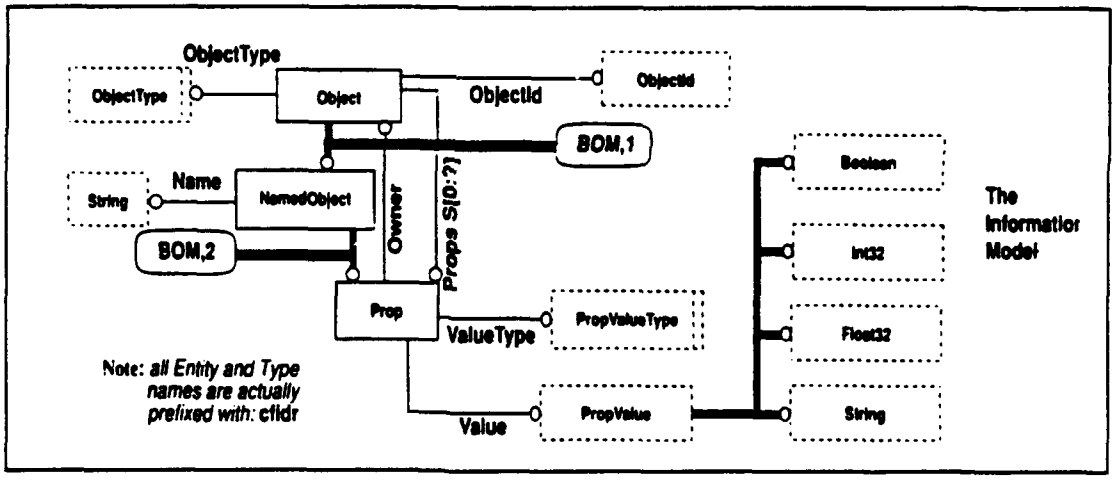


Figure 1. Base Object Model

The Base Connectivity Model Description

This section describes the portion of the model that represents hierarchical netlist connectivity. The EXPRESS-G diagram of the Base Connectivity Model is shown in Figure 2. This model represents the objects and relationships used to represent hierarchical netlists with bundles in CFI 1.0.0 Design Representation.

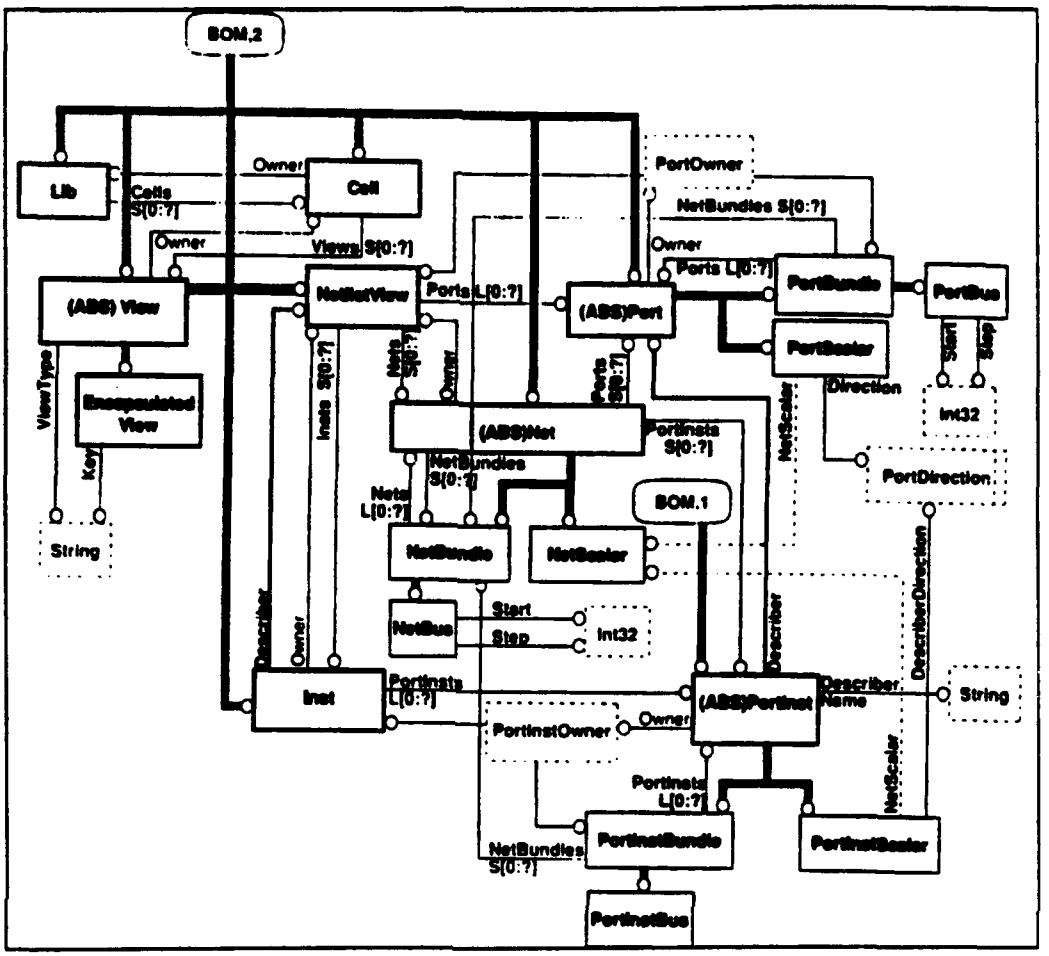


Figure 2. Base Connectivity Model

Hierarchical design supports the notion of building up the behavior of a design by collection and connecting together other designs. Each of the other designs can in turn be built recursively from yet other designs, etc., until a subdesign is reached which is composed of primitive design elements. In this case a primitive design element is one for which no further interior structure is known. Primitive design elements are also referred to as leaf cells.

In order to represent a hierarchical design, there must be a way to represent the design under consideration and the fact that it is composed of other designs which are connected in some way. In the model described herein, a particular implementation of a design is represented by the **NetlistView** entity. The inclusion of smaller designs of which a NetlistView is composed are represented by then **Inst** entity. The term Inst is an abbreviation for the word Instance.

Instantiation is the act of using one design in the structure of another design. In this model, the design which is being used is the Inst, and the design in which an Inst is used is the NetlistView. An example of this could be the NetlistView as a Printed circuit board and an Inst as an individual chip which is soldered down onto the circuit board. A NetlistView may have more than one Inst within it and

multiple Insts of a single design may be placed into the NetlistView. An Inst represents the use of one design within another design. Each Inst represents an instantiation of one NetlistView within another NetlistView.

An instantiation is not exactly a copy nor is it exactly a symbolic reference. For example, in a NetlistView named "Half-Adder" an Inst of a NetlistView names "XOR" represents the fact that the design of an **XOR** gate is used as a component in the design of a **half-adder**.

Having provided a representation for the hierarchical structure of designs using the NetlistView and Inst entities, it is necessary next to provide a representation for interconnecting the Insts within a NetlistView.

The connectors of a design are represented by the **Port** entity. Since an Inst represents the use of a specific NetlistView, the PortInsts belonging to an Inst correspond exactly to the Ports on the NetlistView referenced by the Inst. For example, if an Inst "XOR1" represents the use of an **XOR** gate within a design then each of that Inst's PortInst entities will correspond to a single Port entity in the NetlistView of the **XOR** gate that was used to create this Inst. The correspondence between an Inst and the NetlistView it represents is referred to as the "Describer Relationship". An Inst is completely "described" by the NetlistView it represents. This same correspondence exists between a PortInst and the Port it represents. Both the Inst and PortInst entities contain a **Describer** attribute. The fact that PortInst's attributes for name and direction are **DescriberName** and **DescriberDirection** indicate the close tie required between each PortInst and its **Describer** Port.

To complete the initial model, the Net entity is used to represent each set of connections between PortInsts and Ports within a NetlistView. When a collection of PortInst and Port entities are associated with a Net, it reflects the intention that each PortInst and Port in the collection will have exactly the same signal information at all times. A Net may connect only PortInsts, only Ports, or a mixture of the two.

One final concept is that of **Bundles**. In many scenarios, it is convenient for a designer to group a set of signals together and refer to the set as a single signal. In the Base Connectivity Model, this concept is represented by introducing the notions of **Scalar, Bundle**, and **Bus**. A Scalar is an individual thing which may not be unbundled into anything else. A Bundle is an ordered collection and a Bus is an ordered collection with index values for each position. The idea of Scalar, Bundle, and Bus is applied to Nets, Ports, and PortInsts.

A Net may be either a NetScalar, a NetBundle, or a NetBus. In a sense, there are now three "types" of Net entities. A NetScalar entity represents one individual signal which may not be further decomposed into subsignals. A NetBundle entity is a collection of Nets, each of which is optionally a NetScalar, a NetBundle, or a NetBus. A NetBus entity is a NetBundle with tow additional attributes of **Start** and **Step** which define the range of index values associated with the positions in the bundle.

Thus NetBundles have only the **Names** for each Net and an implicit Position in the bundle for each Net. NetBusses are NetBundles that also have an index

value for each position. This index is restricted to be monotonically changing from position to position by a fixed integer Step, that can be positive or negative, but may Start at any integer value.

NetBundles do not hide the **Names** of their member nets. All Nets in any one NetlistView are required to have unique names. Nets can appear in more than one position in a given bundle and in more than one NetBundle. A given name for a Net in a particular NetlistView always refers to the exact same Net.

A similar structure exists for Ports and PortInsts, resulting in the definition of **PortScalar**, **PortBundle**, **PortBus**, **PortInstScalar**, **PortInstBundle**, and **PortInstBus**. The PortInstBundles and PortInstBusses get their structure entirely from the corresponding PortBundles and PortBusses.

However, a significant difference from NetBundles is that PortBundles hide the Names of their members from other PortBundle contents and from the names of the Ports that are directly in the NetlistView. Thus Port Names may be reused without referring to the same object. The other difference is that a PortBundle, and thus also a PortInstBundle, cannot repeat a member in two different positions. Therefore any one name only appears one time in a given bundle.

D. DIE Information Exchange (DIE) Format Reference Manual (Chapter 1)

IC Manufacturer to MCM Designer

Die Information Exchange (DIE) Format Reference Manual

VERSION: 0.8 (DRAFT)

24 August, 1993

Please check the Notes for Reviewers section behind the Table of Contents

DIE Format Industry Group

(for more information, email a request to die-info@vhdl.org)

Prepared by:

Randolph E. Harr
Siuki Chan

Logic Modeling Corporation

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408.957.5256 (voice, for questions)

Table of Contents

Notes for Reviewers

reh, 24 aug 93 (draft 0.8)

Italicized sections in this document, or phrases enclosed in curly braces {}, represent notes to the reviewer about unclear areas or discussions still not finalized. They should not be considered part of the final document.

Some of the drawings contained herein are based on original electronic work by TI as part of their HDI process description; and further modified by MCC as part of the Design Interface Alliance.

Not all settings have been defined yet. All level 0 ones are, most level 1 and some level 2. They will be completed by the draft release before the workshop.

The Thermal and Electrical models have not been integrated into this draft document as of yet. See separate companion documents describing the proposed models.

TAB or Flip die are not yet included in this description. The current settings should not preclude and should definitely support their inclusion.

A thorough review with experts in all IC process technologies has not been completed yet. Some technologies such as GaAs, ECL or BiCMOS may not yet be properly covered.

Although we have tried to be very careful to consistently use terms, the terms we picked may not be appropriate or correct for the technology (for example, we should possibly use "literal" instead of "value", etc.). Please suggest clearer or more appropriate terminology (even if seemingly trivial) as needed. Being buried in it, we sometimes miss the basic items.

This document, many referenced documents, and related information is all available via the VHDL International Internet Repository. You can get access and download files in many ways. Each is described next:

Email access:
There is an email FTP archive server on the machine. Send an email message to archive@vhdl.org. The subject is ignored. If a line in the body of the message begins with "help", then a descriptive help file of commands available is sent. Basically, you communicate to the server through commands in the mail message body. It then responds to your commands via email. You should always add the command "path <your_email_address>" to any message to assure the return address is understood.

The following examples assume you have initiated a mail message to archive@vhdl.org. They list the contents (or body) the email message should contain. Remember to use "path <your_email_address>" also.

For example:	*path randyh@lmc.com*
To get Help:	*help*
To get a listing of the available files and directories at a given level:	*index pub/die*
and a description of each:	*send pub die/00readme -- note: those are leading zero's*
To ask for a file to be downloaded:	*send pub die/die0-8/die0-8.eps*

Dial-Up access:
Dial-up the vhdl.org system at 408.945.4170. Any baud (upto 14,400), parity, start & stop bits, and v. settings will do. Login as "guest" account. Once in, simple UNIX commands such as "cd pub/die", "ls" and "cat" are available. Also, you can download desired files using "kermit", "xmodem" or "sz" (zmodem).*

Internet access:
Use "ftp vhdl.org" (or "ftp 198.31.14.3") and log in as user anonymous. Also, gopher is available and highly recommended if you have it available. Gopher to "vhdl.org". Remember to set "binary" mode for any binary files you may select.

1. Introduction

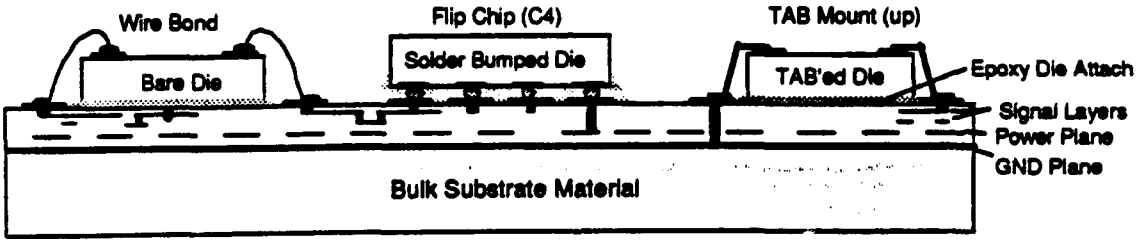
This document is the result of a study and workshop into the design practices and technologies of MCM and IC manufacturers, designers and EDA tools. It represents the data requirements that have been extracted by key companies and people in the industry that were used as the basis to form an interchange specification for die library information. See [REQUIRE] and [WORKSHOP] for more details.

The DIE Format is designed to be a computer sensible (EDA tool processable) interchange format for information from IC manufacturers to MCM designers and foundries. The format is not intended to be an Electronic Data Book nor to necessarily represent all the information needed to understand the die. In some cases, information important to the end user but not computer sensible has been included to facilitate understanding and use of the data.

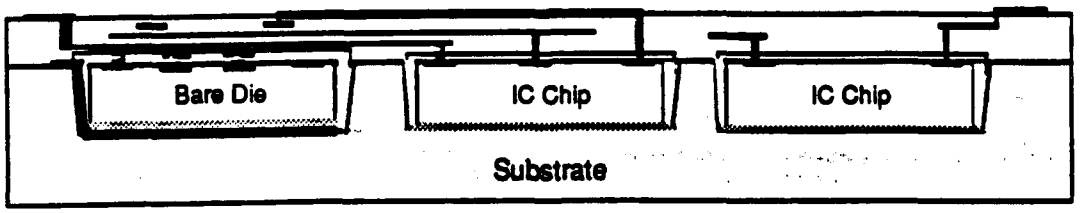
The DIE Format is intended to convey the physical characteristics of the die -- those needed for place & route, thermal analysis, electrical signal analysis, power distribution design, and physical bonding. Other existing formats are expected to incorporate the functional, test, and inherent timing information.

The primary focus has been on digital IC's but the format is eventually meant to include all components used in an MCM process. (ICs, passive devices, connectors, etc.) Information that is time consuming to manually collect, difficult to enter, or not generally available has a priority for inclusion. Information specific about the bare die form of a component generally falls into this category.

Specifically included are pre-diced die, bare die, and die that have been post-processed for attachment mechanisms such as flip chip (Solder bump, C4, etc.), wire bond, TAB (flexible lead frame direct attach to die), and chips first (chip in cavity, embedded chip, etc.; under thin film interconnection). These various forms of die and there use are shown diagrammatically in figure 1. *In this first release, TAB has not been covered nor flip chip with solder bumps or extra thin-film layers added.*



MCM-D Shown (only substrate different from MCM-C)



Chips First (High Density Interconnect) Shown

Figure 1: Typical MCM Die Attach and Pad Bonding Mechanisms

This format represents an interim solution to exchanging bare die information. The resulting information model crudely defined by this document will be used to further refine more comprehensive standards. Specifically, it is expected to help drive the EIA EDIF [EIA548] and CFI CIR (Pinnacles) Electronic Data Book format (syntactically represented using [SGML8879]) emerging standards. A final standard from CFI or EIA is not expected to be ratified before 1996.

Whatever the final standard, the interim format is kept simple so as to make easy availability of a translator capable of taking DIE Format blocks and converting them into any final standard that develops. In this way, IC manufacturers who start delivering to the format today are guaranteed of a long commitment to the format into the future. Also, consideration is given to generating a block from a GDS II file. This, along with the human readability of the format, should make it easy for IC manufacturers to create the necessary file block info about

their die. Given EDA vendors are committed to adopting the format as it exists today, this should further enhance the usefulness of this interim solution.

The specifics of the format itself are broken up into three major sections. First a top down structure of the data, and other lexical information about the format is described. Then the compliance levels with the settings are introduced. Finally, the core of the format, the *settings* are described in a reference style format for easy look-up. The first two section's should be read for an overview, followed by a detailed reading of each setting in the final section. Following the settings are a glossary, reference list, and appendices giving detail in a collected format (for example, the BNF).

1.1. Basic Model

The DIE Format is designed to convey information about bare die in a convenient, succinct manner suitable for EDA tool processing and MCM designer consumption, where needed. Post-processed die which have TAB, ribbon, or solder bumps added to the bare die are considered special, modified forms of the die and as such, receive their own section of description. These special forms of still unpackaged die reference will still need to reference the bare die information for a majority of the detail.

Many times information is common across many die or many objects being described on the die such as interface pads. In these cases, the format allows for the separate definition of the information and objects and then the instancing of the object with any necessary "local" customization given at that time. This is similar to how the TAB die actually reference the bare die and then proceed to describe the differences or "added" objects.

From here on out, when *die* is used unannotated in the this document, it implies bare die. All other form of die (such as flip die, TAB die, etc.) will be identified as such. The generic term for all these various types of die is *unpackaged die*.

For TAB die, the pads are defined to be the contact point areas of the lead frame -- sometimes termed the Outer Lead Bond (OLB). The lead frame is broken up into three sections -- the Inner Lead Bond (ILB), the connecting tape, and the OLB.

Note that for ribbon die which are to be mounted face down (flip), the OLB will be interior compared to the connecting tape. This is due to the action taken of cutting off and shortening the leads during bonding.

Datum and coordinate system

Geometrical figures are defined in a two-dimensional, Euclidean view plane. The geometrical figure is formed by an orthographic parallel projection from the die to the view plane. The view plane is parallel to and above the plane formed by the die active surface. The outside surface closest to the electrically active layers of material defines the "top" of the die. This outer, "top" layer is typically coated with an electrically passive material and thus termed the "passivation layer".

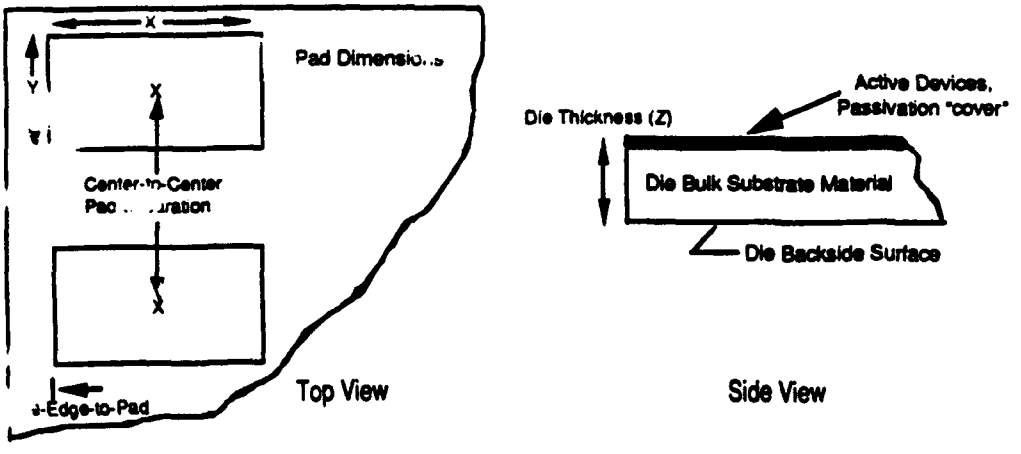


Figure 2: Miscellaneous Die and Pad Specifications

The die coordinate system origin is defined at the center of the smallest rectangle which will bound the die's view plane. A "rotation" orientation of the die is arbitrary but must be consistently applied. The bonding pad diagram is usually a useful visual aid to establishing for the user the orientation of the die in the view plane.

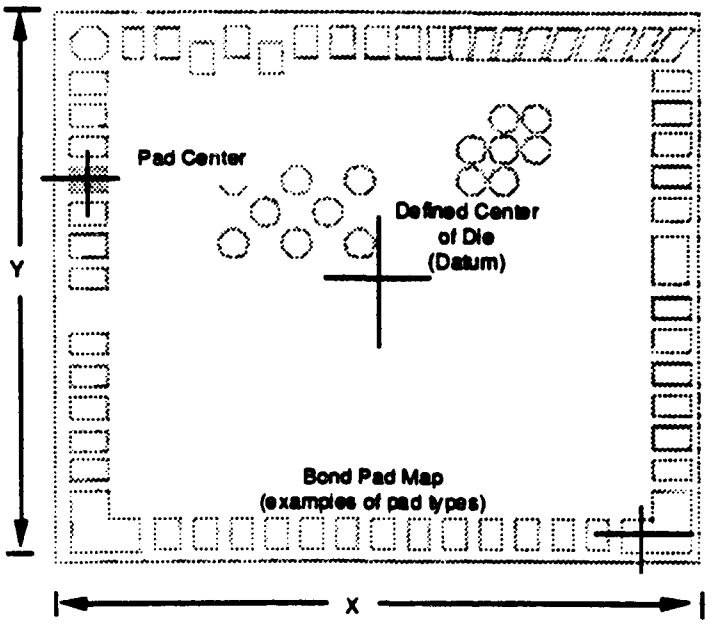


Figure 3: Die and Pad Datum (centers),
Pad outli.. and p:. :cement examples

Similarly, a pad's coordinate system origin is defined to be the center of the smallest rectangle which will bound the pad. For level 0 pad geometry's, a pad .. defined as the smallest passivation opening over the metal contact of an intended connect point.

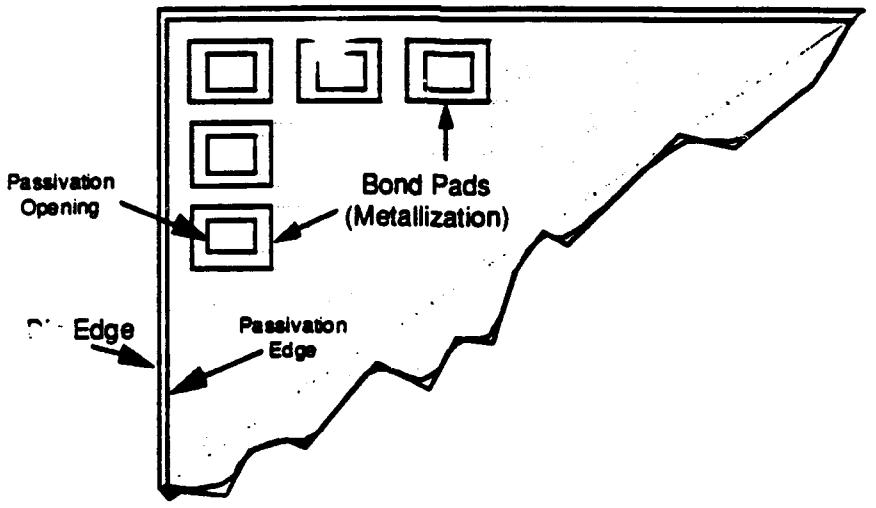


Figure 4: Miscellaneous Die and Pad Specifications

Tolerances and Accuracy

A physical dimension, such as a width, height or thickness, has both a basic dimension value and a tolerance. The basic dimension is defined to be the numerical value used to describe the theoretical size of an object. It is the basis (or datum) from which the tolerances and accuracy are defined. Tolerances specify the minimum or maximum expected deviation from a given theoretical di.. ension for the physical structure being described.

The tolerance for a physical dimension or coordinate point is given by a separate setting attribute. If not defined for the section, then the tolerance is unknown. The tolerance represents the deviation in the physical object from the basis.

Each numeric value has a precision and an accuracy. The precision is represented by the number of numeric digits used to represent the value. The accuracy is, by default, plus or minus 1/2 of the least, non-zero digit *radix*. That is, if the last non-zero digit *radix* is 10^{-3}, then the accuracy is ± .0005. When creating a block in the DIE format, the appropriate precision to imply an accuracy that is close to the intended value should be used for all values. The accuracy represents the deviation possible in the numeric value due to measurement, computing or other forms of introduced errors; but not the tolerance of a value to represent a physical item.

Note that an accuracy of other than 1/2 a digit cannot be specified (although a tolerance for a dimension can be more specific).

1.2. BNF Conventions

Throughout the rest of the document, the syntax of the DIE Format is introduced using BNF. The conventions are briefly covered here for those readers unfamiliar with this format.

A definition is shown starting with a non-terminal of the item being defined followed by a '::=' sequence and then the body of the definition. A definition may span multiple lines of the document.

```
<Non_terminal_definition> ::= <body>
```

A non-terminal is shown between angle brackets ('<' and '>'). A terminal is a keyword or special character shown in **boldface** type and between single quotes if only a single character.

```
<non_terminal>
terminal_such_as_keyword
'1'
```

When zero or one occurrences of an item or group of items can exist, the item(s) are grouped within square brackets ('[' and ']'). When zero, one or more occurrences of an item or group of items can occur, they are grouped within curly braces ('{' and '}'). One or more occurrences are defined by putting the item(s) first and then again inside curly braces. When a fixed number of items, a fixed number range of items, or a fixed minimum number of items is required; this is represented by putting the items in curly braces followed immediately by the number or range designation (n, n-m, or n+; respectively).

```
Zero or One Occurrences:                [ <body> ]
Zero, One or More Occurrences:          { <body> }
One or More Occurrences:                <body> { <body> }
```

Sometimes there is the possibility of a choice between several different items. Each item may be a single name value or a complex non-terminal. When there is an option or choice between a list of different items, the items are separated by a vertical pipe ('|') character. All items between two vertical pipes are part of the same choice. All items between the definition start and the first vertical pipe are part of the first choice. All items after the last vertical pipe to the end of the definition comprise the last choice.

```
<choice_definition_example> ::= <1> <2> <3> | <x> <y> | <a> <b> <c> <d>
```

Items may be grouped into a sub-definition to avoid creating a nested definition. If an option is being defined, the grouping defines the beginning and end of the definition. The grouping is indicated by enclosing the items in parenthesis ('(' and ')').

```
::= ... <item> ( <1> <2> <3> | <x> <y> | <a> ... ) <item> ...
which is in lieu of doing a reference to another non-terminal:
    ::= ... <item> <choice_definition_example> <item> ...
```

Non-terminals shown in the syntax that are *{tokens or lexicons or literals}* of the language are described in the lexical conventions section presented later on.

E. ASEM CAx Interface Specification Alliance Program Plan and Roadmap

ASEM CAx Interface Specification Alliance

Program Plan and Roadmap

Working Document

Contract Line Item No. 0001
Data Item A011

Contract # F33615-92-C-1134

July 1993

Microelectronics and Computer Technology Corporation
12100 Technology Boulevard
Austin, Texas 78727

Contact: Dr. Kenneth Drake 512-250-2764
drake@mcc.com

1.3 Objective Statements

The following are the key objectives which this Alliance will accomplish in fulfillment of its mission.

- The Alliance will define, develop, and disseminate a comprehensive set of ASEM information and data exchange interface specifications for the bi-directional flow between the design environment and multiple manufacturers (open foundries).
- Existing standards will be exploited to the fullest extent possible and recommendations made for their extensions to accommodate any unique requirements for ASEMs.
- Any new candidates for a standard will be prepared for submission to the appropriate standards group.
- Focus will initially be on the exchange of physical level design information, progressing upward in the design flow as deemed necessary later in the program.

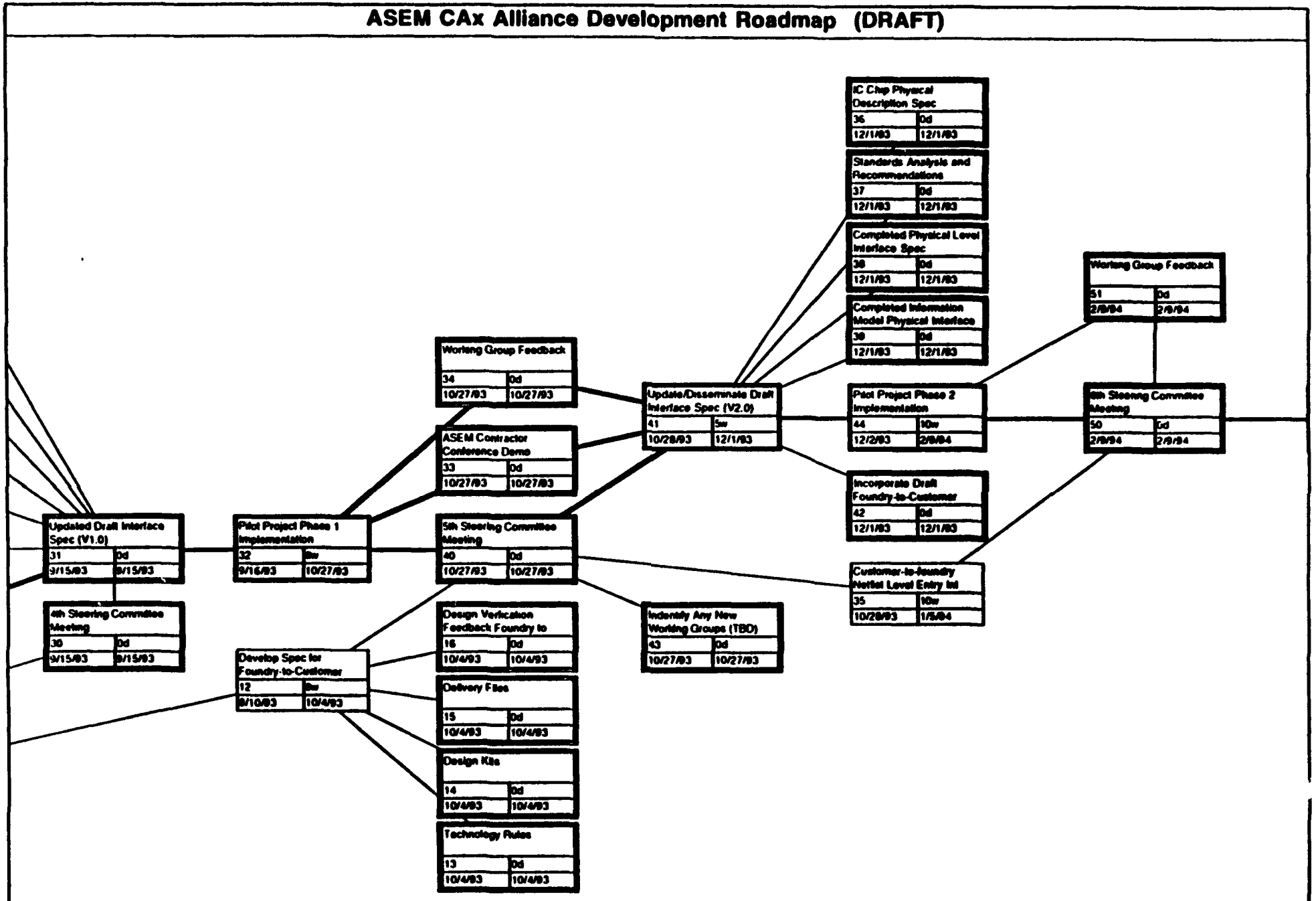
1.4 Plan-of-Action

MCC, as the Alliance facilitator, has defined a five step approach to accomplish the mission of the program. These basic steps are as follows:

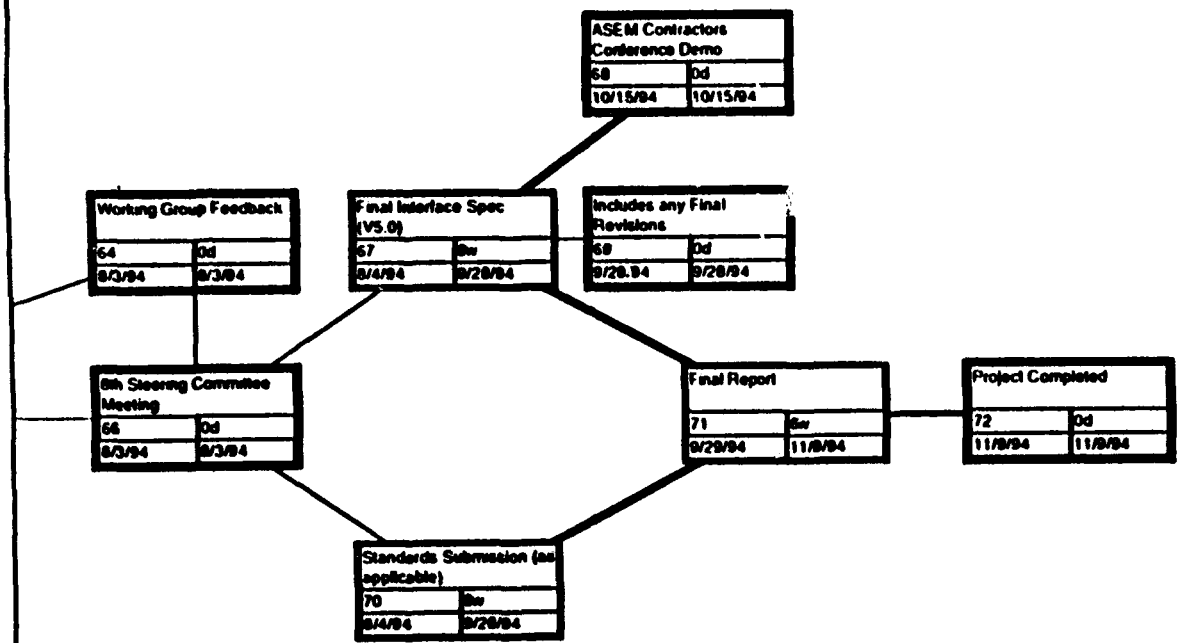
- Establish Program organization, industry/government Steering Committee, and roadmap.
- Define a working model of the ASEM design information/data flow, PRIORITIZE, and partition it into logical interfaces.
- Hold industry review session, staff working groups with experts to address specific interfaces, develop interface specification documents, and exercise and validate those interface specifications.
- Review and seek approval from Alliance members (revise as needed).
- Determine applicable standards for the exchange of ASEM design data, identify any modifications and/or make recommendations for new standards.

These steps are incorporated into this document and form the basis of the roadmap (PERT chart) included in section 2.0.

ASEM CAx Alliance Development Roadmap (DRAFT)



ASEM CAx Alliance Development Roadmap (DRAFT)



Project:
Date: 6/30/93

Name
ID | Duration
Scheduled Start | Scheduled Finish

Critical | Milestone
Noncritical | Subproject

John Isaac (Mentor G.)
Kevyn Salsburg (IBM)
Frank Boyle (Cadence)
Lou Concha (WL)
Tony Mazzullo (Harris)
Randy Harr (Logic Modeling)
Dave Zarnow (Hughes)
Don Kuk (Intergraph)
Wes Hansford (ISI)

The responsibilities of the steering committee include the following:

- Provide overall executive direction for the Program.
- Determine priority of interfaces and appropriate subcommittees (working groups).
- Help recruit appropriate individuals for working groups.
- Monitor the working groups to ensure focus and progress.

2.3 Roadmap (PERT Chart)

Based on the recommendations and requirements established by the steering committee over the past four months a PERT chart was generated based on the schedule of events and milestones needed to meet the mission statement of this program. The PERT chart was generated based on the definition of working groups recommended by the steering committee. Refer to section 4.0 for Working Group mission statements. This PERT chart accommodates the requirements of the validation pilot project working group as needed to exercise and support the working groups defining the actual interface specifications. The PERT charts are comprised of the following four pages.

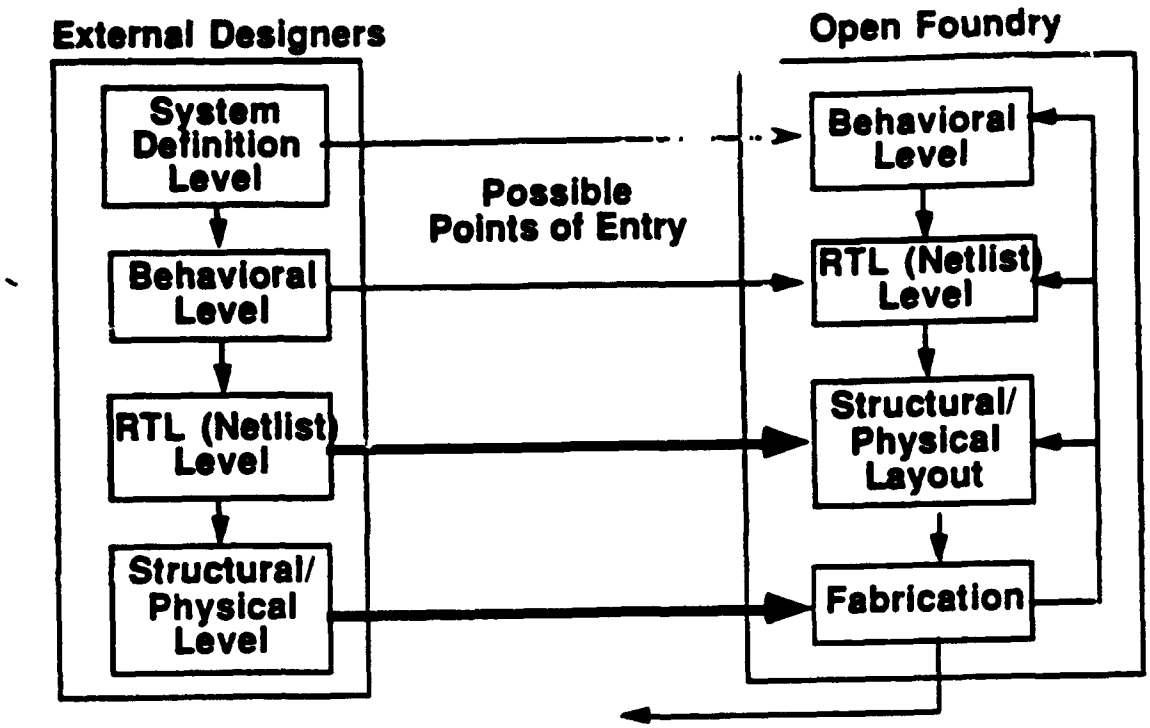


Figure 3-2 *There will be multiple entry points from an external customer to an ASEM foundry.*

A more detailed analysis of the foundry interface was provided by Texas Instruments and Motorola with additional reviews and comments by the other steering committee members. The view at this more detailed entry level is shown in Figure 3-3. This illustrates the relationship of external customer design flow with the entry into the foundry's internal design flow. The bi-directional exchange of information is essential for the complete and accurate design of ASEMs. Hence, the early design information from the foundry to the external customers must be defined concurrently with the flow of electrical design, layout, and packaging information from the external design to the foundry.

The interdependencies on the bi-directional flow of information made it extremely difficult to define the working groups which will work explicitly to determine the various interfaces at each exchange level. The type of information required is also dependent on the point of entry into the design flow. The steering committee decided to partition the problem into topics which represent the flow of information and recommended that the working groups should be defined accordingly. Note that the nomenclature used below was selected to refer to the direction of the data exchange and will be used throughout this document to describe the topic matter of the working groups. The problem was partitioned as follows:

1) Customer-to-Foundry: That information which is produced by the customer from both the CAD environment and from other descriptive information that is required by the foundry to produce an ASEM.

2) Foundry-to-Customer: That information which a foundry must provide a customer to select and design, with the appropriate technology, an ASEM which meets the customer's application requirements.

3) IC Physical Description: That information required by both the customer and the foundry to complete the physical and electrical design of an ASEM.

An example of the type of design information is shown in Figure 3-4.

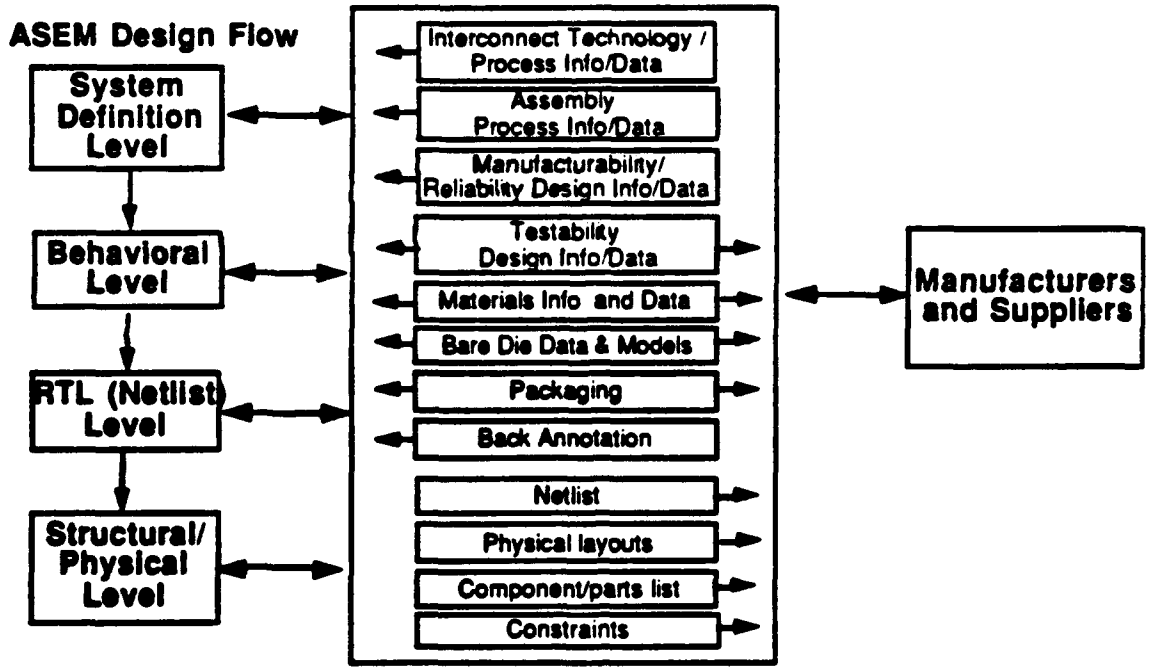


Figure 3-4 *ASEM design data types and direction of design information/data flow.*

The Customer to Foundry Working Group will also publicize our activities to other standards groups (CFI, IGES Harmonization, PAP/E, EDIF, VHDL), and to the industry in conjunction with industry meetings (IEPS in San Diego in September '93 and the IPC meeting in Washington, D.C. in October '93.)

The Working Group will also review the IC Draft prepared by the IC Data Specification and Interface Working Group.

4.2 Foundry-to-Customer Working Group Mission (Chairperson: Kevyn Salsburg)

Objective: To define, through industry consensus, interface specifications leading toward the standardization of the exchange of data from MCM foundries to the ASEM CAE/CAD environment. This data shall include:

- delivery files
- design kits
- feedback information following data transfer from customer to foundry
- technology rules

The working group will add information to the MCC draft specification which:

1) defines what information will be given back to the customer following an exchange of design data from the customer to the foundry, and
2) defines the format of that information so that the same type of information is provided to the customer independent of which foundry was used.

A data model of the content of design kits will be coordinated through the information modeling working group.

The first focus of this group will be directed at information and data needed to ensure the success of physical design level data.

4.3 IC Data and Interface Specification Working Group Mission (Chairperson: Randy Harr)

Objective: To identify, develop, and refine interface specifications that are essential for the exchange of IC related physical design information needed as part of the design data interface

complexity of the validation exercises and to have well defined demonstrable milestones each six months.

5.0 Industry Review Process

Factored into the program's plan of action are specific steps to ensure the review and acceptance by industry of the interface specification standards. As shown in the program PERT chart, there are planned industry participations, reviews and presentations over the next 18 months. Key to the success of the industry consensus process is the staffing of working groups by industry, representing the interests of end-users (customers), EDA vendors, IC manufacturers, suppliers, and ASEM manufacturers.

Working group chairpersons and MCC will ensure the recruiting of volunteer participants in the industry review process. These working groups are chartered with the missions listed in Section 4.0 above. The review process must be formalized so that information is captured and presented for industry review in a well organized model. A procedural approach to analyze and describe the information and data interfaces will be followed for each interface level, using a common information language called EXPRESS. EXPRESS is an object oriented, "Pascal-like," language used to capture information in a common descriptive format (textual, graphical, physical, process, etc). The use of EXPRESS is extremely important because, first, it provides a well-defined characterization of the information received or generated at each interface level. This is a sufficient prerequisite to allow EDA vendors to provide design automation tools and to allow definition of the foundry interface. Second, it is important to both government and industry that the information description allows industry to act early with the interface specifications and not wait for them to become an accepted standard.

6.0 Standards

The Alliance does not intend to create a new standard, but to leverage from existing standards and determine a standard method and approach in applying these standards to standardized on how data and information is most easily exchanged from the design environment to the foundry for manufacture. As recommended by the steering committee, in the near term this standard will be comprised of multiple industry-accepted data formats for physical layout with augmented files such as for text and test data. In the long term, the Alliance will work with other standards groups such

```
(*****************************************************************)
(*                                                               *)
(* Copyright 1993, Microelectronics and Computer Technology Corporation *)
(*                        All rights reserved                    *)
(*                                                               *)
(*****************************************************************)
SCHEMA asem;

ENTITY Property;
        name: STRING;
        value: STRING;
END_ENTITY;

ENTITY Layer
        SUBTYPE OF (DbObject);
        lyr: INTEGER;
END_ENTITY;

ENTITY Point
        SUBTYPE OF (DbObject);
        x: REAL;
        y: REAL;
END_ENTITY;

ENTITY BBx
        SUBTYPE OF (DbObject);
        ll: Point;
        ur: Point;
END_ENTITY;

ENTITY Line
        SUBTYPE OF (DbObject);
        lyr: Layer;
        nPath: INTEGER;
        path: LIST OF Point;
END_ENTITY;

ENTITY Path
        SUBTYPE OF (DbObject);
        beginExt: REAL;
        endExt: REAL;
        lyr: Layer;
        netNum: INTEGER;
        nPath: INTEGER;
        path: LIST OF Point;
        pathShape: STRING;
        width: REAL;
END_ENTITY;

ENTITY Rectangle
        SUBTYPE OF (DbObject);
        bBox: BBx;
        lyr: Layer;
END_ENTITY;
```

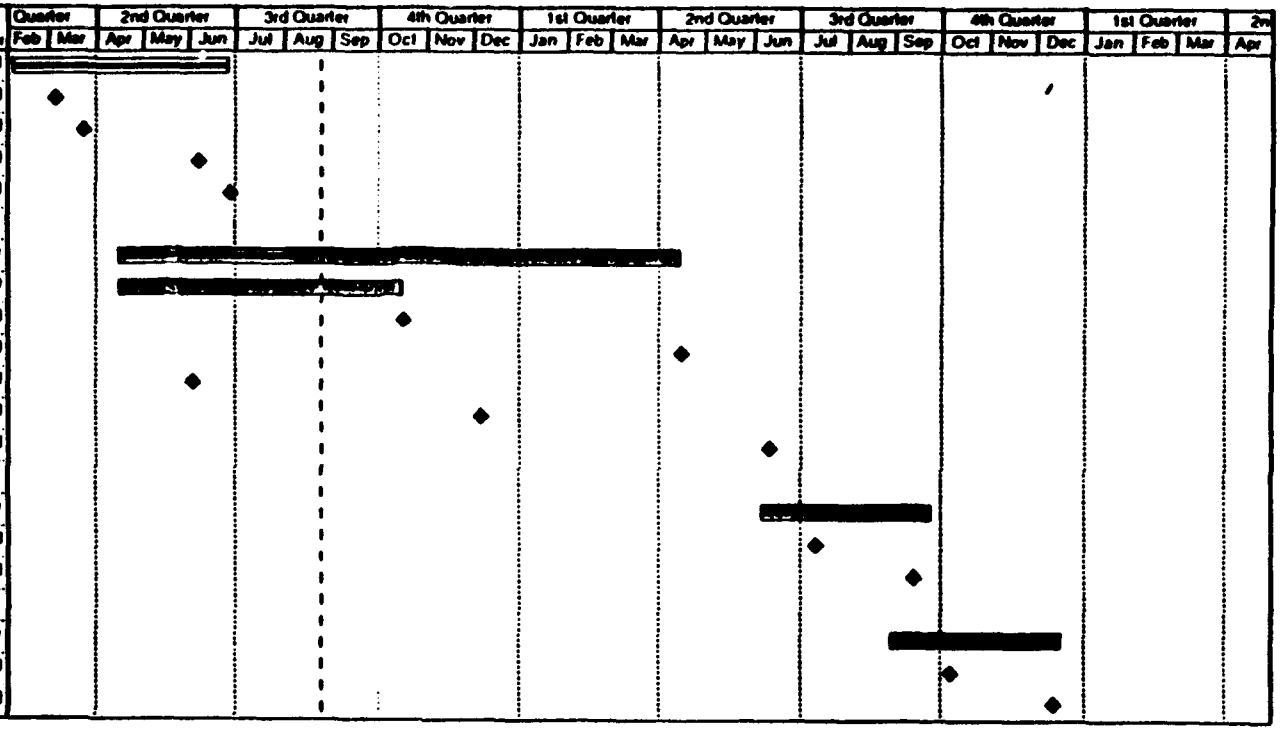
```
        justify: STRING;
        labelType: STRING;
        lyr: Layer;
        orient: STRING,
        angle: REAL;
        theLabel: STRING;
        xy: Point;
ND_ENTITY;

NTITY compIdentText
        SUBTYPE OF (Label);
ND_ENTITY;

NTITY Cell
        SUPERTYPE OF (ONEOF ( via, Padstack, Package,
                              chipReference, Fiducial, chipBondPads, bondPad,
                              connectorPad, connector))
        SUBTYPE OF (DbObject);
        blockName: STRING;
        cellType: STRING;
        objList: LIST OF DbObject;
ND_ENTITY;

NTITY diePhysicalDimensions
        SUBTYPE OF (DbObject);
        chipUnits: REAL;
        x: REAL;
        xTolerance: REAL;
        y: REAL;
        yTolerance: REAL;
        padShape: STRING;
        padCenterlinetoDieCenterline: REAL;
        padCenterlinetoDieCenterlineTolerance: REAL;
        dieThickness: REAL;
        dieThicknessTolerance: REAL;
        minimumDieFeatureSize: REAL;
        minimumDieFeatureSizeTolerance: REAL;
ND_ENTITY;

NTITY bondPadMap
        SUBTYPE OF (DbObject);
        pinOut: LIST OF PadstackOccurrence;
        pinsSkipped: LIST OF PadstackOccurrence;
        xOpeningSize: REAL;
        yOpeningSize: REAL;
ND_ENTITY;

NTITY dieBackSide
        SUBTYPE OF (DbObject);
        materialType: STRING;
        materialThickness: REAL;
        surfaceFinish: STRING;
        electricalPotential: STRING;
        minimumBiasVoltage: REAL;
        votageUnits: REAL;
        minimumBiasCurrent: REAL;
        currentUnits: REAL;
ND_ENTITY;

NTITY dieOperatingTemperature
        SUBTYPE OF (DbObject);
        minimumAllowed: REAL;
        maximumAllowed: REAL;
```

```
        processLimits: physicalProcessLimitations;
        criticalConditions: dieCriticalConditions;
        protectiveLayer: topProtectiveLayer;
        padMetal: diePadMetal;
        attachMaterial: dieAttach;
        handlingLimitations: LIST OF STRING;
        assemblyProtectedAreas: LIST OF Polygon;
        lidSeal: dieLidSeal;
END_ENTITY;

ENTITY wireBondedDie
        SUBTYPE OF (Chip);
        bondWireSize: REAL;
        sizeUnits: REAL;
        downBonds: INTEGER;
END_ENTITY;

ENTITY TABFrameMap
        SUBTYPE OF (DbObject);
        xDimension: REAL;
        yDimension: REAL;
        lengthunits: REAL;
        electricalPotential: REAL;
        potentialunits: REAL;
        pinList: LIST OF PadstackOccurrence;
END_ENTITY;

ENTITY TABbedDie
        SUBTYPE OF (Chip);
        outline: STRING;
        frameMap: TABFrameMap;
        partMap: Occurrence;
        leadframeCoatingMaterial: Material;
        leadFrameCoatingRemoval: LIST OF STRING;
END_ENTITY;

ENTITY dieBumps
        SUBTYPE OF (DbObject);
        location: LIST OF Point;
        centerToCenter: REAL;
        tolerance: REAL;
        lengthUnits: REAL;
        xbump: REAL;
        yBump: REAL;
        closestToEdgeDistance: REAL;
        func: LIST OF STRING;
        minimumBumpToActiveDistance: REAL;
END_ENTITY;

ENTITY FlipChipDie
        SUBTYPE OF (Chip);
        bumps: dieBumps;
        protectiveCoating: Material;
        protectiveCoatingRemoval: LIST OF STRING;
END_ENTITY;

ENTITY Occurrence
        SUPERTYPE OF (ONEOF ( viaOccurrence, PadstackOccurrence,
                              viaHoleOccurrence, viaPadOccurrence,
                              PackageOccurrence, chipReferenceOccurrence,
                              FiducialOccurrence, chipBondPadsOccurrence,
```

```
END_ENTITY;

ENTITY bondPad
        SUBTYPE OF (Cell);
        name: STRING;
END_ENTITY;

ENTITY bondPadOccurrence
        SUBTYPE OF (Occurrence);
        name: STRING;
END_ENTITY;

ENTITY chipBondPads
        SUBTYPE OF (Cell);
        name: STRING;
END_ENTITY;

ENTITY chipBondPadsOccurrence
        SUBTYPE OF (Occurrence);
        name: STRING;
END_ENTITY;

ENTITY connector
        SUBTYPE OF (Cell);
        name: STRING;
END_ENTITY;

ENTITY connectorOccurrence
        SUBTYPE OF (Occurrence);
        name: STRING;
END_ENTITY;

ENTITY connectorPad
        SUBTYPE OF (Cell);
        name: STRING;
END_ENTITY;

ENTITY connectorPadOccurrence
        SUBTYPE OF (Occurrence);
        name: STRING;
END_ENTITY;

ENTITY viaHole
        SUBTYPE OF (DbObject);
        shape: DbObject;
        name: STRING;
END_ENTITY;

ENTITY viaPad
        SUBTYPE OF (DbObject);
        shape: DbObject;
        name: STRING;
END_ENTITY;

ENTITY viaHoleOccurrence
        SUBTYPE OF (Occurrence);
        master: STRING;
        xy: Point;
        rotation: STRING;
        uname: STRING;
END_ENTITY;
```

ASEM CAx Interface Specification Alliance

ID	Name	Duration
1	Task 1- Program Rqmts and Plan	101d
2	1.1 Kickoff Mtg w/ WL	0d
3	1.2 Steering Committee Kickoff	0d
4	1.3 Detailed Steering Committee Mtg	0d
5	Deliverable D-1: Rqmts & Execution Plan	0d
6		
7	Task 2 - Interface Specification Develp	52.2w
8	Pilot Project Verification Demo (Physical Interface)	88888
9	Foundry Interface Specification Developed	0d
10	2.1 1st Major Industry Review Meeting	0d
11	2.2 Begin Technical Subcom Spec Develp	0d
12	2.3 1st Partial Release Interf Specs	0d
13	2.4 Complete Interface Spec Release	0d
14		
15	Task 3 - Industrial Review	18w
16	3.1 Industry Review Meeting	0d
17	Deliverable D-2 Final Interface Spec	0d
18		
19	Task 4 - Candidate Stds Submission	18w
20	Deliverable D-3 Submit Candidate Standards	0d
21	Deliverable D-4 Final Report	0d



Project:
Date: 8/24/93

Critical Noncritical Progress Milestone Summary

F. Market Study Telemarketing Survey

F1. EDA DICE Market Study Telemarketing Program

EDA

DICE MARKET STUDY

TELEMARKETING PROGRAM

NAME: MR./MS. _____

TITLE: _____

COMPANY: _____

ADDRESS: _____

_____

CITY: _____ ST: _____ ZIP: _____

TELEPHONE: _____

Good morning/afternoon this is _____ from Marketing Support Services. I am calling in support of a study sponsored by the ARPA, Advanced Research Projects Agency. This study is collecting information on concurrent engineering software for multichip module design. Your input is very important to us as the information gathered will be included in the study. This study will be distributed to ARPA and made available to a wide range of government agencies. This survey can be done anonymously.

May I please have a few minutes of your time to ask these survey questions?

YES **NO** - May I call you back at a more convenient time?

_____

Thank you.

1. Are you currently utilizing, or planning to use in the future, Multichip Module Technology?

   1. CURRENTLY USING -(Go to ques 3) **2. THE FUTURE-(Go to ques 4)**

   3. NOT USING -(Go to ques 2)

2. Is there someone else in your organization that may be using, or considering using MCM technology?

   YES -(Get name and telephone number, ask to be transferred)

   NO -(Terminate call)

3. In which phases of MCM design or manufacturing are you involved?

			COMMENTS
A. DESIGN	____51	____	_____
B. SUBSTRATE FABRICATION	____52	____	_____
C. ASSEMBLY	____53	____	_____
D. TEST	____54	____	_____
E. DESIGN SOFTWARE	____55	____	_____
F. ENGINEERING SUPPORT	____56	____	_____
G. CONSULTING SERVICES	____57	____	_____

********** GO TO QUESTION 7 **********

4. In which phases of MCM design or manufacturing are you expecting to be involved?

		COMMENTS
A. DESIGN	____58	_____
B. SUBSTRATE FABRICATION	____59	_____
C. ASSEMBLY	____60	_____
D. TEST	____61	_____
E. DESIGN SOFTWARE	____62	_____
F. ENGINEERING SUPPORT	____63	_____
G. CONSULTING SERVICES	____64	_____

5. On a scale of 0 to 10 with 0 indicating not important or not satisfied, and 10 indicating very important or very satisfied, how would you expect to rate the importance and satisfaction of the following activities in which you are considering utilizing MCM technology: **(Ask for ratings only on the ones indicated "IN USE" in ques 4)**

	IMP	SAT	COMMENTS
A. DESIGN	____	____ 1	_____
B. SUBSTRATE FABRICATION	____	____ 2	_____
C. ASSEMBLY	____	____ 3	_____
D. TEST	____	____ 4	_____
E. DESIGN SOFTWARE	____	____ 5	_____
F. ENGINEERING SUPPORT	____	____ 6	_____
G. CONSULTING SERVICES	____	____ 7	_____

6. Which of the following MCM technologies are you planning to use in the future?

		COMMENTS
A. MCM-L LAMINATE	____ 65	____ _____
B. MCM-C CERAMIC THICK FILM	____ 66	____ _____
C. MCM-C CERAMIC LOW TEMPERATURE COFIRED	____ 67	____ _____
D. MCM-D THIN FILM ON SILICON OR CERAMIC	____ 68	____ _____
E. MCM-HDI CHIPS-FIRST	____ 69	____ _____
F. OTHER:	70 _____	

********** **GO TO QUESTION 9** **********

7. On a scale of 0 to 10 with 0 indicating not important or not satisfied, and 10 indicating very important or very satisfied how would you rate the importance and satisfaction of the following categories in which you are utilizing MCM technology: **(Ask for ratings only on the ones indicated "IN USE" in ques 3)**

	IMP	SAT	COMMENTS
A. DESIGN	____	____8	_____
B. SUBSTRATE FABRICATION	____	____9	_____
C. ASSEMBLY	____	____10	_____
D. TEST	____	____11	_____
E. DESIGN SOFTWARE	____	____12	_____
F. ENGINEERING SUPPORT	____	____13	_____
G. CONSULTING SERVICES	____	____14	_____

8. Which of the following MCM technologies are you currently using, or are planning to use in the future?

	IN USE	FUTURE	COMMENTS
A. MCM-L LAMINATE	____	____15	_____
B. MCM-C CERAMIC THICK FILM	____	____16	_____
C. MCM-C CERAMIC LOW TEMPERATURE COFIRED	____	____17	_____
D. MCM-D THIN FILM ON SILICON OR CERAMIC	____	____18	_____
E. MCM-HDI CHIPS-FIRST	____	____19	_____

9. What design tools do you currently use, or plan to use, in your design environment?

A. FOR CAE 72 _____

B. FOR CAD 73 _____

C. FOR CAM 74 _____

D. FOR YOUR OVERALL ENVIRONMENT & FRAMEWORK 75 _____

10. Please rate the following issues relative to the design and manufacturing of MCM's.

	IMP	SAT	COMMENTS
A. DESIGN AUTOMATION SOFTWARE	____	____20	_____
B. THE INTEGRATION OF YOUR DESIGN TOOLS FOR MCM DESIGN	____	____21	_____
C.STANDARDS FOR DATA TRANSFER BETWEEN DESIGN AND MANUFACTURER	____	____22	_____
D.ACCESS TO CHIP & COMPONENT DATA	____	____23	_____
E.KNOWLEDGE OF DESIGN METHODOLOGIES TO IMPLEMENT MCM'S	____	____24	_____
F.AUTOMATED TESTING & QUALITY METHODS	____	____25	_____

11. Using the same 0 to 10 scale, please rate the following capabilities?

	IMP	SAT	COMMENTS
A. AN ENVIRONMENT WHICH ALLOWS THE OPEN, BI-DIRECTIONAL TRANSLATION OF DATA FROM ONE DESIGN SYSTEM TO ANOTHER	____	____26	_____
B.THE CAPABILITY TO DESIGN AN MCM ON TWO DIFFERENT DESIGN SYSTEMS SIMULTANEOUSLY, FOR EXAMPLE AUTOROUTING, THERMAL ANALYSIS, & MANUFACTURING DOCUMENTATION	____	____27	_____
C.THE CAPABILITY TO MOVE DESIGNS AND DATA AMONG SIMILAR APPLICATIONS FROM DIFFERENT EDA VENDORS	____	____28	_____
D.THE CAPABILITY OF STORING THE MCM DATA IN NEUTRAL FILE FORMAT RATHER THAN AN EDA VENDORS NATIVE FORMAT	____	____29	_____
E.THAT EACH SOFTWARE APPLICATION IS BEST IN ITS CLASS	____	____30	_____
F.THAT ALL OR MOST OF THE SOFTWARE USED IN YOUR ENVIRONMENT BE PURCHASED FROM A SINGLE VENDOR	____	____31	_____

12. Please rate the following relative to applications, features or capabilities of an MCM design environment?

	IMP	SAT	COMMENTS
A.SYSTEM SPECIFICATIONS	____	____32	_____
B.SYSTEM PARTITIONING	____	____33	_____
C.AUTOROUTING	____	____34	_____
D.PACKAGING TECHNOLOGY SELECTION	____	____35	_____
E.SUPPORT OF MCM FOUNDRIES WITH DESIGN KITS	____	____36	_____
F.OPTIMIZATION OF MANUFACTURING DATA	____	____37	_____

13. Does your company use CONCURRENT ENGINEERING?

1. YES - (Go to ques 16) **2. NO -(Go to ques 17)**

3. NOT SURE -(Go to ques 14)

14. Our definition of "CONCURRENT ENGINEERING" is:

"Concurrent Engineering consists of a design methodology and the use of design automation systems that promote and support a multi-disciplined engineering team where team members work in parallel to complete an optimal product design in the minimum amount of time."

15. How closely does your current electronic design automation software and systems match the concurrent design environment that was just discussed?

1. VERY CLOSELY **2. CLOSELY** **3. SOMEWHAT**

4. NOT AT ALL **5. OTHER:** _____

16. In your opinion, how important is investing in design automation systems to meet your concurrent engineering requirements? **(Prompt)**

1. EXTREMELY IMPORTANT **2. VERY IMPORTANT**

3. IMPORTANT **4. NOT IMPORTANT**

17. In selecting an MCM manufacturer, please rate the following factors on the 0 to 10 scale.

	IMP	SAT	COMMENTS
A. THE AVAILABILITY OF DESIGN KITS FROM THE MANUFACTURER OR EDA VENDOR.	____	____38	_____
B.THE MCM MANUFACTURES REPUTATION, EXPERIENCE, TRACK RECORD.	____	____39	_____
C.THE TECHNOLOGY OFFERED BY THE MANUFACTURER	____	____40	_____
D.RECURRING COST OF PRODUCTION	____	____41	_____
E.ENGINEERING SUPPORT AND CONSULTING	____	____42	_____

18. Using the same scale please rate the following data exchange standards:

	IMP	SAT	COMMENTS
A.CAD FRAMEWORK INITIATIVE (CFI)	____	____43	_____
B.STEP/PDES	____	____44	_____
C.IGES	____	____45	_____
D.EDIF	____	____46	_____
E.IPC-350	____	____47	_____
F.GERBER	____	____48	_____
G.GDSII STREAM	____	____49	_____
H.DXF	____	____50	_____

19. The last question is an overall satisfaction rating with the effectiveness of your current engineering design environment. What is your rating on the 0 to 10 scale and why?

_____[79] _____

_____

Thank you very much Mr./Ms._____ for your time. Do you have any final comments you would like to make regarding MCM technology?

YES **NO**

_____

_____

_____

****

COMMENTS: _____

_____

_____

_____

_____

_____

F2. Marketing Survey List

Marketing Survey List

1. MOSIS Organizer Engineering Manager
   USC - ISI - MOSIS
   Marina Del Ray, CA

2. Consultant
   IBM
   South Bend, IN

3. Anonymous #1

4. Anonymous #2

5. Anonymous #3

6. Manager Micro Electronics & Communication Technical Program
   Martin Marietta
   Syracuse, NY

7. Sr. Member Technical Staff
   Texas Instruments
   Dallas, TX

8. Advanced Manufacturing Speciliast
   Acustar
   Huntsville, AL

9. Qualcomm

10. Digital Equipment Corporation
    Merrimack, NH

11. Senior Software Engineer
Raytheon CAE Operations
Tewksbury, MA

12. CAD Support
Mayo Clinic
Rochester, MN

13. VP Products/Services
H Chip Inc
San Jose, CA

14. Manager/Advanced Pkg. Technologies
ERIM
Ann Arbor, Mi

15. Drafting Supervisor
Micro Networks
Worchester, MA

16. Harris Government Aerospace Systems Division

17. Harris Cemiconductor

18. Eastman Kodak

19. Motorola

20. Hayes Microcomputer Products

21. Hughes

22. Raytheon

23. Charles Draper Labs

24. Interchip systems Inc.

25. SMI Electronics

26. Motorola

27. Litton Amecon

28. Raytheon

F3. Basic Statistics

Basic Statistics

The pages aa-bb contain the numerical analysis performed by the Telemarketing group.

A summary of the statistics is contained on the following pages.

[redacted] MARKET STUDY SURVEY STATISTICS
SURVEY PERIOD 9312 - ALL RESPONSES
BY QUESTION
GAP INDEX = 1.74

09:25 MONDAY, DECEMBER 6, 1993

CATEGORY	QUESTION	RESPONSES	MEAN IMP	MEAN SAT	MEAN GAP
01-CONSIDERING MCM TECH.	01-05A-DESIGN	3	10.0	9.0	1.0
	04-05D-TEST	1	10.0	5.0	5.0
	05-05E-DESIGN SOFTWARE	1	10.0	9.0	1.0
	06-05F-ENGINEERING SUPPORT	1	10.0	8.0	2.0
	07-05G-CONSULTING SERVICES	1	6.0	7.0	-1.0
02-UTILIZING MCM TECHNOLOGY	08-07A-DESIGN	10	9.3	7.6	1.7
	09-07B-SUBSTRATE FABRICATION	10	9.4	7.5	1.9
	10-07C-ASSEMBLY	12	8.8	8.0	0.8
	11-07D-TEST	14	9.6	6.6	3.0
	12-07E-DESIGN SOFTWARE	11	8.7	6.9	1.8
	13-07F-ENGINEERING SUPPORT	19	8.3	7.4	0.8
	14-07G-CONSULTING SERVICES	12	6.8	7.0	-0.2
04-DESIGN/MFG OF MCM'S	20-10A-DESIGN AUTOMATION SOFTWARE	25	8.5	6.9	1.6
	21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	24	8.3	6.8	1.5
	22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	24	9.2	6.0	3.2
	23-10D-ACCESS TO CHIP & COMPONENT DATA	23	9.3	5.1	4.2
	24-10E-DESIGN METHODS TO IMPLEMENT MCM'S	25	9.4	8.0	1.3
	25-10F-AUTOMATED TESTING & QUALITY METHODS	22	8.7	6.4	2.3
05-CAPABILITIES	26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	23	8.0	4.6	3.4
	27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	21	7.0	5.3	1.7
	28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	23	7.1	4.7	2.5
	29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	23	7.7	4.4	3.3
	30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	24	7.7	6.9	0.8
	31-11F-MOST S/W PURCHASED FROM ONE VENDOR	22	5.2	6.4	-1.2
06-MCM DESIGN ENVIRONMENT	32-12A-SYSTEM SPECIFICATIONS	19	8.2	6.6	1.6
	33-12B-SYSTEM PARTITIONING	21	8.0	5.8	2.2
	34-12C-AUTOROUTING	23	8.5	7.2	1.3
	35-12D-PACKAGING TECHNOLOGY SELECTION	21	8.4	6.2	2.1
	36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	21	7.8	4.9	2.9
	37-12F-OPTIMIZATION OF MANUFACTURING DATA	19	8.1	5.9	2.2
07-SELECTING MCM MFG	38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	20	7.5	5.0	2.5
	39-17B-MFG REPUTATION/EXPERIENCE/RECORD	21	8.9	7.1	1.8
	40-17C-TECHNOLOGY OFFERED BY MANAFACTURER	21	8.8	7.6	1.2
	41-17D-RECURRING COST OF PRODUCTION	20	8.4	5.3	3.2
	42-17E-ENGINEERING SUPPORT & CONSULTING	21	8.1	6.5	1.7
08-DATA EXCHANGE STANDARDS	43-18A-CAD FRAMEWORK INITIATINVE (CFI)	20	6.8	4.8	2.0
	44-18B-STEP/PDES	14	6.4	4.5	1.9
	45-18C-IGES	16	7.3	6.5	0.8
	46-18D-EDIF	22	7.7	5.7	2.0
	47-18E-IPC-350	13	5.5	4.5	0.9
	48-18F-GERBER	23	8.0	7.1	0.9
	49-18G-GDSII STREAM	22	8.0	7.5	0.6

PROGRAM = STATS

EDA DICE MARKET STUDY SURVEY STATISTICS
SURVEY PERIOD 9312 - ALL RESPONSES
BY QUESTION
GAP INDEX = 1.74

09:25 MONDAY, DECEMBER 6, 1993

CATEGORY	QUESTION	RESPONSES	MEAN IMP	MEAN SAT	MEAN GAP
08-DATA EXCHANGE STANDARDS	50-10H-DXF	21	7.3	6.9	0.5

PROGRAM = STATS

EDA DICE MARKET STUDY SURVEY STATISTICS
SURVEY PERIOD 9312 - ALL RESPONSES
RANKED BY DESCENDING IMPORTANCE
GAP INDEX = 1.74

09:25 MONDAY, DECEMBER 6, 1993

CATEGORY	QUESTION	RESPONSES	MEAN IMP	MEAN SAT	MEAN GAP
01-CONSIDERING MCM TECH.	01-05A-DESIGN	3	10.0	9.0	1.0
01-CONSIDERING MCM TECH.	04-05D-TEST	1	10.0	5.0	5.0
01-CONSIDERING MCM TECH.	05-05E-DESIGN SOFTWARE	1	10.0	9.0	1.0
01-CONSIDERING MCM TECH.	06-05F-ENGINEERING SUPPORT	1	10.0	8.0	2.0
02-UTILIZING MCM TECHNOLOGY	11-07D-TEST	14	9.6	6.6	3.0
02-UTILIZING MCM TECHNOLOGY	09-07B-SUBSTRATE FABRICATION	10	9.4	7.5	1.9
04-DESIGN/MFG OF MCM'S	24-10E-DESIGN METHODS TO IMPLEMENT MCM'S	25	9.4	8.0	1.3
02-UTILIZING MCM TECHNOLOGY	08-07A-DESIGN	18	9.3	7.6	1.7
04-DESIGN/MFG OF MCM'S	23-10D-ACCESS TO CHIP & COMPONENT DATA	23	9.3	5.1	4.2
04-DESIGN/MFG OF MCM'S	22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	24	9.2	6.0	3.2
07-SELECTING MCM MFG	39-17B-MFG REPUTATION/EXPERIENCE/RECORD	21	8.9	7.1	1.8
02-UTILIZING MCM TECHNOLOGY	10-07C-ASSEMBLY	12	8.8	8.0	0.8
07-SELECTING MCM MFG	40-17C-TECHNOLOGY OFFERED BY MANAFACTURER	21	8.8	7.6	1.2
02-UTILIZING MCM TECHNOLOGY	12-07E-DESIGN SOFTWARE	11	8.7	6.9	1.8
04-DESIGN/MFG OF MCM'S	25-10F-AUTOMATED TESTING & QUALITY METHODS	22	8.7	6.4	2.3
04-DESIGN/MFG OF MCM'S	20-10A-DESIGN AUTOMATION SOFTWARE	25	8.5	6.9	1.6
06-MCM DESIGN ENVIRONMENT	34-12C-AUTOROUTING	23	8.5	7.2	1.3
06-MCM DESIGN ENVIRONMENT	35-12D-PACKAGING TECHNOLOGY SELECTION	21	8.4	6.2	2.1
07-SELECTING MCM MFG	41-17D-RECURRING COST OF PRODUCTION	20	8.4	5.3	3.2
02-UTILIZING MCM TECHNOLOGY	13-07F-ENGINEERING SUPPORT	19	8.3	7.4	0.8
04-DESIGN/MFG OF MCM'S	21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	24	8.3	6.8	1.5
06-MCM DESIGN ENVIRONMENT	32-12A-SYSTEM SPECIFICATIONS	19	8.2	6.6	1.6
06-MCM DESIGN ENVIRONMENT	37-12F-OPTIMIZATION OF MANUFACTURING DATA	19	8.1	5.9	2.2
07-SELECTING MCM MFG	42-17E-ENGINEERING SUPPORT & CONSULTING	21	8.1	6.5	1.7
05-CAPABILITIES	26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	23	8.0	4.6	3.4
06-MCM DESIGN ENVIRONMENT	33-12B-SYSTEM PARTITIONING	21	8.0	5.8	2.2
08-DATA EXCHANGE STANDARDS	48-18F-GERBER	23	8.0	7.1	0.9
08-DATA EXCHANGE STANDARDS	49-18G-GDSII STREAM	22	8.0	7.5	0.6
06-MCM DESIGN ENVIRONMENT	36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	21	7.8	4.9	2.9
05-CAPABILITIES	29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	23	7.7	4.4	3.3
05-CAPABILITIES	30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	24	7.7	6.9	0.8
08-DATA EXCHANGE STANDARDS	46-18D-EDIF	22	7.7	5.7	2.0
07-SELECTING MCM MFG	38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	20	7.5	5.0	2.5
08-DATA EXCHANGE STANDARDS	45-18C-IGES	16	7.3	6.5	0.8
08-DATA EXCHANGE STANDARDS	50-18H-DXF	21	7.3	6.9	0.5
05-CAPABILITIES	28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	23	7.1	4.7	2.5
05-CAPABILITIES	27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	21	7.0	5.3	1.7
02-UTILIZING MCM TECHNOLOGY	14-07G-CONSULTING SERVICES	12	6.8	7.0	-0.2
08-DATA EXCHANGE STANDARDS	43-18A-CAD FRAMEWORK INITIATINVE (CFI)	20	6.8	4.8	2.0
08-DATA EXCHANGE STANDARDS	44-18B-STEP/PDES	14	6.4	4.5	1.9
01-CONSIDERING MCM TECH.	07-05G-CONSULTING SERVICES	1	6.0	7.0	-1.0
08-DATA EXCHANGE STANDARDS	47-18E-IPC-350	13	5.5	4.5	0.9
05-CAPABILITIES	31-11F-MOST S/W PURCHASED FROM ONE VENDOR	22	5.2	6.4	-1.2

PROGRAM = STATS

EDA DICE MARKET STUDY SURVEY STATISTICS
SURVEY PERIOD 9312 - ALL RESPONSES
RANKED BY DESCENDING GAP
GAP INDEX = 1.74

09:25 MONDAY, DECEMBER 6, 1993

CATEGORY	QUESTION	RESPONSES	MEAN IMP	MEAN SAT	MEAN GAP
01-CONSIDERING MCM TECH.	04-05D-TEST	1	10.0	5.0	5.0
04-DESIGN/MFG OF MCM'S	23-10D-ACCESS TO CHIP & COMPONENT DATA	23	9.3	5.1	4.2
05-CAPABILITIES	26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	23	8.0	4.6	3.4
05-CAPABILITIES	29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	23	7.7	4.4	3.3
04-DESIGN/MFG OF MCM'S	22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	24	9.2	6.0	3.2
07-SELECTING MCM MFG	41-17D-RECURRING COST OF PRODUCTION	20	8.4	5.3	3.2
02-UTILIZING MCM TECHNOLOGY	11-07D-TEST	14	9.6	6.6	3.0
06-MCM DESIGN ENVIRONMENT	36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	21	7.8	4.9	2.9
07-SELECTING MCM MFG	38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	20	7.5	5.0	2.5
05-CAPABILITIES	28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	23	7.1	4.7	2.5
04-DESIGN/MFG OF MCM'S	25-10F-AUTOMATED TESTING & QUALITY METHODS	22	8.7	6.4	2.3
06-MCM DESIGN ENVIRONMENT	37-12F-OPTIMIZATION OF MANUFACTURING DATA	19	8.1	5.9	2.2
06-MCM DESIGN ENVIRONMENT	33-12B-SYSTEM PARTITIONING	21	8.0	5.8	2.2
06-MCM DESIGN ENVIRONMENT	35-12D-PACKAGING TECHNOLOGY SELECTION	21	8.4	6.2	2.1
01-CONSIDERING MCM TECH.	06-05F-ENGINEERING SUPPORT	1	10.0	8.0	2.0
08-DATA EXCHANGE STANDARDS	46-18D-EDIF	22	7.7	5.7	2.0
08-DATA EXCHANGE STANDARDS	43-18A-CAD FRAMEWORK INITIATINVE (CFI)	20	6.8	4.8	2.0
02-UTILIZING MCM TECHNOLOGY	09-07B-SUBSTRATE FABRICATION	10	9.4	7.5	1.9
08-DATA EXCHANGE STANDARDS	44-18B-STEP/PDES	14	6.4	4.5	1.9
07-SELECTING MCM MFG	39-17B-MFG REPUTATION/EXPERIENCE/RECORD	21	8.9	7.1	1.8
02-UTILIZING MCM TECHNOLOGY	12-07E-DESIGN SOFTWARE	11	8.7	6.9	1.8
02-UTILIZING MCM TECHNOLOGY	08-07A-DESIGN	18	9.3	7.6	1.7
07-SELECTING MCM MFG	42-17E-ENGINEERING SUPPORT & CONSULTING	21	8.1	6.5	1.7
05-CAPABILITIES	27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	21	7.0	5.3	1.7
04-DESIGN/MFG OF MCM'S	20-10A-DESIGN AUTOMATION SOFTWARE	25	8.5	6.9	1.6
06-MCM DESIGN ENVIRONMENT	32-12A-SYSTEM SPECIFICATIONS	19	8.2	6.6	1.6
04-DESIGN/MFG OF MCM'S	21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	24	8.3	6.8	1.5
04-DESIGN/MFG OF MCM'S	24-10E-DESIGN METHODS TO IMPLEMENT MCM'S	25	9.4	8.0	1.3
06-MCM DESIGN ENVIRONMENT	34-12C-AUTOROUTING	23	8.5	7.2	1.3
07-SELECTING MCM MFG	40-17C-TECHNOLOGY OFFERED BY MANAFACTURER	21	8.8	7.6	1.2
01-CONSIDERING MCM TECH.	01-05A-DESIGN	3	10.0	9.0	1.0
01-CONSIDERING MCM TECH.	03-05E-DESIGN SOFTWARE	1	10.0	9.0	1.0
08-DATA EXCHANGE STANDARDS	48-18F-GERBER	23	8.0	7.1	0.9
08-DATA EXCHANGE STANDARDS	47-18E-IPC-350	13	5.5	4.5	0.9
02-UTILIZING MCM TECHNOLOGY	10-07C-ASSEMBLY	12	8.8	8.0	0.8
02-UTILIZING MCM TECHNOLOGY	13-07F-ENGINEERING SUPPORT	19	8.3	7.4	0.8
05-CAPABILITIES	30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	24	7.7	6.9	0.8
08-DATA EXCHANGE STANDARDS	45-18C-IGES	16	7.3	6.5	0.8
08-DATA EXCHANGE STANDARDS	49-18G-GDSII STREAM	22	8.0	7.5	0.6
08-DATA EXCHANGE STANDARDS	50-18H-DXF	21	7.3	6.9	0.5
02-UTILIZING MCM TECHNOLOGY	14-07G-CONSULTING SERVICES	12	6.8	7.0	-0.2
01-CONSIDERING MCM TECH.	07-05G-CONSULTING SERVICES	1	6.0	7.0	-1.0
05-CAPABILITIES	31-11F-MOST S/W PURCHASED FROM ONE VENDOR	22	5.2	6.4	-1.2

PROGRAM = STATS

EDA DICE MARKET STUDY SURVEY
OVERALL SATISFACTION
SURVEY PERIOD 9312 - ALL RESPONSES

09:25 MONDAY, DECEMBER 6, 1993

OBS	RESPONSES	OVERALL SATISFACTION AVERAGE
1	27	6.85

PROGRAM = STATS

NON-GAP SUMMARY
SURVEY PERIOD 9312 - ALL RESPONSES

09:25 MONDAY, DECEMBER 6, 1993

QUESTION	ITEM	FREQUENCY COUNT
01-MMT USAGE	CURRENTLY USING	21
	FUTURE MMT USAG	7
03-CURRENT ASSEMBLY		14
03-CURRENT CONSULTING SERVICES		14
03-CURRENT DESIGN		20
03-CURRENT DESIGN SOFTWARE		11
03-CURRENT ENGINEERING SUPPORT		21
03-CURRENT SUBSTRATE FABRICATION		12
03-CURRENT TEST		16
04-FUTURE ASSEMBLY		3
04-FUTURE CONSULTING SERVICES		2
04-FUTURE DESIGN		6
04-FUTURE DESIGN SOFTWARE		4
04-FUTURE ENGINEERING SUPPORT		6
04-FUTURE SUBSTRATE FABRICATION		1
04-FUTURE TEST		4
06-FUTURE MCM-C CERAMIC LOW TEMP COFIRED		4
06-FUTURE MCM-C CERAMIC THICK FILM		3
06-FUTURE MCM-D THIN FILM ON SILICON OR CERAMIC		3
06-FUTURE MCM-MDI CHIPS-FIRST		1
06-FUTURE MCM-L LAMINATE		4
06-FUTURE OTHER		1
08-MCM-C CERAMIC LOW TEMP COFIRED	CURRENT	13
	FUTURE	2
08-MCM-C CERAMIC THICK FILM	CURRENT	12
	FUTURE	1

PROGRAM = DEMO

NON-GAP SUMMARY
SURVEY PERIOD 9312 - ALL RESPONSES

09:25 MONDAY, DECEMBER 6, 1993

QUESTION	ITEM	FREQUENCY COUNT
08-MCM-D THIN FILM ON SILICON OR CERAMIC	CURRENT	11
	FUTURE	1
08-MCM-HDI CHIPS-FIRST	CURRENT	5
	FUTURE	4
08-MCM-L LAMINATE	CURRENT	13
	FUTURE	5
09-DESIGN TOOLS	FOR CAE	27
	FOR CAD	28
	FOR CAM	23
	FOR OVERALL	27
13-CURRENT ENGINEERING	YES	24
	NO	3
	NOT SURE	1
15-MATCH CONCURRENT DESIGN ENVIRONMENT	OTHER	1
16-INVESTING IN DESIGN AUTOMATION SYSTEMS	EXTREMELY IMPOR	11
	VERY IMPORTANT	6
	IMPORTANT	6
	NOT IMPORTANT	1

PROGRAM = DEMO

COMMENTS FROM EDA DICE MARKET STUDY SURVEY
BY CATEGORY BY QUESTION NUMBER
SURVEY PERIOD 9312 - ALL RESPONSES

09:25 MONDAY, DECEMBER 6, 1993

CATEGORY=' '

QUESTION	RESPONSE NUMBER	COMMENT
78-16-IMPORTANCE INVEST DESIGN AUTOMATION	8	BENEFITS HAVE NOT BEEN WELL DEMONSTRATED BY VENDORS.

CATEGORY=01-CONSIDERING MCM TECH.

QUESTION	RESPONSE NUMBER	COMMENT
03-05C-ASSEMBLY	12	NO PERSONAL INVOLVEMENT.
04-05D-TEST	12	NO PERSONAL INVOLVEMENT.
04-05D-TEST	27	INFRASTRUCTURE NOT THERE. STILL VERY IMMATURE.
06-05F-ENGINEERING SUPPORT	12	WOULD BE EVALUATING HIMSELF. NOT COMFORTABLE WITH.

CATEGORY=01-CONSIDERING USING MCM

QUESTION	RESPONSE NUMBER	COMMENT
68-6D-MCM-D THIN FILM ON SILICON OR CERAMI	12	"CHIPS & WIRE" APPLICATION UNDERWAY.
69-6E-MCM-MDI CHIPS-FIRST	12	NOT SURE
70-6F-OTHER	1	PROPERTIES OF MATERIALS NOT YET INVESTIGATED. COST IS PRIMARY
70-6F-OTHER	1	CONSIDERATION.

CATEGORY=02-UTILIZING MCM TECH.

QUESTION	RESPONSE NUMBER	COMMENT
52-3B-SUBSTRATE FABRICATION	8	SUBCONTRACT THIS ACTIVITY.
53-3C-ASSEMBLY	8	SUBCONTRACT THIS ACTIVITY
55-3E-DESIGN SOFTWARE	5	USE IT, DON'T MANUFACTURE.
55-3E-DESIGN SOFTWARE	8	USE, DON'T CREATE.
55-3E-DESIGN SOFTWARE	11	USE, DON'T DESIGN
56-3F-ENGINEERING SUPPORT	6	INFREQUENT
56-3F-ENGINEERING SUPPORT	11	EXTERNAL
57-3G-CONSULTING SERVICES	5	ONLY TO RAYTHEON.
57-3G-CONSULTING SERVICES	14	EXTERNAL

CATEGORY=02-UTILIZING MCM TECHNOLO

QUESTION	RESPONSE NUMBER	COMMENT
08-07A-DESIGN	3	"UNCLEAR", CATEGORY NOT SPECIFIC ENOUGH TO ANSWER.
08-07A-DESIGN	5	USES A TOOL DESIGNED FOR CIRCUITBOARDS; DOESN'T ALWAYS WORK FOR MCM.
08-07A-DESIGN	6	DESIGN TOOLS IMMATURE.
08-07A-DESIGN	8	RATED TOOLS.
08-07A-DESIGN	14	MANY DESIGNS IMMATURE.

PROGRAM = COMMENTS

COMMENTS FROM CDA DICE MARKET STUDY SURVEY
BY CATEGORY BY QUESTION NUMBER
SURVEY PERIOD 9312 - ALL RESPONSES

09:25 MONDAY, DECEMBER 6, 1993

CATEGORY=02-UTILIZING MCM TECHNOLO
(CONTINUED)

QUESTION	RESPONSE NUMBER	COMMENT
08-07A-DESIGN	23	ONLY USE SENIOR EXPERIENCED PEOPLE, MAINLY M.I.T.'S WITH MASTER DEGREES
08-07A-DESIGN	23	AND 12 PLUS YEARS OF EXPERIENCE.
08-07A-DESIGN	24	"CURRENT DESIGN DOES NOT MEET OUR NEEDS."
09-07B-SUBSTRATE FABRICATION	3	"UNCLEAR", CATEGORY NOT SPECIFIC ENOUGH TO ANSWER.
09-07B-SUBSTRATE FABRICATION	6	IMMATURE PROCESSES, LIMITED VENDOR POOL.
10-07C-ASSEMBLY	3	"UNCLEAR", CATEGORY NOT SPECIFIC ENOUGH TO ANSWER.
10-07C-ASSEMBLY	20	LOW YIELDS.
11-07D-TEST	3	"UNCLEAR", CATEGORY NOT SPECIFIC ENOUGH TO ANSWER.
11-07D-TEST	6	LIMITED TOOLS FOR TEST GENERATION. NEED BETTER.
11-07D-TEST	8	RATED FACILITIES.
11-07D-TEST	10	INDUSTRY AWARENESS OF TEST SOLUTIONS SEEM VAGUE.
11-07D-TEST	14	COMPLEX BECAUSE IT IS A SUBSYSTEM. STILL IMMATURE.
11-07D-TEST	17	NO GOOD DIE.
11-07D-TEST	22	JUST LEARNING TO DESIGN FOR TEST.
12-07E-DESIGN SOFTWARE	4	"WE DO IT RIGHT THE FIRST TIME."
12-07E-DESIGN SOFTWARE	5	USES A TOOL DESIGNED FOR CIRCUITBOARDS, DOESN'T ALWAYS WORK FOR MCM.
12-07E-DESIGN SOFTWARE	14	DESIGN TECHNOLOGY NEEDS SOME IMPROVEMENTS.
12-07E-DESIGN SOFTWARE	16	SIMULATION CRITICAL TO SUCCESS, AND TOOLS ARE NOT SUFFICIENT.
12-07E-DESIGN SOFTWARE	18	NOT ALL CAD VENDORS SUPPORT MCM TECHNOLOGY.
12-07E-DESIGN SOFTWARE	23	TOOLS VERY HARD TO USE, AND BARELY CAPABLE OF DOING JOB.
13-07F-ENGINEERING SUPPORT	3	"UNCLEAR", CATEGORY NOT SPECIFIC ENOUGH TO ANSWER.
13-07F-ENGINEERING SUPPORT	5	SATISFACTION RATING WOULD BE BIASED.
13-07F-ENGINEERING SUPPORT	8	SEPARATE WHAT SUBCONTRACTOR CAN OFFER VS. WHAT CUSTOMER CAN DO ON THEIR
13-07F-ENGINEERING SUPPORT	8	OWN.
13-07F-ENGINEERING SUPPORT	14	MANUFACTURERS AND DESIGNERS DON'T UNDERSTAND THE BUSINESS WELL-ENOUGH
13-07F-ENGINEERING SUPPORT	14	YET.
13-07F-ENGINEERING SUPPORT	18	LIBRARIES NOT AVAILABLE SUPPORTING MCM.
13-07F-ENGINEERING SUPPORT	23	MAJOR PROBLEM IS GETTING INFORMATION ON IC'S.
14-07G-CONSULTING SERVICES	3	PROVIDE CONSULTING SERVICES, DON'T USE CONSULTING SERVICES.
14-07G-CONSULTING SERVICES	4	"WE KNOW WHAT WE'RE DOING."
14-07G-CONSULTING SERVICES	5	SATISFACTION RATING WOULD BE BIASED.
14-07G-CONSULTING SERVICES	11	SATISFACTION RATING OF 5 APPLIES TO RECEIPT OF SERVICES. WOULD RATE
14-07G-CONSULTING SERVICES	11	HIS FIRM AN 8 AS A SERVICE PROVIDER.
14-07G-CONSULTING SERVICES	23	ALWAYS ROOM FOR IMPROVEMENT.

CATEGORY=03-PLANNING OR USING MCM

QUESTION	RESPONSE NUMBER	COMMENT
15-08A-MCM-L LAMINATE	4	NO PLANS.
15-08A-MCM-L LAMINATE	6	SOME USE.
15-08A-MCM-L LAMINATE	8	NEAR FUTURE.
15-08A-MCM-L LAMINATE	20	IN EVALUATION NOW.
16-08B-MCM-C CERAMIC THICK FILM	4	NO PLANS.
16-08B-MCM-C CERAMIC THICK FILM	5	CERAMIC HYBRID USED.
16-08B-MCM-C CERAMIC THICK FILM	11	FORMER USE.
16-08B-MCM-C CERAMIC THICK FILM	20	PHASING OUT.
17-08C-MCM-C CERAMIC LOW TEMP COFIRED	4	NO PLANS.

PROGRAM = COMMENTS

CATEGORY=03-PLANNING OR USING MCM
(CONTINUED)

QUESTION	RESPONSE NUMBER	COMMENT
17-08C-MCM-C CERAMIC LOW TEMP COFIRED	6	PREDOMINANTLY USED.
17-08C-MCM-C CERAMIC LOW TEMP COFIRED	11	FORMER USE.
17-08C-MCM-C CERAMIC LOW TEMP COFIRED	20	IN EVALUATION.
18-08D-MCM-D THIN FILM ON SILICON/CERAMIC	11	FORMER USE.
18-08D-MCM-D THIN FILM ON SILICON/CERAMIC	13	NO PLANS.
18-08D-MCM-D THIN FILM ON SILICON/CERAMIC	14	POSSIBLE USE, NOT IN IMMEDIATE FUTURE.
18-08D-MCM-D THIN FILM ON SILICON/CERAMIC	20	NOW USING, BUT NEEDS WORK TO IMPROVE YIELDS.
18-08D-MCM-D THIN FILM ON SILICON/CERAMIC	24	COST TOO HIGH.
19-08E-MCM-MDI CHIPS-FIRST	3	NO PLANS.
19-08E-MCM-MDI CHIPS-FIRST	4	NO PLANS.
19-08E-MCM-MDI CHIPS-FIRST	7	NO PLANS.
19-08E-MCM-MDI CHIPS-FIRST	11	NO PLANS.
19-08E-MCM-MDI CHIPS-FIRST	14	DOESN'T KNOW WHAT "CHIPS FIRST" IS.
19-08E-MCM-MDI CHIPS-FIRST	20	WILL PROBABLY NEVER USE DUE TO FACT IT WON'T MEET MILITARY STANDARDS.

CATEGORY=04-DESIGN/MFG OF MCM'S

QUESTION	RESPONSE NUMBER	COMMENT
20-10A-DESIGN AUTOMATION SOFTWARE	4	"OUR DLS."
20-10A-DESIGN AUTOMATION SOFTWARE	5	"RETRO-FITED TECHNOLOGY."
20-10A-DESIGN AUTOMATION SOFTWARE	6	MCM SOFTWARE IMMATURE, FULL MCM SIMULATION NOT FEASIBLE YET.
20-10A-DESIGN AUTOMATION SOFTWARE	8	AREN'T ENOUGH LINKS OF ANY PARTICULAR CAD TOOL PROVIDER, NOT INTERFACED
20-10A-DESIGN AUTOMATION SOFTWARE	8	TO ENOUGH MCM MANUFACTURERS.
20-10A-DESIGN AUTOMATION SOFTWARE	13	TOO COMPLEX TO DISCUSS.
20-10A-DESIGN AUTOMATION SOFTWARE	20	IN PROCESS. WILL BE IMPORTANT.
20-10A-DESIGN AUTOMATION SOFTWARE	27	FINE FOR DIGITAL.
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	3	THE IMPORTANCE OF DESIGN TOOLS IS OVERRATED, DESIGN TASKS ARE NOT
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	3	EXTREMELY DIFFICULT.
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	4	"OUR TOOLS STAND ALONE."
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	7	VENDORS ARE INTERESTED ONLY IN PUSHING THEIR PRODUCTS, RATHER THAN
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	7	MAKING INTEGRATION EASY.
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	13	"INDUSTRY HAS A WAYS TO GO."
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	14	TOOLS "AREN'T THERE YET," AND ARE "TOO STAND ALONE." INTEGRATION
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	14	REQUIRES INTERNAL WORK.
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	18	TRANSLATION DATA REQUIRED.
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	21	STILL WORKING ON IT.
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	24	STILL NEW TECHNOLOGY. DON'T KNOW IF HAPPY YET.
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	25	DEVELOPED FOR WIRED BOARDS. WON'T WORK AS ANALYSIS TOOL.
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	2	"THERE ARE NO STANDARDS."
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	3	NOTHING IN PLACE YET, LOTS MORE TO BE DONE.
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	5	USES EXISTING STANDARDS FOR OTHER PRODUCT DOMAINS THAT DON'T MEET MCM
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	5	NEEDS.
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	7	VENDORS PREFER USING THEIR OWN INTERNAL FORMATS INSTEAD OF ESTABLISHING
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	7	STANDARDS.
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	8	"PARTICIPATING IN ARPA ASIM AT MCC" TO WORK ON IMPROVMENT FOR THIS.
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	11	NO STANDARD FOR THIS REALLY, EXCEPT FOR GERBER.
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	16	NECESSARY TO ACHIEVE LOW COST AND FIRST TIME SUCCESS, AND STANDARDS

PROGRAM = COMMENTS

COMMENTS FROM LDA DICE MARKET STUDY SURVEY
BY CATEGORY BY QUESTION NUMBER
SURVEY PERIOD 9312 - ALL RESPONSES

09:25 MONDAY, DECEMBER 6, 1993

CATEGORY=04-DESIGN/MFG OF MCM'S
(CONTINUED)

QUESTION	RESPONSE NUMBER	COMMENT
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	16	ARE NOT WIDELY AVAILABLE.
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	17	DON'T DO MUCH IN THIS FIELD. NOT REAL FAMILIAR.
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	18	CAD VENDOR OUTPUT INCOMPATIBLE WITH MANUFACTURING.
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	19	ARE NO STANDARDS IN THE MARKET AND NO ONE IS WORKING HARD ENOUGH ON
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	19	THEM.
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	21	NOT WELL DEVELOPED YET.
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	27	NEVER AS TRANSPARENT AS PEOPLE CLAIM.
23-10D-ACCESS TO CHIP & COMPONENT DATA	2	MOST VENDORS DON'T OFFER.
23-10D-ACCESS TO CHIP & COMPONENT DATA	4	INDUSTRY STANDARDS MISSING.
23-10D-ACCESS TO CHIP & COMPONENT DATA	6	PAD LAYOUTS AND SIMULATION MODELS (INCLUDING TIME ANALYSIS) ARE
23-10D-ACCESS TO CHIP & COMPONENT DATA	6	DIFFICULT TO GET FROM VENDORS.
23-10D-ACCESS TO CHIP & COMPONENT DATA	7	IC VENDORS SLOW TO PROVIDE BARE DIE DATA TO LEVEL PROVIDED FOR
23-10D-ACCESS TO CHIP & COMPONENT DATA	7	PACKAGED DIE DATA.
23-10D-ACCESS TO CHIP & COMPONENT DATA	8	FEW CHIP MANUFACTURERS WILL PROVIDE DATA. THOSE WHO DO PROVIDE DATA
23-10D-ACCESS TO CHIP & COMPONENT DATA	8	DON'T PROVIDE VERY MUCH.
23-10D-ACCESS TO CHIP & COMPONENT DATA	9	INFORMATION SHOULD BE PRINTED IN DATA BOOK. AT PRESENT, NEED TO MAKE
23-10D-ACCESS TO CHIP & COMPONENT DATA	9	FORMAL, WRITTEN REQUEST. ACCESS SHOULD BE EASY.
23-10D-ACCESS TO CHIP & COMPONENT DATA	10	"I'M SPOILED BECAUSE I WORK FOR SEMI-CONDUCTOR."
23-10D-ACCESS TO CHIP & COMPONENT DATA	11	HAVE TO INSERT INFORMATION INTO SYSTEM MANUALLY, NO STANDARD FOR
23-10D-ACCESS TO CHIP & COMPONENT DATA	11	ACCESS.
23-10D-ACCESS TO CHIP & COMPONENT DATA	14	ALREADY HAVE FROM MOTOROLA.
23-10D-ACCESS TO CHIP & COMPONENT DATA	16	COMMERCIAL/MILITARY VENDORS NOT FULLY SUPPORTIVE OF CHIP SALES.
23-10D-ACCESS TO CHIP & COMPONENT DATA	18	CHIP VENDORS DATA UNAVAILABLE AND INACCURATE.
23-10D-ACCESS TO CHIP & COMPONENT DATA	19	TOO EXPENSIVE.
23-10D-ACCESS TO CHIP & COMPONENT DATA	20	DESIGN OUR OWN.
23-10D-ACCESS TO CHIP & COMPONENT DATA	21	HARD TO COME BY.
23-10D-ACCESS TO CHIP & COMPONENT DATA	22	INFORMATION NOT AVAILABLE FROM VENDORS ON STANDARD FORMAT.
23-10D-ACCESS TO CHIP & COMPONENT DATA	23	A MAJOR PROBLEM.
23-10D-ACCESS TO CHIP & COMPONENT DATA	25	NO KNOWN GOOD DIE.
23-10D-ACCESS TO CHIP & COMPONENT DATA	27	VENDORS NOT SET UP. MUST CHASE DOWN PRODUCT ENGINEERS AND MANAGERS
23-10D-ACCESS TO CHIP & COMPONENT DATA	27	TO ACQUIRE INFORMATION.
24-10E-DESIGN METHODS TO IMPLEMENT MCM'S	2	TRANSFER STANDARDS STILL NEED IMPROVEMENT.
24-10E-DESIGN METHODS TO IMPLEMENT MCM'S	5	MCM STILL IN INFANCY. NEEDS D.O.D./VENDOR/USER COALITION TO DEVELOP A
24-10E-DESIGN METHODS TO IMPLEMENT MCM'S	5	GOOD METHODOLOGY.
24-10E-DESIGN METHODS TO IMPLEMENT MCM'S	11	LOTS OF TALK, LITTLE ACTION OR REAL KNOWLEDGE.
24-10E-DESIGN METHODS TO IMPLEMENT MCM'S	18	MARKET TOOL.
25-10F-AUTOMATED TESTING & QUALITY METHODS	8	THING MISSING IS TEST SYSTEMS THAT MEET NEED FOR MCM DESIGNS THAT ARE
25-10F-AUTOMATED TESTING & QUALITY METHODS	8	IN BETWEEN PRINT CIRCUITBOARDS OR INTEGRATED CIRCUITS.
25-10F-AUTOMATED TESTING & QUALITY METHODS	11	TEST IS A PROBLEM.
25-10F-AUTOMATED TESTING & QUALITY METHODS	14	FRAGMENTED.
25-10F-AUTOMATED TESTING & QUALITY METHODS	17	NO GOOD SILICON SUPPLIERS. SUPPLIERS NOT ON BOARD WITH TESTED DIE.
25-10F-AUTOMATED TESTING & QUALITY METHODS	18	INCOMING DIE STANDARDS MUST BE PERFECT, QUALITY NEED TO BE STEPPED UP.
25-10F-AUTOMATED TESTING & QUALITY METHODS	20	IMPLEMENTING #.
25-10F-AUTOMATED TESTING & QUALITY METHODS	27	ABILITY TO ACQUIRE KNOWN GOOD DIE, NO GOOD SOLUTION. FIXTURING IS A
25-10F-AUTOMATED TESTING & QUALITY METHODS	27	PROBLEM WITH DIGITAL -- ANALOG ON IT'S OWN.

PROGRAM = COMMENTS

CATEGORY=05-CAPABILITIES

QUESTION	RESPONSE NUMBER	COMMENT
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	2	DATA TRANSFERS DIFFICULT, I.E., CADENCE TO MENTOR.
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	5	NO EXISTING STANDARD SATISFIES THIS NEED.
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	6	NEARLY IMPOSSIBLE TO DO THIS.
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	7	VENDORS ARE TOO PROPRIETARY.
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	11	NO STAND FOR THIS CAPABILITY THAT HE IS AWARE OF.
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	13	CAD AND CAE STANDARDS NOT FIRM YET. SOFTWARE IS UNPROVEN. INDUSTRY
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	13	IS HEADING RIGHT WAY, MOST NOT SMOOTH YET. POINT SOLUTION INTEGRATION
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	13	IS "NOT THERE YET."
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	16	LACK OF STANDARDS. CAD/CAE VENDORS SLOW TO ADOPT EXISTING STANDARDS.
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	18	FOUNDRIES NEED TO ACCEPT DATA FROM MANY CAD SYSTEMS.
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	19	NOT ONE ON MARKET. STILL NEEDS TO BE DEVELOPED.
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	20	LEADER OF ASEM FOR ARPA CONTRACT.
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	21	STILL NOT FULLY DEVELOPED YET.
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	22	WILL IMPLEMENT FURTHER DOWN THE ROAD.
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	27	NOT AS TRANSPARENT AS PEOPLE CLAIM.
27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	2	UNIQUE STEPS NECESSARY, NO GOOD INTEGRATION.
27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	3	NOT A BIG ISSUE; DON'T THINK MANY WILL WANT.
27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	5	NO FRAMEWORK OR DATA STANDARD IN PLACE TO PERFORM THIS EFFORT.
27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	6	NOT FEASIBLE WITH TODAY'S TOOLS.
27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	7	ACTIVITY WILL BE DIFFICULT TO DO UNTIL EDA VENDORS STOP PUSHING
27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	7	PROPRIETARY FORMATS.
27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	8	HAVE CONTRACT REQUIREMENT FOR THIS CAPABILITY. DIFFICULT TO DO. LACK
27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	8	OF LINKAGE BETWEEN VENDORS IS VERY LIMITING.
27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	19	DOESN'T MATTER.
27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	20	DON'T SEE A NEED TO DO.
28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	2	UNIQUE STEPS NECESSARY, NO GOOD INTEGRATION.
28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	5	NO FRAMEWORK OR DATA STANDARD IN PLACE TO PERFORM THIS EFFORT.
28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	7	WILL BE DIFFICULT TO DO UNTIL STANDARDS ARE IDENTIFIED AND SUPPORTED
28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	7	FOR DESCRIBING DATA AT VARIOUS LEVELS.
28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	10	NEED SOME STANDARD FORMAT.
28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	16	IMPORTANT FOR DESIGN REUSE. STATISTICAL LACK OF STANDARDS.
28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	18	BEST TOOLS FOR DIFFERENT ANALYSIS MAY COME FROM DIFFERENT VENDORS.
28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	20	HAVE NO REASON TO DO THIS.
28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	21	NOT DEVELOPED WELL.
28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	22	WILL IMPLEMENT LATER.
28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	23	HARD TO DO. WOULD BE GREAT IF WE COULD.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	2	FORMATS NOT WELL-STANDARDIZED.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	5	ADVENT OF STEP STANDARD WILL REQUIRE THE DELIVERY OF STEP FOR MCM
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	5	PRODUCTS.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	6	NOT AN ISSUE.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	7	NEUTRAL FILE IS NOT DEFINED TO COVER DIFFERENT MCM DESIGN LEVELS. WILL
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	7	BE CHALLENGE TO GET VENDOR SUPPORT ONCE THEY ARE DEFINED.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	8	DOESN'T EXIST, REALLY.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	11	NO REAL STANDARD FOR THIS.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	14	TECHNOLOGY IS STILL EVOLVING.

CATEGORY=05-CAPABILITIES
(CONTINUED)

QUESTION	RESPONSE NUMBER	COMMENT
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	18	NEUTRAL FORMAT, CAD SYSTEM INDEPENDENT.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	19	STILL NEEDS DEVELOPING.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	20	DON'T KNOW.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	21	NOT AWARE IT CAN BE DONE.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	22	WILL IMPLEMENT LATER.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	23	CAN'T BE DONE.
30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	5	"INTEGRATION MISSING."
30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	6	MCM POINT TOOLS ARE VERY IMMATURE.
30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	7	MORE IMPORTANT TO OPTIMIZE ENTIRE DESIGN PROCESS THAN TO HAVE THE BEST
30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	7	DESIGN TOOL IN ITS CLASS.
30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	15	VERY HARD FOR ONE VENDOR TO DEVELOP JOB AND SUPPORT DESIGN.
30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	16	SOFTWARE VENDORS HAVE NOT ADOPTED OPEN FRAME WORK.
30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	18	MEET CUSTOMERS REQUIREMENTS.
30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	20	"DUMB QUESTION."
30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	22	IMMATURE TECHNOLOGY.
30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	23	WE USE WIDE VARIETY OF TOOLS.
31-11F-MOST S/W PURCHASED FROM ONE VENDOR	2	MULTIPLE VENDORS ARE ACCEPTABLE WHEN INTEGRATION IS GOOD.
31-11F-MOST S/W PURCHASED FROM ONE VENDOR	5	BETTER IF COULD BUY SEPARATE TOOLS FROM SEPARATE VENDORS. VENDORS
31-11F-MOST S/W PURCHASED FROM ONE VENDOR	5	SHOULD WORK TOGETHER IN INTEGRATION.
31-11F-MOST S/W PURCHASED FROM ONE VENDOR	8	CAN'T STANDARDIZE ALL ON ONE SET OF TOOLS TO GET ALL OF THE
31-11F-MOST S/W PURCHASED FROM ONE VENDOR	8	TECHNOLOGIES REQUIRED.
31-11F-MOST S/W PURCHASED FROM ONE VENDOR	17	EACH SOFTWARE PACKAGE DIFFERENT. INVOLVES PRODUCT, CAPABILITY, AND
31-11F-MOST S/W PURCHASED FROM ONE VENDOR	17	QUALITY.
31-11F-MOST S/W PURCHASED FROM ONE VENDOR	20	NOT IMPORTANT.

CATEGORY=06-MCM DESIGN ENVIRONMENT

QUESTION	RESPONSE NUMBER	COMMENT
32-12A-SYSTEM SPECIFICATIONS	3	"UNCLEAR", NOT SPECIFIC ENOUGH TO ANSWER.
32-12A-SYSTEM SPECIFICATIONS	6	LITTLE COUPLING BETWEEN SYSTEM REQUIREMENT TOOLS AND LOWER LEVEL TOOLS.
32-12A-SYSTEM SPECIFICATIONS	7	TOOLS IMMATURE AND SYSTEM SPECIFIC.
32-12A-SYSTEM SPECIFICATIONS	10	"DON'T UNDERSTAND" WHAT THE SYSTEM SPECIFICATIONS APPLIES TO.
32-12A-SYSTEM SPECIFICATIONS	18	NOT MANY SYSTEM TOOLS AVAILABLE.
32-12A-SYSTEM SPECIFICATIONS	27	DON'T DO IT.
33-12B-SYSTEM PARTITIONING	3	"UNCLEAR", NOT SPECIFIC ENOUGH TO ANSWER.
33-12B-SYSTEM PARTITIONING	4	DESIGNERS AREN'T USED TO THE LEVEL OF INTEGRATION POSSIBLE.
33-12B-SYSTEM PARTITIONING	7	PARTITIONING OFTEN DONE BEFORE SPECIFICTIONS, OFTEN NOT A BIG ROLE
33-12B-SYSTEM PARTITIONING	7	PLAYED.
33-12B-SYSTEM PARTITIONING	16	CURRENT TOOLS DON'T ADDRESS HIGH LEVEL BEHAVIORAL SIMULATION TO ALLOW
33-12B-SYSTEM PARTITIONING	16	PARTITION OPTIMIZING.
33-12B-SYSTEM PARTITIONING	23	TOOLS DON'T EXIST.
33-12B-SYSTEM PARTITIONING	27	HIGH LEVEL SIMULATION NOT THERE.
34-12C-AUTOROUTING	2	NOT WELL-ADAPTED TO MCM YET.
34-12C-AUTOROUTING	3	"UNCLEAR", NOT SPECIFIC ENOUGH TO ANSWER.
34-12C-AUTOROUTING	4	DON'T USE IT.
34-12C-AUTOROUTING	6	AUTOROUTING TOO DIFFICULT FOR MASSES TO USE. DIFFICULTY ROUTING FULL
34-12C-AUTOROUTING	6	MCM'S.

CATEGORY=06-MCM DESIGN ENVIRONMENT
(CONTINUED)

QUESTION	RESPONSE NUMBER	COMMENT
34-12C-AUTOROUTING	10	HARD TO FINDS TOOLS FOR 100% COMPLETION ON COMPLEX APPLICATIONS.
34-12C-AUTOROUTING	12	CONSIDERING MULTILAYER. USING SINGLE LAYER NOW.
34-12C-AUTOROUTING	14	SOME TOOLS BETTER THAN OTHERS. STILL A LOT TO BE LEARNED.
34-12C-AUTOROUTING	18	FALL SHORT SUPPORTING MCM DENSITY REQUIREMENTS.
35-12D-PACKAGING TECHNOLOGY SELECTION	3	"UNCLEAR", NOT SPECIFIC ENOUGH TO ANSWER.
35-12D-PACKAGING TECHNOLOGY SELECTION	7	PROVIDERS UNWILLING TO RELEASE INFORMATION, SEEM TO FEAR EXCLUSION IN
35-12D-PACKAGING TECHNOLOGY SELECTION	7	LATER STAGE OF DEVELOPMENT OF MCM TECHNOLOGY.
35-12D-PACKAGING TECHNOLOGY SELECTION	8	"DOESN'T EXIST, REALLY."
35-12D-PACKAGING TECHNOLOGY SELECTION	9	"REALLY NOTHING AVAILABLE NOW."
35-12D-PACKAGING TECHNOLOGY SELECTION	10	A DECISION-MAKING TOOL WOULD BE HELPFUL.
35-12D-PACKAGING TECHNOLOGY SELECTION	22	STILL HAVE A LONG WAY TO GO.
35-12D-PACKAGING TECHNOLOGY SELECTION	23	DOESN'T EXIST.
35-12D-PACKAGING TECHNOLOGY SELECTION	27	DON'T GIVE HELP IN SIMULATION AND VARIATION. HAVE TO DRAW ON PAST
35-12D-PACKAGING TECHNOLOGY SELECTION	27	EXPERIENCE.
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	2	FEW VENDORS OFFER.
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	3	"UNCLEAR", NOT SPECIFIC ENOUGH TO ANSWER.
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	6	KITS JUST BECOMING AVAILABLE. "JUST NOT THERE."
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	7	"NOT MUCH THERE." FOUNDRIES JUST BEGINNING TO BUILD KITS.
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	8	NOT NEARLY ENOUGH INTERCONNECTION, AND NOT ENOUGH DESIGN KITS.
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	11	DO NOT USE.
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	12	"HASN'T GONE ALL TOO SMOOTH."
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	18	NOT MANY DESIGN KITS AVAILABLE FOR TECHNOLOGY.
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	20	EMERGING TECHNOLOGY.
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	22	DON'T HAVE ANY REAL DESIGN KITS YET.
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	23	VERY FEW KITS AVAILABLE. THOSE THAT ARE AVAILABLE ARE GEARED TO
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	23	SPECIFIC DESIGNS.
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	27	DON'T DO IT; WHEN THEY DO, WON'T GUARANTEE. COST.
37-12F-OPTIMIZATION OF MANUFACTURING DATA	3	"UNCLEAR", NOT SPECIFIC ENOUGH TO ANSWER.
37-12F-OPTIMIZATION OF MANUFACTURING DATA	4	"WHAT DO YOU MEAN?"
37-12F-OPTIMIZATION OF MANUFACTURING DATA	5	BEING ABLE TO MODEL MANUFACTURED PRODUCT DURING DESIGN WOULD LOWER COST
37-12F-OPTIMIZATION OF MANUFACTURING DATA	5	AND INCREASE YIELD.
37-12F-OPTIMIZATION OF MANUFACTURING DATA	6	NOT DOING ANYTHING WITH IT IN MCM'S.
37-12F-OPTIMIZATION OF MANUFACTURING DATA	10	"DON'T UNDERSTAND" WHAT OPTIMIZATION OF DATA ENCOMPASSES.
37-12F-OPTIMIZATION OF MANUFACTURING DATA	16	LITTLE STATISTICAL INFORMATION AVAILABLE.
37-12F-OPTIMIZATION OF MANUFACTURING DATA	18	NECESSARY TO MANAGE DATA SUCCESSFULLY IN ENVIRONMENTAL FOUNDRY.
37-12F-OPTIMIZATION OF MANUFACTURING DATA	22	DOESN'T EXIST YET.

CATEGORY=07-SELECTING MCM MFG

QUESTION	RESPONSE NUMBER	COMMENT
38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	2	MOST VENDORS DON'T OFFER COMPLETE WITH ALL EDA PLATFORMS.
38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	6	NO DESIGN KITS YET TO SPEAK OF.
38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	7	KITS VERY IMMATURE.
38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	8	NOT ENOUGH KITS AVAILABLE, TOO FEW LINKAGES BETWEEN VENDORS.
38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	19	NEED TO BUILD IN TRADE-OFF CAPABILITIES.
38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	20	AREN'T ANY SOURCES.
38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	22	DON'T EXIST YET.

PROGRAM = COMMENTS

COMMENTS FROM EDA DIGEST MARKET STUDY SURVEY
BY CATEGORY BY QUESTION NUMBER
SURVEY PERIOD 9312 - ALL RESPONSES

09:25 MONDAY, DECEMBER 6, 1993

CATEGORY=07-SELECTING MCM MFG
(CONTINUED)

QUESTION	RESPONSE NUMBER	COMMENT
38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	27	DON'T HAVE. DON'T GUARANTEE.
39-17B-MFG REPUTATION/EXPERIENCE/RECORD	6	EXPERIENCE BASE IS STILL BUILDING.
39-17B-MFG REPUTATION/EXPERIENCE/RECORD	10	NOT A LOT OF APPLICATIONS THAT HAVE BEEN EXPEDIENTLY DONE.
39-17B-MFG REPUTATION/EXPERIENCE/RECORD	14	RATING SELF.
39-17B-MFG REPUTATION/EXPERIENCE/RECORD	17	NOT A LOT OF EXPERIENCE WITH ANY MANUFACTURER YET. NEW TECHNOLOGY.
39-17B-MFG REPUTATION/EXPERIENCE/RECORD	19	COST TOO HIGH.
39-17B-MFG REPUTATION/EXPERIENCE/RECORD	23	ENORMOUS VARIETIES OF CAPABILITIES IN THE INDUSTRY.
40-17C-TECHNOLOGY OFFERED BY MANUFACTURER	20	NO ONE CAN SUPPLY. USE OUR OWN IN-HOUSE SOURCE.
40-17C-TECHNOLOGY OFFERED BY MANUFACTURER	21	LIMITED AT THIS POINT.
40-17C-TECHNOLOGY OFFERED BY MANUFACTURER	23	NOT MATURE.
41-17D-RECURRING COST OF PRODUCTION	5	TECHNOLOGY IS IMPROVING, BUT HARD TO ESTABLISH YIELDS OR COSTS OF
41-17D-RECURRING COST OF PRODUCTION	5	PRODUCTION RUNS.
41-17D-RECURRING COST OF PRODUCTION	7	"CHICKEN AND EGG THING." COSTS WON'T GO DOWN UNTIL VOLUMES ARE UP, AND
41-17D-RECURRING COST OF PRODUCTION	7	VICE-VERSA.
41-17D-RECURRING COST OF PRODUCTION	8	LOW VOLUME SITUATION.
41-17D-RECURRING COST OF PRODUCTION	10	LOW VOLUME REQUIREMENTS DON'T ALLOW ECONOMIES OF SKILL.
41-17D-RECURRING COST OF PRODUCTION	11	COSTS TOO HIGH IN GENERAL.
41-17D-RECURRING COST OF PRODUCTION	16	MCM NEEDS TO PRODUCE HIGH VOLUME TO DRIVE DOWN COST ON LEARNING CURVE.
41-17D-RECURRING COST OF PRODUCTION	19	COST TOO HIGH.
41-17D-RECURRING COST OF PRODUCTION	20	"WE'RE IN A LEARNING PROCESS."
41-17D-RECURRING COST OF PRODUCTION	21	COST TOO HIGH.
41-17D-RECURRING COST OF PRODUCTION	22	NOT IMPORTNAT, R&D CO.
41-17D-RECURRING COST OF PRODUCTION	23	PRICE IS NOW COMING DOWN.
42-17E-ENGINEERING SUPPORT & CONSULTING	5	WOULD BE UNCONFORTABLE ANSWERING.
42-17E-ENGINEERING SUPPORT & CONSULTING	7	FOUNDRIES HAVEN'T FIGURED OUT THEIR BUSINESS MODELS, AND SUPPORT WILL
42-17E-ENGINEERING SUPPORT & CONSULTING	7	BE CONFUSING UNTIL THEY DO.
42-17E-ENGINEERING SUPPORT & CONSULTING	19	NON-RECURRING COST SHOULD BE LESS THAN 25K PER DESIGN.

CATEGORY=08-DATA EXCHANGE STANDARD

QUESTION	RESPONSE NUMBER	COMMENT
43-18A-CAD FRAMEWORK INITIATINVE (CFI)	2	MAKING PROGRESS.
43-18A-CAD FRAMEWORK INITIATINVE (CFI)	3	NOT REALLY A STANDARD, THEY'RE A GROUP.
43-18A-CAD FRAMEWORK INITIATINVE (CFI)	5	HAVEN'T PRODUCED ANYTHING YET.
43-18A-CAD FRAMEWORK INITIATINVE (CFI)	6	VERY SLOW IN DEVELOPING.
43-18A-CAD FRAMEWORK INITIATINVE (CFI)	8	STANDARD GOOD, CAD TOOL PROVIDERS NOT SUPPORTING WELL.
43-18A-CAD FRAMEWORK INITIATINVE (CFI)	13	NOT READY FOR CERTIFICATION. NEED TIME FOR VENDORS TO IMPLEMENT.
44-18B-STEP/PDES	2	LOOKS PROMISING.
44-18B-STEP/PDES	3	NOT FAMILIAR WITH.
44-18B-STEP/PDES	5	"ON RIGHT TRACK."
44-18B-STEP/PDES	7	HAS RIGHT INFO CONTENT, BUT NO USEFUL UNTIL VENDORS SUPPORT.
44-18B-STEP/PDES	8	DON'T USE.
44-18B-STEP/PDES	11	NOT FAMILIAR WITH.
44-18B-STEP/PDES	12	NOT FAMILIAR WITH.
44-18B-STEP/PDES	14	NOT FAMILIAR WITH.
44-18B-STEP/PDES	18	DON'T USE THESE STANDARDS. DOES NOT SUPPORT MCM NOW.
44-18B-STEP/PDES	19	NO STANDARDS YET.

PROGRAM = COMMENTS

COMMENTS FROM EDA DICE MARKET STUDY SURVEY
BY CATEGORY BY QUESTION NUMBER
SURVEY PERIOD 9312 - ALL RESPONSES

09:25 MONDAY, DECEMBER 6, 1993

CATEGORY=08-DATA EXCHANGE STANDARD
(CONTINUED)

QUESTION	RESPONSE NUMBER	COMMENT
45-18C-IGES	3	NOT FAMILIAR WITH.
45-18C-IGES	5	MUST LIVE WITH LEGACY DATA FORMAT -- SHOULD PHASE INTO STEP/PDES.
45-18C-IGES	7	EVERYONE'S "FLAVOR" VARIES SLIGHTLY. DIFFICULT TRANSLATIONS; LOSE
45-18C-IGES	7	DATA.
45-18C-IGES	8	DON'T USE.
45-18C-IGES	12	HAVEN'T USED.
45-18C-IGES	14	NOT FAMILIAR WITH.
45-18C-IGES	15	HARD TO DO WITH DIFFERENT TOOL SETS AND INTERFACE EXP.
45-18C-IGES	18	DOES NOT SUPPORT MCM NOW.
46-18D-EDIF	5	SHOULD BE REPLACED.
46-18D-EDIF	6	NOT A WELL-DEFINED STANDARD.
46-18D-EDIF	7	RIGHT INFO CONTENT, BUT NOT USEFUL UNTIL VENDORS SUPPORT.
46-18D-EDIF	11	NOT FAMILIAR WITH.
46-18D-EDIF	12	HAVEN'T USED.
46-18D-EDIF	18	DOES NOT SUPPORT MCM NOW.
46-18D-EDIF	19	NO ONE HAS EDIF STANDARDS.
46-18D-EDIF	23	NOT REAL TIME TO US.
47-18E-IPC-350	3	NOT FAMILIAR WITH.
47-18E-IPC-350	5	SHOULD BE REPLACED.
47-18E-IPC-350	7	NO SIGNIFICANT VENDORS ARE SUPPORTING.
47-18E-IPC-350	8	DON'T USE.
47-18E-IPC-350	10	NOT FAMILIAR WITH.
47-18E-IPC-350	12	HAVEN'T USED.
47-18E-IPC-350	14	NOT FAMILIAR WITH.
47-18E-IPC-350	15	USED AS GUIDE. LONG TIME COMING OUT.
47-18E-IPC-350	18	ENHANCEMENT AND UPGRADE NEEDED FOR MCM.
47-18E-IPC-350	19	DON'T KNOW WHAT IT IS.
48-18F-GERBER	3	DON'T USE.
48-18F-GERBER	5	SHOULD BE REPLACED. OUTDATED FORMAT.
48-18F-GERBER	7	WILL BE USED FOR MCM-C AND MCM-L UNTIL VENDORS SUPPORT "MORE ROBUST
48-18F-GERBER	7	STANDARDS."
48-18F-GERBER	8	"NOT A GOOD STANDARD."
48-18F-GERBER	18	CONTENTS INADEQUATE FOR ELECTRICAL RULE VERIFICATION.
49-18G-GDSII STREAM	2	DOESN'T SUPPORT A LOT OF MCM FEATURES.
49-18G-GDSII STREAM	5	SHOULD BE REPLACED. OUTDATED FORMAT.
49-18G-GDSII STREAM	7	IMPROVING IN HDI TECHNOLOGY. NOT IMPORTANT EXCEPT FOR THIN FILM ON
49-18G-GDSII STREAM	7	SILICON SUBSTRATE.
49-18G-GDSII STREAM	8	BETTER THAN GERBER, BUT LIMITED.
49-18G-GDSII STREAM	18	CONTENTS INADEQUATE FOR ELECTRICAL RULE VERIFICATION.
50-18H-DXF	3	NOT FAMILIAR WITH.
50-18H-DXF	5	SHOULD BE REPLACED. OUTDATED FORMAT.
50-18H-DXF	7	SOMETHING MORE THAN "DRAFTING LANGUAGE" WILL BE NEEDED FOR HIGH-
50-18H-DXF	7	COMPLEXITY MCM'S.
50-18H-DXF	8	BETTER THAN GERBER, BUT LIMITED.
50-18H-DXF	12	VERY LITTLE USE.
50-18H-DXF	18	CONTENTS INADEQUATE FOR ELECTRICAL RULE VERIFICATION.

PROGRAM = COMMENTS

CATEGORY=09-PHASES OF MCM PLANNED

QUESTION	RESPONSE NUMBER	COMMENT
59-4B-SUBSTRATE FABRICATION	12	MAYBE; SOME IN HOUSE, SOME SUBCONTRACTED.
60-4C-ASSEMBLY	1	MAYBE
61-4D-TEST	1	MAYBE
62-4E-DESIGN SOFTWARE	12	WILL DO OWN DESIGNING. WILL USE HARRIS VIEWLOGIC.
64-4G-CONSULTING SERVICE	1	MAYBE

CATEGORY=10-DESIGN TOOLS

QUESTION	RESPONSE NUMBER	COMMENT
72-9A-TOOLS FOR CAE	1	SYNOPSIS VIEWLOGIC, CADENCE, VARIOUS SIMULATORS.
72-9A-TOOLS FOR CAE	2	CADENCE CONCEPT, MENTOR GRAPHICS DESIGN ARCH.
72-9A-TOOLS FOR CAE	3	MENTOR MCM STATION, CADENCE ALLEGRO STATION
72-9A-TOOLS FOR CAE	4	DAZIX
72-9A-TOOLS FOR CAE	5	MENTOR GRAPHICS
72-9A-TOOLS FOR CAE	6	CADENCE CONCEPT, CADENCE RAPID SIM
72-9A-TOOLS FOR CAE	7	VIEWLOGIC, ZYCAD, SOME OF CAD TOOLS
72-9A-TOOLS FOR CAE	8	DON'T REGARD AS SEPARATE FROM CAD
72-9A-TOOLS FOR CAE	9	MENTOR GRAPHICS, CADAM
72-9A-TOOLS FOR CAE	10	SAME AS CAD
72-9A-TOOLS FOR CAE	11	SAME AS CAD, JUST BROADER TERM
72-9A-TOOLS FOR CAE	13	QUATAL LABORATORIES, THERMAL PACKAGE PACIFIC NUMERICS
72-9A-TOOLS FOR CAE	14	NOT SURE WHAT TERM INCLUDES.
72-9A-TOOLS FOR CAE	15	MENTOR GRAPHICS
72-9A-TOOLS FOR CAE	16	MENTOR GRAPHICS
72-9A-TOOLS FOR CAE	17	HARRIS EDA, MENTOR GRAPHICS SOFTWARE
72-9A-TOOLS FOR CAE	18	MENTOR GRAPHICS
72-9A-TOOLS FOR CAE	19	MENTOR, CADENCE, HARRIS, INTERGRAPH
72-9A-TOOLS FOR CAE	20	SUNSPARK SYSTEM, MENTOR, COPPER CHYAM ENHANCEMENT
72-9A-TOOLS FOR CAE	21	MENTOR
72-9A-TOOLS FOR CAE	22	POWER VIEW
72-9A-TOOLS FOR CAE	23	DEA 3D ANALYSIS TOOLS, TANGO, VERILOG, H SPICE, LINE SIS PROBE
72-9A-TOOLS FOR CAE	24	OWN IN HOUSE SYSTEM
72-9A-TOOLS FOR CAE	25	CADENCE
72-9A-TOOLS FOR CAE	26	MENTOR GRAPHICS
72-9A-TOOLS FOR CAE	27	VIEWLOGIC
72-9A-TOOLS FOR CAE	28	MENTOR
73-9B-TOOLS FOR CAD	1	HARRIS EDA
73-9B-TOOLS FOR CAD	2	CADENCE ALEGRO, MENTOR BOARD STATION 500
73-9B-TOOLS FOR CAD	3	"MOST PEOPLE SEE CAE & CAD AS SAME ACTIVITY." CAD INTERCHANGEABLE WITH
73-9B-TOOLS FOR CAD	3	CAE-(MENTOR MCM STATION, CADENCE ALLEGRO STATION).
73-9B-TOOLS FOR CAD	4	DLS UNDER WINDOWS
73-9B-TOOLS FOR CAD	5	RACELL VISULA, MENTOR GRAPHICS, MCM STATION
73-9B-TOOLS FOR CAD	6	CADENCE MCM ALLEGRO
73-9B-TOOLS FOR CAD	7	CADENCE , MENTOR, HARRIS EDA; ALSO SOME IBM INTERNAL TOOLS
73-9B-TOOLS FOR CAD	8	CADENCE, MENTOR GRAPHICS, HARRIS EDA
73-9B-TOOLS FOR CAD	9	MENTOR GRAPHICS, AUTOCAD
73-9B-TOOLS FOR CAD	10	HARRIS EDA FINESSE
73-9B-TOOLS FOR CAD	11	SPICE, PC BASED TOOLS, PCAD, AUTOCAD DERIVATIVES

CATEGORY=10-DESIGN TOOLS
(CONTINUED)

QUESTION	RESPONSE NUMBER	COMMENT
73-9B-TOOLS FOR CAD	12	HARRIS FINESSE, MCM SOFTWARE
73-9B-TOOLS FOR CAD	13	INTERGRAPH, MOVING TO MENTOR
73-9B-TOOLS FOR CAD	14	MENTOR, HARRIS FINESSE, CADENCE
73-9B-TOOLS FOR CAD	15	HARRIS FINESSE, MENTOR GRAPHICS
73-9B-TOOLS FOR CAD	16	FINESSE
73-9B-TOOLS FOR CAD	17	HARRIS EDA, MENTOR GRAPHICS
73-9B-TOOLS FOR CAD	18	MENTOR GRAPHICS, HARRIS FINESSE
73-9B-TOOLS FOR CAD	19	MENTOR, CADENCE, HARRIS, INTERGRAPH
73-9B-TOOLS FOR CAD	20	SUN SPARK SYSTEM, MENTOR, COPPER CMYAN ENHANCEMENT
73-9B-TOOLS FOR CAD	21	MENTOR
73-9B-TOOLS FOR CAD	22	MENTOR GDT & HARRIS FINESSE
73-9B-TOOLS FOR CAD	23	HARRIS FINESSE, IC EDITORS, LAYOUT, DRC, LVS
73-9B-TOOLS FOR CAD	24	MENTOR GRAPHICS, CADENCE
73-9B-TOOLS FOR CAD	25	CATIA
73-9B-TOOLS FOR CAD	26	THEDA, EUCLID
73-9B-TOOLS FOR CAD	27	FINESSE
73-9B-TOOLS FOR CAD	28	MENTOR
74-9C-TOOLS FOR CAM	1	INTERNALLY DEVELOPED TOOLS
74-9C-TOOLS FOR CAM	4	DLS UNDER WINDOWS
74-9C-TOOLS FOR CAM	5	COMPUTERVISION
74-9C-TOOLS FOR CAM	7	IBM INTERNAL TOOLS
74-9C-TOOLS FOR CAM	8	DON'T REGARD AS SEPERATE FROM CAD
74-9C-TOOLS FOR CAM	9	MENTOR GRAPHICS, AUTOCAD
74-9C-TOOLS FOR CAM	10	WORKSTREAM
74-9C-TOOLS FOR CAM	11	GERBER CONVERTERS, CAD-CAM TYPE PROGRAM
74-9C-TOOLS FOR CAM	13	INTEGRATED WITH CAD
74-9C-TOOLS FOR CAM	14	NOT DEFINED, USE MANY
74-9C-TOOLS FOR CAM	15	CONSILIUM
74-9C-TOOLS FOR CAM	16	AUTOCAD
74-9C-TOOLS FOR CAM	17	NOT USING NOW, BUT WILL USE INTERGRAPH.
74-9C-TOOLS FOR CAM	18	AUTO CAD
74-9C-TOOLS FOR CAM	19	OWN IN HOUSE SYSTEM
74-9C-TOOLS FOR CAM	20	IN PROCESS DEVELOPMENT
74-9C-TOOLS FOR CAM	21	IN HOUSE DESIGN
74-9C-TOOLS FOR CAM	23	PC GERBER, ASM 600
74-9C-TOOLS FOR CAM	24	OWN IN HOUSE SYSTEM
74-9C-TOOLS FOR CAM	25	ALLEGRO
74-9C-TOOLS FOR CAM	26	IN HOUSE LITTON DEVELOPED SYSTEM
74-9C-TOOLS FOR CAM	27	DON'T KNOW, TO BE DETERMINED.
74-9C-TOOLS FOR CAM	28	In HOUSE DESIGN
75-9D-TOOLS FOR OVERALL	1	DEC STATION
75-9D-TOOLS FOR OVERALL	2	CADENCE DESIGN FRAMEWORK II & VALID FRAME, MENTOR FALCON FRAMEWORK
75-9D-TOOLS FOR OVERALL	3	SAME AS CAE-(MENTOR MCM STATION, CADENCE ALLEGRO STATION). NOTHING
75-9D-TOOLS FOR OVERALL	3	"SITS ON TOP OF" THEIR MENTOR OR CADENCE.
75-9D-TOOLS FOR OVERALL	4	PC'S
75-9D-TOOLS FOR OVERALL	5	MENTOR GRAPHICS
75-9D-TOOLS FOR OVERALL	6	CADENCE TOOLS
75-9D-TOOLS FOR OVERALL	7	CADENCE, IBM TOOLS
75-9D-TOOLS FOR OVERALL	8	CADENCE, MENTOR
75-9D-TOOLS FOR OVERALL	9	APOLLO

PROGRAM = COMMENTS

CATEGORY=10-DESIGN TOOLS
(CONTINUED)

QUESTION	RESPONSE NUMBER	COMMENT
75-9D-TOOLS FOR OVERALL	10	CADENCE
75-9D-TOOLS FOR OVERALL	11	ON ORDER
75-9D-TOOLS FOR OVERALL	12	SUN SYSTEM
75-9D-TOOLS FOR OVERALL	13	MENTOR
75-9D-TOOLS FOR OVERALL	14	MOTOROLA
75-9D-TOOLS FOR OVERALL	15	MOVING TO MENTOR GRAPHICS
75-9D-TOOLS FOR OVERALL	16	INTERGRAPH
75-9D-TOOLS FOR OVERALL	17	INTERGRAPH SYSTEM
75-9D-TOOLS FOR OVERALL	18	FOR CAD - MENTOR GRAPHICS, HARRIS FINESSE. FOR MANUFACTURING - CUSTOM
75-9D-TOOLS FOR OVERALL	18	DESIGN SYSTEM.
75-9D-TOOLS FOR OVERALL	19	IBM & CFI COMPATIBLE SYSTEM
75-9D-TOOLS FOR OVERALL	20	MIL SPECS
75-9D-TOOLS FOR OVERALL	21	MENTOR, VHDL
75-9D-TOOLS FOR OVERALL	24	OWN IN HOUSE SYSTEM
75-9D-TOOLS FOR OVERALL	25	CADENCE, IBM 6000
75-9D-TOOLS FOR OVERALL	26	SUN
75-9D-TOOLS FOR OVERALL	27	MENTOR
75-9D-TOOLS FOR OVERALL	28	MENTOR

CATEGORY=11-OVERALL SATISFACTION

QUESTION	RESPONSE NUMBER	COMMENT
79-19-OVERALL SATISFACTION	1	"TOOLS ARE NOT HIGHLY INTEGRATED."
79-19-OVERALL SATISFACTION	2	ABLE TO COMPLETE A LOT WITH MCM TECHNOLOGIES, BUT IT HAS POTENTIAL TO
79-19-OVERALL SATISFACTION	2	BE FAR MORE PRODUCTIVE.
79-19-OVERALL SATISFACTION	3	CURRENT ENVIRONMENT HAS PROVEN VERY EFFECTIVE, BUT BETTER TOOLS AND
79-19-OVERALL SATISFACTION	3	PROCEDURES WOULD MAKE IT MORE PRODUCTIVE.
79-19-OVERALL SATISFACTION	4	"IT WORKS!"
79-19-OVERALL SATISFACTION	5	HAVE GOOD POINT SOLUTIONS; BUT INTEGRATION, COLLABORATIONS,
79-19-OVERALL SATISFACTION	5	METHODOLOGIES & INFRASTRUCTURE ARE LACKING.
79-19-OVERALL SATISFACTION	6	MCM DESIGN & FABRICATION IS FEASIBLE; DOING A FAIR AMOUNT OF IT. "WOULD
79-19-OVERALL SATISFACTION	6	BE EASIER IF TOOLS WERE FURTHER ALONG."
79-19-OVERALL SATISFACTION	7	"MY SATISFACTION WILL BE LOW UNTIL STANDARDS ARE DEFINED AND TOOL KITS
79-19-OVERALL SATISFACTION	7	ARE AVAILABLE." HAVE MADE PROGRESS IN EDUCATING PEOPLE IN MCM
79-19-OVERALL SATISFACTION	7	TECHNOLOGIES AND CHANGES REQUIRED TO DESIGN AND MANUFACTURE, BUT
79-19-OVERALL SATISFACTION	7	"...STILL HAVE A LONG WAY TO GO."
79-19-OVERALL SATISFACTION	8	"WE CAN DO MOST OF THE BASICS," BUT CAN'T DO THEM WITH THE FULL RANGE
79-19-OVERALL SATISFACTION	8	OF DESIRED CAD TOOLS OR WITH THE VARIETY OF VENDORS DESIRED.
79-19-OVERALL SATISFACTION	9	DOING TOO MANY THINGS AT ONE TIME. NEED TO NARROW FOCUS.
79-19-OVERALL SATISFACTION	10	"WE DON'T HAVE THE PROPER INFRASTRUCTURE IN PLACE YET."
79-19-OVERALL SATISFACTION	11	THEY ARE LACKING TOOLS THAT WOULD MAKE FOR GREATER EFFICIENCY. NEED TO
79-19-OVERALL SATISFACTION	11	MAKE SOME PURCHASES.
79-19-OVERALL SATISFACTION	12	USING "CHIP & WIRE" ON THIN FILM SUBSTRATE IS SO DIFFERENT FROM PRINTED
79-19-OVERALL SATISFACTION	12	CIRCUITBOARD THAT THEY'VE HAD TO MAKE ADJUSTMENTS IN PROCEDURE. NEW
79-19-OVERALL SATISFACTION	12	SOFTWARE IS EXPECTED TO TAKE CLUMSINESS OUT.
79-19-OVERALL SATISFACTION	13	FEELS THEIR NEEDS FOR DESIGN AND ANALYSIS ARE BEING FILLED, "... NO
79-19-OVERALL SATISFACTION	13	HOLES THERE." FEELS THEY ARE WORKING EFFICIENTLY.

CATEGORY=11-OVERALL SATISFACTION
(CONTINUED)

QUESTION	RESPONSE NUMBER	COMMENT
79-19-OVERALL SATISFACTION	14	MATURITY WILL BRING NEEDED IMPROVEMENTS TO THEIR NCM ENVIRONMENT.
79-19-OVERALL SATISFACTION	15	USE OF CONCURRENT ENGINEERING AND CLOSE INTERFACE WITH MANUFACTURING.
79-19-OVERALL SATISFACTION	16	MARTIN MARIETTA HAS INVESTED HEAVILY ON CONCURRENT ENGINEERING TOOLS
79-19-OVERALL SATISFACTION	16	WHICH ARE PAYING OFF.
79-19-OVERALL SATISFACTION	17	THE PRODUCT DESIGN IS COMPLEX. OVERALL, ADMINISTRATIVE AREAS ARE THE
79-19-OVERALL SATISFACTION	17	REAL PROBLEM.
79-19-OVERALL SATISFACTION	18	FOUNDRY DOES NOT CURRENTLY SUPPORT ENGINEERING DESIGN.
79-19-OVERALL SATISFACTION	19	HAVE BEEN USING & DEVELOPING FOR 15+ YEARS. WE HAVE PROVEN DESIGN AND
79-19-OVERALL SATISFACTION	19	DEMO OF 1ST TIME PASS.
79-19-OVERALL SATISFACTION	20	"WE'RE THE LEADER IN DEVELOPING TECHNOLOGY." BUT STILL HAVE ROOM AND
79-19-OVERALL SATISFACTION	20	NEEDS TO IMPROVE.
79-19-OVERALL SATISFACTION	21	STILL IMPLEMENTING SYSTEM. DON'T HAVE FULLY INTEGRATED SYSTEM, PLANS
79-19-OVERALL SATISFACTION	21	TO IMPROVE.
79-19-OVERALL SATISFACTION	22	TECHNOLOGY & TOOLS ARE MODERATELY DEVELOPED BUT MAKING STEPS. MATURITY
79-19-OVERALL SATISFACTION	22	OF TOOLS AND OUR OWN EXPERIENCE ARE MOVING UP ON THE LEARNING CURVE.
79-19-OVERALL SATISFACTION	23	"WE CAN DO WORK WITH TOOLS WE HAVE, BUT IT'S VERY HARD."
79-19-OVERALL SATISFACTION	24	TECHNOLOGICAL IMPROVEMENT NEEDED.
79-19-OVERALL SATISFACTION	25	"EMBODIES STRICT ENGINEERING SUPPORT."
79-19-OVERALL SATISFACTION	26	"WE'RE IN THE INFANCY STAGE, NOT REALLY ON BOARD YET."
79-19-OVERALL SATISFACTION	27	STILL IMMATURE, "HAVING TO TWEEK". MANUAL NOT AUTOMATED, BARE DIE
79-19-OVERALL SATISFACTION	27	PROBLEM.
79-19-OVERALL SATISFACTION	28	TECHNOLOGY IS STILL IMMATURE. "ALL SYSTEMS ARE BEING DESIGNED AS WE
79-19-OVERALL SATISFACTION	28	LEARN."

DESCRIPTION	RESPONSE NUMBER	COMMENT
COMPANY NAME	1	DIGITAL EQUIPMENT CORPORATION
	2	MAYO CLINIC
	3	M CHIP INC
	4	ERIM
	5	RAYTHEON CAE OPERATIONS
	6	HARRIS GOVERNMENT AEROSPACE SYS DIV
	7	IBM
	8	USC-ISI-MOSIS
	9	ANONYMOUS
	10	HARRIS SEMICONDUCTOR
	11	ANONYMOUS
	12	MICRO NETWORKS
	13	EASTMAN KODAK
	14	MOTOROLA
	15	HAYES MICROCOMPUTER PRODUCTS
	16	MARTIN MARIETTA
	17	ACUSTAR
	18	TEXAS INSTRUMENTS
	19	IBM
	20	HUGHES
	21	RAYTHEON
	22	CHARLES DRAPER LABS
	23	INTERCHIP SYSTEMS INC
	24	SMI ELECTRONICS
	25	MOTOROLA
	26	LITTON AMECOM
	27	ANONYMOUS
	28	RAYTHEON
GENERAL COMMENTS	2	"USERS NEED TO WORK WITH MCM AND CAP VENDORS ON STANDARDIZATION AND
	2	INTEGRATION."
	4	"SOUNDS LIKE YOU WORK FOR MENTOR GRAPHICS."
	5	"WAVE OF THE FUTURE."
	8	FEELS THAT ANALYSTS SHOULD NOTE ANY EFFECT THERE MIGHT BE ON HIS
	8	RESPONSES BY THEIR CURRENT ARPA-FUNDED PROJECT.
	11	MCM-C AND MCM-D VENDORS NEED TO WORK HARDER ON COST CONTROLS. NEED TO
	11	TALK LESS AND PROVIDE MORE.
	15	ITS NEW TECHNOLOGY, NOT AT COMMERCIAL PRICING.
	17	NEEDS BIGGER PUSH ON SILICON VENDOR TO DELIVER TESTED DIE AT COST
	17	COMPETITIVE RATE.
	19	CRITICAL TECHNOLOGY IN MCM. "WE NEED TO INVEST TIME AND MONEY TO MAKE
	19	IT WORK."
	21	IMPORTANT THAT ARPA CONTINUE TO FUND RESEARCH SO TECHNOLOGY CAN
	21	CONTINUE TO GROW.
	23	MCM IS IN ITS INFANCY, BUT BUSINESS IS DOUBLING YEAR TO YEAR AND WILL
	23	BE SUCCESSFUL AS TECHNOLOGY ADVANCES.
	24	"WANT AND HOPE MCM WILL DO WELL SO WE CAN SELL PRODUCT."
	27	TECHNOLOGY IS COMING. NEED TO SOLVE DESIGN AUTOMATION PROCESS AND
	27	AQUIRE GOOD BARE DIE AND INFO ON BARE DIE ON NON-DIGITAL PROD.
	28	HOPE MCM TECHNOLOGY TAKES OFF. WORKING ON INFRASTRUCTURE TO KEEP COST

[redacted]

GENERAL COMMENTS FROM DCA DISA MARKET STUDY -- VEV
SURVEY PERIOD 9312 - ALL RESPONSES

09:25 MONDAY, DECEMBER 6, 1993

DESCRIPTION	RESPONSE NUMBER	COMMENT
GENERAL COMMENTS	28	DOWN.
SUVERVER COMMENTS	1	MR. ATKINSON WOULD NOT RATE THE DEGREE OF SATISFACTION HE EXPECTED TO
	1	EXPERIENCE AND WOULD SAY ONLY THAT HE EXPECTED TO HAVE HIS ENGINEERS "BE
	1	HAPPY". (SEE QUESTIONS 5, 10, 11, 12, 16, 18G)
	3	REALLY PRESSED TO FIND OUT THE ORIGINATOR OF THE SURVEY. FOUND
	3	QUESTIONS 7 (8 THROUGH 14 ON REPORT) AND 12 (32 THROUGH 37 ON REPORT) TOO
	3	CONFUSING TO ADDRESS. DID NOT ASK QUESTION 17 (38 THROUGH 42 ON REPORT).
	3	PARTICIPANT'S FIRM IS AN MCM MANUFACTURER. THEIR FIRM HAS SOME KIND OF
	3	INVOLVEMENT AT PRESENT WITH ARPA, SOME FUNDED PROJECT.
	4	DID NOT ASK QUESTION 17-(38 THROUGH 42 ON REPORT), PARTICIPANT IS
	4	PROTOTYPE DEVELOPER.
	6	FOUND THE EXAMPLES CITED IN 11B (NUMBER 27 IN REPORT) TO BE IN CONFLICT
	6	WITH THE DESCRIPTION OF THE CAPABILITY. HE WOULD LIKE A COPY OF THE STUDY
	6	WHEN IT IS COMPLETE, IF POSSIBLE.
	7	"EAGER TO KNOW SOURCE OF SURVEY."
	8	THIS IS THE SECOND OR THIRD COMPLAINT THAT QU_STION 17A (NUMBER 38 ON
	8	REPORT) IS REDUNDANT. HE WOULD LIKE TO RECEIVE A COPY OF THE STUDY WHEN
	8	IT IS COMPLETE.
	10	PRESSED "HARD" FOR ME TO CONFIRM THAT I WORKED FOR HARRIS CORPORATE
	10	HEADQUARTERS AS HIS TELEPHONE INDICATED. GLENN PETERSEN SAID HE WILL CALL
	10	MR. SALATINO THIS PM TO SMOOTH THE WAY FOR REMAINDER OF SURVEY.
	10	RE-CONTACTED MR. SALATINO AFTER MR. PETERSEN'S CALL, WENT SMOOTHLY.
	18	THIS COMPANY MANUFACTURES MCM'S, SO QUESTION 17 (38 THROUGH 42 IN
	18	REPORT)IS NOT APPLICABLE.
	20	MR. GATES WOULD LIKE A COPY OF FINAL SURVEY WHEN COMPLETED.
	21	THIS IS AN R&D FACILITY AND HE DID NOT FEEL HE COULD ANSWER THE
	21	SATISFACTION PART ON SOME QUESTIONS.
	26	COULD NOT GIVE SATISFACTION RATINGS BECAUSE..."WE ARE JUST GETTING INTO
	26	MCM'S."
	27	WOULD LIKE A COPY OF STUDY WHEN COMPLETE.
	28	COULD NOT ANSWER SATISFACTION RATINGS, JUST GETTING INTO IT.

[redacted] DI[redacted] KE[redacted] IV[redacted] V [redacted] II[redacted]

SURVEY PERIOD 9312 - CURRENTLY USING MCM
BY QUESTION
GAP INDEX = 1.74

09:25 MONDAY, DECEMBER 6, 1993

CATEGORY	QUESTION	RESPONSES	MEAN IMP	MEAN SAT	MEAN GAP
02-UTILIZING MCM TECHNOLOGY	08-07A-DESIGN	18	9.3	7.6	1.7
	09-07B-SUBSTRATE FABRICATION	10	9.4	7.5	1.9
	10-07C-ASSEMBLY	12	8.8	8.0	0.8
	11-07D-TEST	14	9.6	6.6	3.0
	12-07E-DESIGN SOFTWARE	11	8.7	6.9	1.8
	13-07F-ENGINEERING SUPPORT	19	8.3	7.4	0.8
	14-07G-CONSULTING SERVICES	12	6.8	7.0	-0.2
04-DESIGN/MFG OF MCM'S	20-10A-DESIGN AUTOMATION SOFTWARE	20	8.5	6.9	1.6
	21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	20	8.3	6.6	1.7
	22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	21	9.2	6.0	3.2
	23-10D-ACCESS TO CHIP & COMPONENT DATA	20	9.3	5.2	4.1
	24-10E-DESIGN METHODS TO IMPLEMENT MCM'S	21	9.4	8.0	1.3
	25-10F-AUTOMATED TESTING & QUALITY METHODS	19	8.6	6.4	2.2
05-CAPABILITIES	26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	20	7.8	4.5	3.3
	27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	18	6.8	5.1	1.7
	28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	20	7.1	4.6	2.5
	29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	20	7.6	4.4	3.3
	30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	20	7.7	6.8	0.9
	31-11F-MOST S/W PURCHASED FROM ONE VENDOR	18	4.8	6.3	-1.5
06-MCM DESIGN ENVIRONMENT	32-12A-SYSTEM SPECIFICATIONS	16	8.0	6.6	1.4
	33-12B-SYSTEM PARTITIONING	18	7.9	5.6	2.3
	34-12C-AUTOROUTING	20	8.5	7.1	1.4
	35-12D-PACKAGING TECHNOLOGY SELECTION	18	8.2	6.1	2.1
	36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	17	7.5	4.6	2.9
	37-12F-OPTIMIZATION OF MANUFACTURING DATA	17	7.9	5.8	2.1
07-SELECTING MCM MFG	38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	16	7.1	4.6	2.5
	39-17B-MFG REPUTATION/EXPERIENCE/RECORD	17	9.0	6.9	2.1
	40-17C-TECHNOLOGY OFFERED BY MANAFACTURER	17	8.7	7.6	1.1
	41-17D-RECURRING COST OF PRODUCTION	17	8.4	5.1	3.2
	42-17E-ENGINEERING SUPPORT & CONSULTING	17	7.8	6.2	1.6
08-DATA EXCHANGE STANDARDS	43-18A-CAD FRAMEWORK INITIATINVE (CFI)	16	6.7	4.6	2.1
	44-18B-STEP/PDES	12	6.3	4.4	1.9
	45-18C-IGES	13	7.3	6.6	0.7
	46-18D-EDIF	19	7.8	5.7	2.1
	47-18E-IPC-350	11	5.0	4.4	0.6
	48-18F-GERBER	18	8.1	7.2	0.9
	49-18G-GDSII STREAM	19	7.8	7.3	0.6
	50-18H-DXF	18	7.3	6.9	0.4

PROGRAM = STATS

[redacted]

SURVEY PERIOD 9312 - CURRENTLY USING MCM
RANKED BY DESCENDING IMPORTANCE
GAP INDEX = 1.74

09:29 MONDAY, DECEMBER 6, 1993

CATEGORY	QUESTION	RESPONSES	MEAN IMP	MEAN SAT	MEAN GAP
02-UTILIZING MCM TECHNOLOGY	11-07D-TEST	14	9.6	6.6	3.0
02-UTILIZING MCM TECHNOLOGY	09-07B-SUBSTRATE FABRICATION	10	9.4	7.5	1.9
04-DESIGN/MFG OF MCM'S	24-10E-DESIGN METHODS TO IMPLEMENT MCM'S	21	9.4	8.0	1.3
02-UTILIZING MCM TECHNOLOGY	08-07A-DESIGN	18	9.3	7.6	1.7
04-DESIGN/MFG OF MCM'S	23-10D-ACCESS TO CHIP & COMPONENT DATA	20	9.3	5.2	4.1
04-DESIGN/MFG OF MCM'S	22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	21	9.2	6.0	3.2
07-SELECTING MCM MFG	39-17B-MFG REPUTATION/EXPERIENCE/RECORD	17	9.0	6.9	2.1
02-UTILIZING MCM TECHNOLOGY	10-07C-ASSEMBLY	12	8.8	8.0	0.8
02-UTILIZING MCM TECHNOLOGY	12-07E-DESIGN SOFTWARE	11	8.7	6.9	1.8
07-SELECTING MCM MFG	40-17C-TECHNOLOGY OFFERED BY MANAFACTURER	17	8.7	7.6	1.1
04-DESIGN/MFG OF MCM'S	25-10F-AUTOMATED TESTING & QUALITY METHODS	19	8.6	6.4	2.2
04-DESIGN/MFG OF MCM'S	20-10A-DESIGN AUTOMATION SOFTWARE	20	8.5	6.9	1.6
06-MCM DESIGN ENVIRONMENT	34-12C-AUTOROUTING	20	8.5	7.1	1.4
07-SELECTING MCM MFG	41-17D-RECURRING COST OF PRODUCTION	17	8.4	5.1	3.2
02-UTILIZING MCM TECHNOLOGY	13-07F-ENGINEERING SUPPORT	19	8.3	7.4	0.8
04-DESIGN/MFG OF MCM'S	21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	20	8.3	6.6	1.7
06-MCM DESIGN ENVIRONMENT	35-12D-PACKAGING TECHNOLOGY SELECTION	18	8.2	6.1	2.1
08-DATA EXCHANGE STANDARDS	48-18F-GERBER	18	8.1	7.2	0.9
06-MCM DESIGN ENVIRONMENT	32-12A-SYSTEM SPECIFICATIONS	16	8.0	6.6	1.4
06-MCM DESIGN ENVIRONMENT	33-12B-SYSTEM PARTITIONING	18	7.9	5.6	2.3
06-MCM DESIGN ENVIRONMENT	37-12F-OPTIMIZATION OF MANUFACTURING DATA	17	7.9	5.8	2.1
05-CAPABILITIES	26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	20	7.8	4.5	3.3
07-SELECTING MCM MFG	42-17E-ENGINEERING SUPPORT & CONSULTING	17	7.8	6.2	1.6
08-DATA EXCHANGE STANDARDS	46-18D-EDIF	19	7.8	5.7	2.1
08-DATA EXCHANGE STANDARDS	49-18G-GDSII STREAM	19	7.8	7.3	0.6
05-CAPABILITIES	30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	20	7.7	6.8	0.9
05-CAPABILITIES	29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	20	7.6	4.4	3.3
06-MCM DESIGN ENVIRONMENT	36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	17	7.5	4.6	2.9
08-DATA EXCHANGE STANDARDS	45-18C-IGES	13	7.3	6.6	0.7
08-DATA EXCHANGE STANDARDS	50-18H-DXF	18	7.3	6.9	0.4
05-CAPABILITIES	28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	20	7.1	4.6	2.5
07-SELECTING MCM MFG	38-17A-DESIGN KITS AVAIL. FROM MFG/VENDO[illegible]	16	7.1	4.6	2.5
02-UTILIZING MCM TECHNOLOGY	14-07G-CONSULTING SERVICES	12	6.8	7.0	-0.2
05-CAPABILITIES	27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	18	6.8	5.1	1.7
08-DATA EXCHANGE STANDARDS	43-18A-CAD FRAMEWORK INITIATINVE (CFI)	16	6.7	4.6	2.1
08-DATA EXCHANGE STANDARDS	44-18B-STEP/PDES	12	6.3	4.4	1.9
08-DATA EXCHANGE STANDARDS	47-18E-IPC-350	11	5.0	4.4	0.6
05-CAPABILITIES	31-11F-MOST S/W PURCHASED FROM ONE VENDOR	18	4.8	6.3	-1.5

PROGRAM = STATS

[redacted]

RANKED BY DESCENDING GAP
GAP INDEX = 1.74

09:25 MONDAY, DECEMBER 6, 1993

CATEGORY	QUESTION	RESPONSES	MEAN IMP	MEAN SAT	MEAN GAP
04-DESIGN/MFG OF MCM'S	23-10D-ACCESS TO CHIP & COMPONENT DATA	20	9.3	5.2	4.1
05-CAPABILITIES	26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	20	7.8	4.5	3.3
05-CAPABILITIES	29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	20	7.6	4.4	3.3
04-DESIGN/MFG OF MCM'S	22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	21	9.2	6.0	3.2
07-SELECTING MCM MFG	41-17D-RECURRING COST OF PRODUCTION	17	8.4	5.1	3.2
02-UTILIZING MCM TECHNOLOGY	11-07D-TEST	14	9.6	6.6	3.0
06-MCM DESIGN ENVIRONMENT	36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	17	7.5	4.6	2.9
05-CAPABILITIES	28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	20	7.1	4.6	2.5
07-SELECTING MCM MFG	38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	16	7.1	4.6	2.5
06-MCM DESIGN ENVIRONMENT	33-12B-SYSTEM PARTITIONING	18	7.9	5.6	2.3
04-DESIGN/MFG OF MCM'S	25-10F-AUTOMATED TESTING & QUALITY METHODS	19	8.6	6.4	2.2
07-SELECTING MCM MFG	39-17B-MFG REPUTATION/EXPERIENCE/RECORD	17	9.0	6.9	2.1
06-MCM DESIGN ENVIRONMENT	35-12D-PACKAGING TECHNOLOGY SELECTION	18	8.2	6.1	2.1
06-MCM DESIGN ENVIRONMENT	37-12F-OPTIMIZATION OF MANUFACTURING DATA	17	7.9	5.8	2.1
08-DATA EXCHANGE STANDARDS	46-18D-EDIF	19	7.8	5.7	2.1
08-DATA EXCHANGE STANDARDS	43-18A-CAD FRAMEWORK INITIATINVE (CFI)	16	6.7	4.6	2.1
02-UTILIZING MCM TECHNOLOGY	09-07B-SUBSTRATE FABRICATION	10	9.4	7.5	1.9
08-DATA EXCHANGE STANDARDS	44-18B-STEP/PDES	12	6.3	4.4	1.9
02-UTILIZING MCM TECHNOLOGY	12-07E-DESIGN SOFTWARE	11	8.7	6.9	1.8
02-UTILIZING MCM TECHNOLOGY	08-07A-DESIGN	18	9.3	7.6	1.7
04-DESIGN/MFG OF MCM'S	21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	20	8.3	6.6	1.7
05-CAPABILITIES	27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	18	6.8	5.1	1.7
04-DESIGN/MFG OF MCM'S	20-10A-DESIGN AUTOMATION SOFTWARE	20	8.5	6.9	1.6
07-SELECTING MCM MFG	42-17E-ENGINEERING SUPPORT & CONSULTING	17	7.8	6.2	1.6
06-MCM DESIGN ENVIRONMENT	34-12C-AUTOROUTING	20	8.5	7.1	1.4
06-MCM DESIGN ENVIRONMENT	32-12A-SYSTEM SPECIFICATIONS	16	8.0	6.6	1.4
04-DESIGN/MFG OF MCM'S	24-10E-DESIGN METHODS TO IMPLEMENT MCM'S	21	9.4	8.0	1.3
07-SELECTING MCM MFG	40-17C-TECHNOLOGY OFFERED BY MANAFACTURER	17	8.7	7.6	1.1
08-DATA EXCHANGE STANDARDS	48-18F-GERBER	18	8.1	7.2	0.9
05-CAPABILITIES	30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	20	7.7	6.8	0.9
02-UTILIZING MCM TECHNOLOGY	10-07C-ASSEMBLY	12	8.8	8.0	0.8
02-UTILIZING MCM TECHNOLOGY	13-07F-ENGINEERING SUPPORT	19	8.3	7.4	0.8
08-DATA EXCHANGE STANDARDS	45-18C-IGES	13	7.3	6.6	0.7
08-DATA EXCHANGE STANDARDS	49-18G-GDSII STREAM	19	7.8	7.3	0.6
08-DATA EXCHANGE STANDARDS	47-18E-IPC-350	11	5.0	4.4	0.6
08-DATA EXCHANGE STANDARDS	50-18H-DXF	18	7.3	6.9	0.4
02-UTILIZING MCM TECHNOLOGY	14-07G-CONSULTING SERVICES	12	6.8	7.0	-0.2
05-CAPABILITIES	31-11F-MOST S/W PURCHASED FROM ONE VENDOR	18	4.8	6.3	-1.5

PROGRAM = STATS

[redacted]

OVERALL SATISFACTION
SURVEY PERIOD 9312 - CURRENTLY USING MCM

09:25 MONDAY, DECEMBER 6, 1993

OBS	RESPONSES	OVERALL SATISFACTION AVERAGE
1	20	6.9

PROGRAM = STATS

EDA DICE MARKET STUDY SURVEY
NON-GAP SUMMARY
SURVEY PERIOD 9312 - CURRENTLY USING MCM

09:25 MONDAY, DECEMBER 6, 1993

QUESTION	ITEM	FREQUENCY COUNT
1-MMT USAGE	CURRENTLY USING	21
13-CURRENT ENGINEERING	YES	17
	NO	3
	NOT SURE	1
15-MATCH CONCURRENT DESIGN ENVIRONMENT	OTHER	1
16-INVESTING IN DESIGN AUTOMATION SYSTEMS	EXTREMELY IMPOR	7
	VERY IMPORTANT	4
	IMPORTANT	5
	NOT IMPORTANT	1
3-CURRENT ASSEMBLY		14
3-CURRENT CONSULTING SERVICES		14
3-CURRENT DESIGN		20
3-CURRENT DESIGN SOFTWARE		11
3-CURRENT ENGINEERING SUPPORT		21
3-CURRENT SUBSTRATE FABRICATION		12
3-CURRENT TEST		16
8-MCM-C CERAMIC LOW TEMP COFIRED	CURRENT	13
	FUTURE	2
8-MCM-C CERAMIC THICK FILM	CURRENT	12
	FUTURE	1
8-MCM-D THIN FILM ON SILICON OR CERAMIC	CURRENT	11
	FUTURE	1
8-MCM-MDI CHIPS-FIRST	CURRENT	5
	FUTURE	4
8-MCM-L LAMINATE	CURRENT	13
	FUTURE	5
9-DESIGN TOOLS	FOR CAE	21
	FOR CAD	21
	FOR CAM	17
	FOR OVERALL	20

PROGRAM = DEMO

SURVEY PERIOD 9312 - CURRENTLY USING MCM

09:23 MONDAY, DECEMBER 6, 1993

CATEGORY=' '

QUESTION	RESPONSE NUMBER	COMMENT
78-16-IMPORTANCE INVEST DESIGN AUTOMATION	8	BENEFITS HAVE NOT BEEN WELL DEMONSTRATED BY VENDORS.

CATEGORY=02-UTILIZING MCM TECH.

QUESTION	RESPONSE NUMBER	COMMENT
52-3B-SUBSTRATE FABRICATION	8	SUBCONTRACT THIS ACTIVITY.
53-3C-ASSEMBLY	8	SUBCONTRACT THIS ACTIVITY
55-3E-DESIGN SOFTWARE	5	USE IT, DON'T MANUFACTURE.
55-3E-DESIGN SOFTWARE	8	USE, DON'T CREATE.
55-3E-DESIGN SOFTWARE	11	USE, DON'T DESIGN
56-3F-ENGINEERING SUPPORT	6	INFREQUENT
56-3F-ENGINEERING SUPPORT	11	EXTERNAL
57-3G-CONSULTING SERVICES	5	ONLY TO RAYTHEON.
57-3G-CONSULTING SERVICES	14	EXTERNAL

CATEGORY=02-UTILIZING MCM TECHNOLO

QUESTION	RESPONSE NUMBER	COMMENT
08-07A-DESIGN	3	"UNCLEAR", CATEGORY NOT SPECIFIC ENOUGH TO ANSWER.
08-07A-DESIGN	5	USES A TOOL DESIGNED FOR CIRCUITBOARDS; DOESN'T ALWAYS WORK FOR MCM.
08-07A-DESIGN	6	DESIGN TOOLS IMMATURE.
08-07A-DESIGN	8	RATED TOOLS.
08-07A-DESIGN	14	MANY DESIGNS IMMATURE.
08-07A-DESIGN	23	ONLY USE SENIOR EXPERIENCED PEOPLE, MAINLY M.I.T.'S WITH MASTER DEGREES
08-07A-DESIGN	23	AND 12 PLUS YEARS OF EXPERIENCE.
08-07A-DESIGN	24	"CURRENT DESIGN DOES NOT MEET OUR NEEDS."
09-07B-SUBSTRATE FABRICATION	3	"UNCLEAR", CATEGORY NOT SPECIFIC ENOUGH TO ANSWER.
09-07B-SUBSTRATE FABRICATION	6	IMMATURE PROCESSES, LIMITED VENDOR POOL.
10-07C-ASSEMBLY	3	"UNCLEAR", CATEGORY NOT SPECIFIC ENOUGH TO ANSWER.
10-07C-ASSEMBLY	20	LOW YIELDS.
11-07D-TEST	3	"UNCLEAR", CATEGORY NOT SPECIFIC ENOUGH TO ANSWER.
11-07D-TEST	6	LIMITED TOOLS FOR TEST GENERATION. NEED BETTER.
11-07D-TEST	8	RATED FACILITIES.
11-07D-TEST	10	INDUSTRY AWARENESS OF TEST SOLUTIONS SEEM VAGUE.
11-07D-TEST	14	COMPLEX BECAUSE IT IS A SUBSYSTEM. STILL IMMATURE.
11-07D-TEST	17	NO GOOD DIE.
11-07D-TEST	22	JUST LEARNING TO DESIGN FOR TEST.
12-07E-DESIGN SOFTWARE	4	"WE DO IT RIGHT THE FIRST TIME."
12-07E-DESIGN SOFTWARE	5	USES A TOOL DESIGNED FOR CIRCUITBOARDS, DOESN'T ALWAYS WORK FOR MCM.
12-07E-DESIGN SOFTWARE	14	DESIGN TECHNOLOGY NEEDS SOME IMPROVEMENTS.
12-07E-DESIGN SOFTWARE	16	SIMULATION CRITICAL TO SUCCESS, AND TOOLS ARE NOT SUFFICIENT.
12-07E-DESIGN SOFTWARE	18	NOT ALL CAD VENDORS SUPPORT MCM TECHNOLOGY.
12-07E-DESIGN SOFTWARE	23	TOOLS VERY HARD TO USE, AND BARELY CAPABLE OF DOING JOB.
13-07F-ENGINEERING SUPPORT	3	"UNCLEAR", CATEGORY NOT SPECIFIC ENOUGH TO ANSWER.
13-07F-ENGINEERING SUPPORT	5	SATISFACTION RATING WOULD BE BIASED.

PROGRAM = COMMENTS

CATEGORY=02-UTILIZING MCM TECHNOLG
(CONTINUED)

QUESTION	RESPONSE NUMBER	COMMENT
13-07F-ENGINEERING SUPPORT	8	SEPARATE WHAT SUBCONTRACTOR CAN OFFER VS. WHAT CUSTOMER CAN DO ON THEIR
13-07F-ENGINEERING SUPPORT	8	OWN.
13-07F-ENGINEERING SUPPORT	14	MANUFACTURERS AND DESIGNERS DON'T UNDERSTAND THE BUSINESS WELL-ENOUGH
13-07F-ENGINEERING SUPPORT	14	YET.
13-07F-ENGINEERING SUPPORT	18	LIBRARIES NOT AVAILABLE SUPPORTING MCM.
13-07F-ENGINEERING SUPPORT	23	MAJOR PROBLEM IS GETTING INFORMATION ON IC'S.
14-07G-CONSULTING SERVICES	3	PROVIDE CONSULTING SERVICES, DON'T USE CONSULTING SERVICES.
14-07G-CONSULTING SERVICES	4	"WE KNOW WHAT WE'RE DOING."
14-07G-CONSULTING SERVICES	5	SATISFACTION RATING WOULD BE BIASED.
14-07G-CONSULTING SERVICES	11	SATISFACTION RATING OF 5 APPLIES TO RECEIPT OF SERVICES. WOULD RATE
14-07G-CONSULTING SERVICES	11	HIS FIRM AN 8 AS A SERVICE PROVIDER.
14-07G-CONSULTING SERVICES	23	ALWAYS ROOM FOR IMPROVEMENT.

CATEGORY=03-PLANNING OR USING MCM

QUESTION	RESPONSE NUMBER	COMMENT
15-08A-MCM-L LAMINATE	4	NO PLANS.
15-08A-MCM-L LAMINATE	6	SOME USE.
15-08A-MCM-L LAMINATE	8	NEAR FUTURE.
15-08A-MCM-L LAMINATE	20	IN EVALUATION NOW.
16-08B-MCM-C CERAMIC THICK FILM	4	NO PLANS.
16-08B-MCM-C CERAMIC THICK FILM	5	CERAMIC HYBRID USED.
16-08B-MCM-C CERAMIC THICK FILM	11	FORMER USE.
16-08B-MCM-C CERAMIC THICK FILM	20	PHASING OUT.
17-08C-MCM-C CERAMIC LOW TEMP COFIRED	4	NO PLANS.
17-08C-MCM-C CERAMIC LOW TEMP COFIRED	6	PREDOMINANTLY USED.
17-08C-MCM-C CERAMIC LOW TEMP COFIRED	11	FORMER USE.
17-08C-MCM-C CERAMIC LOW TEMP COFIRED	20	IN EVALUATION.
18-08D-MCM-D THIN FILM ON SILICON/CERAMIC	11	FORMER USE.
18-08D-MCM-D THIN FILM ON SILICON/CERAMIC	13	NO PLANS.
18-08D-MCM-D THIN FILM ON SILICON/CERAMIC	14	POSSIBLE USE, NOT IN IMMEDIATE FUTURE.
18-08D-MCM-D THIN FILM ON SILICON/CERAMIC	20	NOW USING, BUT NEEDS WORK TO IMPROVE YIELDS.
18-08D-MCM-D THIN FILM ON SILICON/CERAMIC	24	COST TOO HIGH.
19-08E-MCM-HDI CHIPS-FIRST	3	NO PLANS.
19-08E-MCM-HDI CHIPS-FIRST	4	NO PLANS.
19-08E-MCM-HDI CHIPS-FIRST	7	NO PLANS.
19-08E-MCM-HDI CHIPS-FIRST	11	NO PLANS.
19-08E-MCM-HDI CHIPS-FIRST	14	DOESN'T KNOW WHAT "CHIPS FIRST" IS.
19-08E-MCM-HDI CHIPS-FIRST	20	WILL PROBABLY NEVER USE DUE TO FACT IT WON'T MEET MILITARY STANDARDS.

CATEGORY=04-DESIGN/MFG OF MCM'S

QUESTION	RESPONSE NUMBER	COMMENT
20-10A-DESIGN AUTOMATION SOFTWARE	4	"OUR DLS."

[redacted] LNI [redacted] IM [redacted] ICE [redacted] EI [redacted] SU [redacted]
BY CATEGORY BY QUESTION NUMBER
SURVEY PERIOD 9312 - CURRENTLY USING MCM

09:25 MONDAY, DECEMBER 6, 1993

CATEGORY=04-DESIGN/MFG OF MCM'S
(CONTINUED)

QUESTION	RESPONSE NUMBER	COMMENT
20-10A-DESIGN AUTOMATION SOFTWARE	5	"RETRO-FITED TECHNOLOGY."
20-10A-DESIGN AUTOMATION SOFTWARE	6	MCM SOFTWARE IMMATURE, FULL MCM SIMULATION NOT FEASIBLE YET.
20-10A-DESIGN AUTOMATION SOFTWARE	8	AREN'T ENOUGH LINKS OF ANY PARTICULAR CAD TOOL PROVIDER, NOT INTERFACED
20-10A-DESIGN AUTOMATION SOFTWARE	8	TO ENOUGH MCM MANUFACTURERS.
20-10A-DESIGN AUTOMATION SOFTWARE	13	TOO COMPLEX TO DISCUSS.
20-10A-DESIGN AUTOMATION SOFTWARE	20	IN PROCESS. WILL BE IMPORTANT.
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	3	THE IMPORTANCE OF DESIGN TOOLS IS OVERRATED, DESIGN TASKS ARE NOT
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	3	EXTREMELY DIFFICULT.
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	4	"OUR TOOLS STAND ALONE."
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	7	VENDORS ARE INTERESTED ONLY IN PUSHING THEIR PRODUCTS, RATHER THAN
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	7	MAKING INTEGRATION EASY.
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	13	"INDUSTRY HAS A WAYS TO GO."
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	14	TOOLS "AREN'T THERE YET," AND ARE "TOO STAND ALONE." INTEGRATION
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	14	REQUIRES INTERNAL WORK.
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	18	TRANSLATION DATA REQUIRED.
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	24	STILL NEW TECHNOLOGY. DON'T KNOW IF HAPPY YET.
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	25	DEVELOPED FOR WIRED BOARDS. WON'T WORK AS ANALYSIS TOOL.
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	2	"THERE ARE NO STANDARDS."
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	3	NOTHING IN PLACE YET, LOTS MORE TO BE DONE.
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	5	USES EXISTING STANDARDS FOR OTHER PRODUCT DOMAINS THAT DON'T MEET MCM
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	5	NEEDS.
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	7	VENDORS PREFER USING THEIR OWN INTERNAL FORMATS INSTEAD OF ESTABLISHING
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	7	STANDARDS.
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	8	"PARTICIPATING IN ARPA ASIM AT MCC" TO WORK ON IMPROVMENT FOR THIS.
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	11	NO STANDARD FOR THIS REALLY, EXCEPT FOR GERBER.
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	16	NECESSARY TO ACHIEVE LOW COST AND FIRST TIME SUCCESS, AND STANDARDS
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	16	ARE NOT WIDELY AVAILABLE.
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	17	DON'T DO MUCH IN THIS FIELD. NOT REAL FAMILIAR.
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	18	CAD VENDOR OUTPUT INCOMPATIBLE WITH MANUFACTURING.
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	19	ARE NO STANDARDS IN THE MARKET AND NO ONE IS WORKING HARD ENOUGH ON
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	19	THEM.
23-10D-ACCESS TO CHIP & COMPONENT DATA	2	MOST VENDORS DON'T OFFER.
23-10D-ACCESS TO CHIP & COMPONENT DATA	4	INDUSTRY STANDARDS MISSING.
23-10D-ACCESS TO CHIP & COMPONENT DATA	6	PAD LAYOUTS AND SIMULATION MODELS (INCLUDING TIME ANALYSIS) ARE
23-10D-ACCESS TO CHIP & COMPONENT DATA	6	DIFFICULT TO GET FROM VENDORS.
23-10D-ACCESS TO CHIP & COMPONENT DATA	7	IC VENDORS SLOW TO PROVIDE BARE DIE DATA TO LEVEL PROVIDED FOR
23-10D-ACCESS TO CHIP & COMPONENT DATA	7	PACKAGED DIE DATA.
23-10D-ACCESS TO CHIP & COMPONENT DATA	8	FEW CHIP MANUFACTURERS WILL PROVIDE DATA. THOSE WHO DO PROVIDE DATA
23-10D-ACCESS TO CHIP & COMPONENT DATA	8	DON'T PROVIDE VERY MUCH.
23-10D-ACCESS TO CHIP & COMPONENT DATA	9	INFORMATION SHOULD BE PRINTED IN DATA BOOK. AT PRESENT, NEED TO MAKE
23-10D-ACCESS TO CHIP & COMPONENT DATA	9	FORMAL, WRITTEN REQUEST. ACCESS SHOULD BE EASY.
23-10D-ACCESS TO CHIP & COMPONENT DATA	10	"I'M SPOILED BECAUSE I WORK FOR SEMI-CONDUCTOR."
23-10D-ACCESS TO CHIP & COMPONENT DATA	11	HAVE TO INSERT INFORMATION INTO SYSTEM MANUALLY, NO STANDARD FOR
23-10D-ACCESS TO CHIP & COMPONENT DATA	11	ACCESS.
23-10D-ACCESS TO CHIP & COMPONENT DATA	14	ALREADY HAVE FROM MOTOROLA.
23-10D-ACCESS TO CHIP & COMPONENT DATA	16	COMMERCIAL/MILITARY VENDORS NOT FULLY SUPPORTIVE OF CHIP SALES.
23-10D-ACCESS TO CHIP & COMPONENT DATA	18	CHIP VENDORS DATA UNAVAILABLE AND INACCURATE.
23-10D-ACCESS TO CHIP & COMPONENT DATA	19	TOO EXPENSIVE.
23-10D-ACCESS TO CHIP & COMPONENT DATA	20	DESIGN OUR OWN.
23-10D-ACCESS TO CHIP & COMPONENT DATA	22	INFORMATION NOT AVAILABLE FROM VENDORS ON STANDARD FORMAT.

PROGRAM = COMMENTS

[redacted]
BY CATEGORY BY QUESTION NUMBER
SURVEY PERIOD 9312 - CURRENTLY USING MCM

09:25 MONDAY, DECEMBER 6, 1993

CATEGORY=04-DESIGN/MFG OF MCM'S
(CONTINUED)

QUESTION	RESPONSE NUMBER	COMMENT
23-10D-ACCESS TO CHIP & COMPONENT DATA	23	A MAJOR PROBLEM.
23-10D-ACCESS TO CHIP & COMPONENT DATA	25	NO KNOWN GOOD DIE.
24-10E-DESIGN METHODS TO IMPLEMENT MCM'S	2	TRANSFER STANDARDS STILL NEED IMPROVEMENT.
24-10E-DESIGN METHODS TO IMPLEMENT MCM'S	5	MCM STILL IN INFANCY. NEEDS D.O.D./VENDOR/USER COALITION TO DEVELOP A
24-10E-DESIGN METHODS TO IMPLEMENT MCM'S	5	GOOD METHODOLOGY.
24-10E-DESIGN METHODS TO IMPLEMENT MCM'S	11	LOTS OF TALK, LITTLE ACTION OR REAL KNOWLEDGE.
24-10E-DESIGN METHODS TO IMPLEMENT MCM'S	18	MARKET TOOL.
25-10F-AUTOMATED TESTING & QUALITY METHODS	8	THING MISSING IS TEST SYSTEMS THAT MEET NEED FOR MCM DESIGNS THAT ARE
25-10F-AUTOMATED TESTING & QUALITY METHODS	8	IN BETWEEN PRINT CIRCUITBOARDS OR INTEGRATED CIRCUITS.
25-10F-AUTOMATED TESTING & QUALITY METHODS	11	TEST IS A PROBLEM.
25-10F-AUTOMATED TESTING & QUALITY METHODS	14	FRAGMENTED.
25-10F-AUTOMATED TESTING & QUALITY METHODS	17	NO GOOD SILICONE SUPPLIERS. SUPPLIERS NOT ON BOARD WITH TESTED DIE.
25-10F-AUTOMATED TESTING & QUALITY METHODS	18	INCOMING DIE STANDARDS MUST BE PERFECT, QUALITY NEED TO BE STEPPED UP.
25-10F-AUTOMATED TESTING & QUALITY METHOD	20	IMPLEMENTING NOW.

CATEGORY=05-CAPABILITIES

QUESTION	RESPONSE NUMBER	COMMENT
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	2	DATA TRANSFERS DIFFICULT, I.E., CADENCE TO MENTOR.
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	5	NO EXISTING STANDARD SATISFIES THIS NEED.
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	6	NEARLY IMPOSSIBLE TO DO THIS.
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	7	VENDORS ARE TOO PROPRIETARY.
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	11	NO STAND FOR THIS CAPABILITY THAT HE IS AWARE OF.
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	13	CAD AND CAE STANDARDS NOT FIRM YET. SOFTWARE IS UNPROVEN. INDUSTRY
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	13	IS HEADING RIGHT WAY, MOST NOT SMOOTH YET. POINT SOLUTION INTEGRATION
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	13	IS "NOT THERE YET."
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	16	LACK OF STANDARDS. CAD/CAE VENDORS SLOW TO ADOPT EXISTING STANDARDS.
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	18	FOUNDRIES NEED TO ACCEPT DATA FROM MANY CAD SYSTEMS.
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	19	NOT ONE ON MARKET. STILL NEEDS TO BE DEVELOPED.
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	20	LEADER OF ASEM FOR ARPA CONTRACT.
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	22	WILL IMPLEMENT FURTHER DOWN THE ROAD.
27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	2	UNIQUE STEPS NECESSARY, NO GOOD INTEGRATION.
27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	3	NOT A BIG ISSUE; DON'T THINK MANY WILL WANT.
27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	5	NO FRAMEWORK OR DATA STANDARD IN PLACE TO PERFORM THIS EFFORT.
27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	6	NOT FEASIBLE WITH TODAY'S TOOLS.
27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	7	ACTIVITY WILL BE DIFFICULT TO DO UNTIL EDA VENDORS STOP PUSHING
27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	7	PROPRIETARY FORMATS.
27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	8	HAVE CONTRACT REQUIREMENT FOR THIS CAPABILITY. DIFFICULT TO DO. LACK
27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	8	OF LINKAGE BETWEEN VENDORS IS VERY LIMITING.
27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	19	DOESN'T MATTER.
27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	20	DON'T SEE A NEED TO DO.
28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	2	UNIQUE STEPS NECESSARY, NO GOOD INTEGRATION.
28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	5	NO FRAMEWORK OR DATA STANDARD IN PLACE TO PERFORM THIS EFFORT.
28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	7	WILL BE DIFFICULT TO DO UNTIL STANDARDS ARE IDENTIFIED AND SUPPORTED
28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	7	FOR DESCRIBING DATA AT VARIOUS LEVELS.
28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	10	NEED SOME STANDARD FORMAT.
28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	16	IMPORTANT FOR DESIGN REUSE. STATISTICAL LACK OF STANDARDS.

PROGRAM = COMMENTS

CATEGORY=05-CAPABILITIES
(CONTINUED)

QUESTION	RESPONSE NUMBER	COMMENT
28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	18	BEST TOOLS FOR DIFFERENT ANALYSIS MAY COME FROM DIFFERENT VENDORS.
28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	20	HAVE NO REASON TO DO THIS.
28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	22	WILL IMPLEMENT LATER.
28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	23	HARD TO DO. WOULD BE GREAT IF WE COULD.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	2	FORMATS NOT WELL-STANDARDIZED.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	5	ADVENT OF STEP STANDARD WILL REQUIRE THE DELIVERY OF STEP FOR MCM
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	5	PRODUCTS.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	6	NOT AN ISSUE.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	7	NEUTRAL FILE IS NOT DEFINED TO COVER DIFFERENT MCM DESIGN LEVELS. WILL
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	7	BE CHALLENGE TO GET VENDOR SUPPORT ONCE THEY ARE DEFINED.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	8	DOESN'T EXIST, REALLY.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	11	NO REAL STANDARD FOR THIS.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	14	TECHNOLOGY IS STILL EVOLVING.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	18	NEUTRAL FORMAT, CAD SYSTEM INDEPENDENT.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	19	STILL NEEDS DEVELOPING.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	20	DON'T KNOW.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	22	WILL IMPLEMENT LATER.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	23	CAN'T BE DONE.
30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	5	"INTEGRATION MISSING."
30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	6	MCM POINT TOOLS ARE VERY IMMATURE.
30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	7	MORE IMPORTANT TO OPTIMIZE ENTIRE DESIGN PROCESS THAN TO HAVE THE BEST
30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	7	DESIGN TOOL IN ITS CLASS.
30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	16	SOFTWARE VENDORS HAVE NOT ADOPTED OPEN FRAME WORK.
30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	18	MEET CUSTOMERS REQUIREMENTS.
30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	20	"DUMB QUESTION."
30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	22	IMMATURE TECHNOLOGY.
30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	23	WE USE WIDE VARIETY OF TOOLS.
31-11F-MOST S/W PURCHASED FROM ONE VENDOR	2	MULTIPLE VENDORS ARE ACCEPTABLE WHEN INTEGRATION IS GOOD.
31-11F-MOST S/W PURCHASED FROM ONE VENDOR	5	BETTER IF COULD BUY SEPARATE TOOLS FROM SEPARATE VENDORS. VENDORS
31-11F-MOST S/W PURCHASED FROM ONE VENDOR	5	SHOULD WORK TOGETHER IN INTEGRATION.
31-11F-MOST S/W PURCHASED FROM ONE VENDOR	8	CAN'T STANDARDIZE ALL ON ONE SET OF TOOLS TO GET ALL OF THE
31-11F-MOST S/W PURCHASED FROM ONE VENDOR	8	TECHNOLOGIES REQUIRED.
31-11F-MOST S/W PURCHASED FROM ONE VENDOR	17	EACH SOFTWARE PACKAGE DIFFERENT. INVOLVES PRODUCT, CAPABILITY, AND
31-11F-MOST S/W PURCHASED FROM ONE VENDOR	17	QUALITY.
31-11F-MOST S/W PURCHASED FROM ONE VENDOR	20	NOT IMPORTANT.

CATEGORY=06-MCM DESIGN ENVIRONMENT

QUESTION	RESPONSE NUMBER	COMMENT
32-12A-SYSTEM SPECIFICATIONS	3	"UNCLEAR", NOT SPECIFIC ENOUGH TO ANSWER.
32-12A-SYSTEM SPECIFICATIONS	6	LITTLE COUPLING BETWEEN SYSTEM REQUIREMENT TOOLS AND LOWER LEVEL TOOLS.
32-12A-SYSTEM SPECIFICATIONS	7	TOOLS IMMATURE AND SYSTEM SPECIFIC.
32-12A-SYSTEM SPECIFICATIONS	10	"DON'T UNDERSTAND" WHAT THE SYSTEM SPECIFICATIONS APPLIES TO.
32-12A-SYSTEM SPECIFICATIONS	18	NOT MANY SYSTEM TOOLS AVAILABLE.
33-12B-SYSTEM PARTITIONING	3	"UNCLEAR", NOT SPECIFIC ENOUGH TO ANSWER.
33-12B-SYSTEM PARTITIONING	4	DESIGNERS AREN'T USED TO THE LEVEL OF INTEGRATION POSSIBLE.
33-12B-SYSTEM PARTITIONING	7	PARTITIONING OFTEN DONE BEFORE SPECIFICTIONS, OFTEN NOT A BIG ROLE

CATEGORY=06-MCM DESIGN ENVIRONMENT
(CONTINUED)

QUESTION	RESPONSE NUMBER	COMMENT
33-12B-SYSTEM PARTITIONING	7	PLAYED.
33-12B-SYSTEM PARTITIONING	16	CURRENT TOOLS DON'T ADDRESS HIGH LEVEL BEHAVIORAL SIMULATION TO ALLOW
33-12B-SYSTEM PARTITIONING	16	PARTITION OPTIMIZING.
33-12B-SYSTEM PARTITIONING	23	TOOLS DON'T EXIST.
34-12C-AUTOROUTING	2	NOT WELL-ADAPTED TO MCM YET.
34-12C-AUTOROUTING	3	"UNCLEAR", NOT SPECIFIC ENOUGH TO ANSWER.
34-12C-AUTOROUTING	4	DON'T USE IT.
34-12C-AUTOROUTING	6	AUTOROUTING TOO DIFFICULT FOR MASSES TO USE. DIFFICULTY ROUTING FULL
34-12C-AUTOROUTING	6	MCM'S.
34-12C-AUTOROUTING	10	HARD TO FINDS TOOLS FOR 100% COMPLETION ON COMPLEX APPLICATIONS.
34-12C-AUTOROUTING	14	SOME TOOLS BETTER THAN OTHERS. STILL A LOT TO BE LEARNED.
34-12C-AUTOROUTING	18	FALL SHORT SUPPORTING MCM DENSITY REQUIREMENTS.
35-12D-PACKAGING TECHNOLOGY SELECTION	3	"UNCLEAR", NOT SPECIFIC ENOUGH TO ANSWER.
35-12D-PACKAGING TECHNOLOGY SELECTION	7	PROVIDERS UNWILLING TO RELEASE INFORMATION, SEEM TO FEAR EXCLUSION IN
35-12D-PACKAGING TECHNOLOGY SELECTION	7	LATER STAGE OF DEVELOPMENT OF MCM TECHNOLOGY.
35-12D-PACKAGING TECHNOLOGY SELECTION	8	"DOESN'T EXIST, REALLY."
35-12D-PACKAGING TECHNOLOGY SELECTION	9	"REALLY NOTHING AVAILABLE NOW."
35-12D-PACKAGING TECHNOLOGY SELECTION	10	A DECISION-MAKING TOOL WOULD BE HELPFUL.
35-12D-PACKAGING TECHNOLOGY SELECTION	22	STILL HAVE A LONG WAY TO GO.
35-12D-PACKAGING TECHNOLOGY SELECTION	23	DOESN'T EXIST.
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	2	FEW VENDORS OFFER.
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	3	"UNCLEAR", NOT SPECIFIC ENOUGH TO ANSWER.
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	6	KITS JUST BECOMING AVAILABLE. "JUST NOT THERE."
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	7	"NOT MUCH THERE." FOUNDRIES JUST BEGINNING TO BUILD KITS.
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	8	*NOT NEARLY ENOUGH INTERCONNECTION, AND NOT ENOUGH DESIGN KITS.*
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	11	DO NOT USE.
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	18	NOT MANY DESIGN KITS AVAILABLE FOR TECHNOLOGY.
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	20	EMERGING TECHNOLOGY.
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	22	DON'T HAVE ANY REAL DESIGN KITS YET.
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	23	VERY FEW KITS AVAILABLE. THOSE THAT ARE AVAILABLE ARE GEARED TO
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	23	SPECIFIC DESIGNS.
37-12F-OPTIMIZATION OF MANUFACTURING DATA	3	"UNCLEAR", NOT SPECIFIC ENOUGH TO ANSWER.
37-12F-OPTIMIZATION OF MANUFACTURING DATA	4	"WHAT DO YOU MEAN?"
37-12F-OPTIMIZATION OF MANUFACTURING DATA	5	BEING ABLE TO MODEL MANUFACTURED PRODUCT DURING DESIGN WOULD LOWER COST
37-12F-OPTIMIZATION OF MANUFACTURING DATA	5	AND INCREASE YIELD.
37-12F-OPTIMIZATION OF MANUFACTURING DATA	6	NOT DOING ANYTHING WITH IT IN MCM'S.
37-12F-OPTIMIZATION OF MANUFACTURING DATA	10	"DON'T UNDERSTAND" WHAT OPTIMIZATION OF DATA ENCOMPASSES.
37-12F-OPTIMIZATION OF MANUFACTURING DATA	16	LITTLE STATISTICAL INFORMATION AVAILABLE.
37-12F-OPTIMIZATION OF MANUFACTURING DATA	18	NECESSARY TO MANAGE DATA SUCCESSFULLY IN ENVIRONMENTAL FOUNDRY.
37-12F-OPTIMIZATION OF MANUFACTURING DATA	22	DOESN'T EXIST YET.

CATEGORY=07-SELECTING MCM MFG

QUESTION	RESPONSE NUMBER	COMMENT
38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	2	MOST VENDORS DON'T OFFER COMPLETE WITH ALL EDA PLATFORMS.
38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	6	NO DESIGN KITS YET TO SPEAK OF.
38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	7	KITS VERY IMMATURE.

PROGRAM = COMMENTS

CATEGORY=07-SELECTING MCM MFG
(CONTINUED)

QUESTION	RESPONSE NUMBER	COMMENT
38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	8	NOT ENOUGH KITS AVAILABLE, TOO FEW LINKAGES BETWEEN VENDORS.
38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	19	NEED TO BUILD IN TRADE-OFF CAPABILITIES.
38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	20	AREN'T ANY SOURCES.
38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	22	DON'T EXIST YET.
39-17B-MFG REPUTATION/EXPERIENCE/RECORD	6	EXPERIENCE BASE IS STILL BUILDING.
39-17B-MFG REPUTATION/EXPERIENCE/RECORD	10	NOT A LOT OF APPLICATIONS THAT HAVE BEEN EXPEDIENTLY DONE.
39-17B-MFG REPUTATION/EXPERIENCE/RECORD	14	RATING SELF.
39-17B-MFG REPUTATION/EXPERIENCE/RECORD	17	NOT A LOT OF EXPERIENCE WITH ANY MANUFACTURER YET. NEW TECHNOLOGY.
39-17B-MFG REPUTATION/EXPERIENCE/RECORD	19	COST TOO HIGH.
39-17B-MFG REPUTATION/EXPERIENCE/RECORD	23	ENORMOUS VARIETIES OF CAPABILITIES IN THE INDUSTRY.
40-17C-TECHNOLOGY OFFERED BY MANAFACTURER	20	NO ONE CAN SUPPLY. USE OUR OWN IN-HOUSE SOURCE.
40-17C-TECHNOLOGY OFFERED BY MANAFACTURER	23	NOT MATURE.
41-17D-RECURRING COST OF PRODUCTION	5	TECHNOLOGY IS IMPROVING, BUT HARD TO ESTABLISH YIELDS OR COSTS OF
41-17D-RECURRING COST OF PRODUCTION	5	PRODUCTION RUNS.
41-17D-RECURRING COST OF PRODUCTION	7	"CHICKEN AND EGG THING." COSTS WON'T GO DOWN UNTIL VOLUMES ARE UP, AND
41-17D-RECURRING COST OF PRODUCTION	7	VICE-VERSA.
41-17D-RECURRING COST OF PRODUCTION	8	LOW VOLUME SITUATION.
41-17D-RECURRING COST OF PRODUCTION	10	LOW VOLUME REQUIREMENTS DON'T ALLOW ECONOMIES OF SKILL.
41-17D-RECURRING COST OF PRODUCTION	11	COSTS TOO HIGH IN GENERAL.
41-17D-RECURRING COST OF PRODUCTION	16	MCM NEEDS TO PRODUCE HIGH VOLUME TO DRIVE DOWN COST ON LEARNING CURVE.
41-17D-RECURRING COST OF PRODUCTION	19	COST TOO HIGH.
41-17D-RECURRING COST OF PRODUCTION	20	"WE'RE IN A LEARNING PROCESS."
41-17D-RECURRING COST OF PRODUCTION	22	NOT IMPORTNAT, R&D CO.
41-17D-RECURRING COST OF PRODUCTION	23	PRICE IS NOW COMING DOWN.
42-17E-ENGINEERING SUPPORT & CONSULTING	5	WOULD BE UNCOMFORTABLE ANSWERING.
42-17E-ENGINEERING SUPPORT & CONSULTING	7	FOUNDRIES HAVEN'T FIGURED OUT THEIR BUSINESS MODELS, AND SUPPORT WILL
42-17E-ENGINEERING SUPPORT & CONSULTING	7	BE CONFUSING UNTIL THEY DO.
42-17E-ENGINEERING SUPPORT & CONSULTING	19	NON-RECURRING COST SHOULD BE LESS THAN 25K PER DESIGN.

CATEGORY=08-DATA EXCHANGE STANDARD

QUESTION	RESPONSE NUMBER	COMMENT
43-18A-CAD FRAMEWORK INITIATINVE (CFI)	2	MAKING PROGRESS.
43-18A-CAD FRAMEWORK INITIATINVE (CFI)	3	NOT REALLY A STANDARD, THEY'RE A GROUP.
43-18A-CAD FRAMEWORK INITIATINVE (CFI)	5	HAVEN'T PRODUCED ANYTHING YET.
43-18A-CAD FRAMEWORK INITIATINVE (CFI)	6	VERY SLOW IN DEVELOPING.
43-18A-CAD FRAMEWORK INITIATINVE (CFI)	8	STANDARD GOOD, CAD TOOL PROVIDERS NOT SUPPORTING WELL.
43-18A-CAD FRAMEWORK INITIATINVE (CFI)	13	NOT READY FOR CERTIFICATION. NEED TIME FOR VENDORS TO IMPLEMENT.
44-18B-STEP/PDES	2	LOOKS PROMISING.
44-18B-STEP/PDES	3	NOT FAMILIAR WITH.
44-18B-STEP/PDES	5	"ON RIGHT TRACK."
44-18B-STEP/PDES	7	HAS RIGHT INFO CONTENT, BUT NO USEFUL UNTIL VENDORS SUPPORT.
44-18B-STEP/PDES	8	DON'T USE.
44-18B-STEP/PDES	11	NOT FAMILIAR WITH.
44-18B-STEP/PDES	14	NOT FAMILIAR WITH.
44-18B-STEP/PDES	18	DON'T USE THESE STANDARDS. DOES NOT SUPPORT MCM NOW.
44-18B-STEP/PDES	19	NO STANDARDS YET.

CATEGORY=08-DATA EXCHANGE STANDARD
(CONTINUED)

QUESTION	RESPONSE NUMBER	COMMENT
45-18C-IGES	3	NOT FAMILIAR WITH.
45-18C-IGES	5	MUST LIVE WITH LEGACY DATA FORMAT -- SHOULD PHASE INTO STEP/PDES.
45-18C-IGES	7	EVERYONE'S "FLAVOR" VARIES SLIGHTLY. DIFFICULT TRANSLATIONS; LOSE
45-18C-IGES	7	DATA.
45-18C-IGES	8	DON'T USE.
45-18C-IGES	14	NOT FAMILIAR WITH.
45-18C-IGES	18	DOES NOT SUPPORT MCM NOW.
46-18D-EDIF	5	SHOULD BE REPLACED.
46-18D-EDIF	6	NOT A WELL-DEFINED STANDARD.
46-18D-EDIF	7	RIGHT INFO CONTENT, BUT NOT USEFUL UNTIL VENDORS SUPPORT.
46-18D-EDIF	11	NOT FAMILIAR WITH.
46-18D-EDIF	18	DOES NOT SUPPORT MCM NOW.
46-18D-EDIF	19	NO ONE HAS EDIF STANDARDS.
46-18D-EDIF	23	NOT REAL TIME TO US.
47-18E-IPC-350	3	NOT FAMILIAR WITH.
47-18E-IPC-350	5	SHOULD BE REPLACED.
47-18E-IPC-350	7	NO SIGNIFICANT VENDORS ARE SUPPORTING.
47-18E-IPC-350	8	DON'T USE.
47-18E-IPC-350	10	NOT FAMILIAR WITH.
47-18E-IPC-350	14	NOT FAMILIAR WITH.
47-18E-IPC-350	18	ENHANCEMENT AND UPGRADE NEEDED FOR MCM.
47-18E-IPC-350	19	DON'T KNOW WHAT IT IS.
48-18F-GERBER	3	DON'T USE.
48-18F-GERBER	5	SHOULD BE REPLACED. OUTDATED FORMAT.
48-18F-GERBER	7	WILL BE USED FOR MCM-C AND MCM-L UNTIL VENDORS SUPPORT "MORE ROBUST
48-18F-GERBER	7	STANDARDS."
48-18F-GERBER	8	"NOT A GOOD STANDARD."
48-18F-GERBER	18	CONTENTS INADEQUATE FOR ELECTRICAL RULE VERIFICATION.
49-18G-GDSII STREAM	2	DOESN'T SUPPORT A LOT OF MCM FEATURES.
49-18G-GDSII STREAM	5	SHOULD BE REPLACED. OUTDATED FORMAT.
49-18G-GDSII STREAM	7	IMPROVING IN HDI TECHNOLOGY. NOT IMPORTANT EXCEPT FOR THIN FILM ON
49-18G-GDSII STREAM	7	SILICON SUBSTRATE.
49-18G-GDSII STREAM	8	BETTER THAN GERBER, BUT LIMITED.
49-18G-GDSII STREAM	18	CONTENTS INADEQUATE FOR ELECTRICAL RULE VERIFICATION.
50-18H-DXF	3	NOT FAMILIAR WITH.
50-18H-DXF	5	SHOULD BE REPLACED. OUTDATED FORMAT.
50-18H-DXF	7	SOMETHING MORE THAN "DRAFTING LANGUAGE" WILL BE NEEDED FOR HIGH-
50-18H-DXF	7	COMPLEXITY MCM'S.
50-18H-DXF	8	BETTER THAN GERBER, BUT LIMITED.
50-18H-DXF	18	CONTENTS INADEQUATE FOR ELECTRICAL RULE VERIFICATION.

CATEGORY=10-DESIGN TOOLS

QUESTION	RESPONSE NUMBER	COMMENT
72-9A-TOOLS FOR CAE	2	CADENCE CONCEPT, MENTOR GRAPHICS DESIGN ARCH.
72-9A-TOOLS FOR CAE	3	MENTOR MCM STATION, CADENCE ALLEGRO STATION
72-9A-TOOLS FOR CAE	4	DAZIX

PROGRAM = COMMENTS

COMMENTS FROM EDA DICE MARKET STUDY SURVEY
BY CATEGORY BY QUESTION NUMBER
SURVEY PERIOD 9312 - CURRENTLY USING MCM

09:25 MONDAY, DECEMBER 6, 1993

CATEGORY=10-DESIGN TOOLS
(CONTINUED)

QUESTION	RESPONSE NUMBER	COMMENT
72-9A-TOOLS FOR CAE	5	MENTOR GRAPHICS
72-9A-TOOLS FOR CAE	6	CADENCE CONCEPT, CADENCE RAPID SIM
72-9A-TOOLS FOR CAE	7	VIEWLOGIC, ZYCAD, SOME OF CAD TOOLS
72-9A-TOOLS FOR CAE	8	DON'T REGARD AS SEPARATE FROM CAD
72-9A-TOOLS FOR CAE	9	MENTOR GRAPHICS, CADAM
72-9A-TOOLS FOR CAE	10	SAME AS CAD
72-9A-TOOLS FOR CAE	11	SAME AS CAD, JUST BROADER TERM
72-9A-TOOLS FOR CAE	13	QUATAL LABORATORIES, THERMAL PACKAGE PACIFIC NUMERICS
72-9A-TOOLS FOR CAE	14	NOT SURE WHAT TERM INCLUDES.
72-9A-TOOLS FOR CAE	16	MENTOR GRAPHICS
72-9A-TOOLS FOR CAE	17	HARRIS EDA, MENTOR GRAPHICS SOFTWARE
72-9A-TOOLS FOR CAE	18	MENTOR GRAPHICS
72-9A-TOOLS FOR CAE	19	MENTOR, CADENCE, HARRIS, INTERGRAPH
72-9A-TOOLS FOR CAE	20	SUNSPARK SYSTEM, MENTOR, COPPER CHYAN ENHANCEMENT
72-9A-TOOLS FOR CAE	22	POWER VIEW
72-9A-TOOLS FOR CAE	23	OEA 3D ANALYSIS TOOLS, TANGO, VERILOG, H SPICE, LINE SIS PROBE
72-9A-TOOLS FOR CAE	24	OWN IN HOUSE SYSTEM
72-9A-TOOLS FOR CAE	25	CADENCE
73-9B-TOOLS FOR CAD	2	CADENCE ALEGRO, MENTOR BOARD STATION 500
73-9B-TOOLS FOR CAD	3	"MOST PEOPLE SEE CAE & CAD AS SAME ACTIVITY." CAD INTERCHANGEABLE WITH
73-9B-TOOLS FOR CAD	3	CAE-(MENTOR MCM STATION, CADENCE ALLEGRO STATION).
73-9B-TOOLS FOR CAD	4	DLS UNDER WINDOWS
73-9B-TOOLS FOR CAD	5	RACELL VISULA, MENTOR GRAPHICS, MCM STATION
73-9B-TOOLS FOR CAD	6	CADENCE MCM ALLEGRO
73-9B-TOOLS FOR CAD	7	CADENCE , MENTOR, HARRIS EDA; ALSO SOME IBM INTERNAL TOOLS
73-9B-TOOLS FOR CAD	8	CADENCE, MENTOR GRAPHICS, HARRIS EDA
73-9B-TOOLS FOR CAD	9	MENTOR GRAPHICS, AUTOCAD
73-9B-TOOLS FOR CAD	10	HARRIS EDA FINESSE
73-9B-TOOLS FOR CAD	11	SPICE, PC BASED TOOLS, PCAD, AUTOCAD DERIVATIVES
73-9B-TOOLS FOR CAD	13	INTERGRAPH, MOVING TO MENTOR
73-9B-TOOLS FOR CAD	14	MENTOR, HARRIS FINESSE, CADENCE
73-9B-TOOLS FOR CAD	16	FINESSE
73-9B-TOOLS FOR CAD	17	HARRIS EDA, MENTOR GRAPHICS
73-9B-TOOLS FOR CAD	18	MENTOR GRAPHICS, HARRIS FINESSE
73-9B-TOOLS FOR CAD	19	MENTOR, CADENCE, HARRIS, INTERGRAPH
73-9B-TOOLS FOR CAD	20	SUN SPARK SYSTEM, MENTOR, COPPER CHYAN ENHANCEMENT
73-9B-TOOLS FOR CAD	22	MENTOR GDT & HARRIS FINESSE
73-9B-TOOLS FOR CAD	23	HARRIS FINESSE, IC EDITORS, LAYOUT, DRC, LVS
73-9B-TOOLS FOR CAD	24	MENTOR GRAPHICS, CADENCE
73-9B-TOOLS FOR CAD	25	CATIA
74-9C-TOOLS FOR CAM	4	DLS UNDER WINDOWS
74-9C-TOOLS FOR CAM	5	COMPUTERVISION
74-9C-TOOLS FOR CAM	7	IBM INTERNAL TOOLS
74-9C-TOOLS FOR CAM	8	DON'T REGARD AS SEPERATE FROM CAD
74-9C-TOOLS FOR CAM	9	MENTOR GRAPHICS, AUTOCAD
74-9C-TOOLS FOR CAM	10	WORKSTREAM
74-9C-TOOLS FOR CAM	11	GERBER CONVERTERS, CAD-CAM TYPE PROGRAM
74-9C-TOOLS FOR CAM	13	INTEGRATED WITH CAD
74-9C-TOOLS FOR CAM	14	NOT DEFINED, USE MANY
74-9C-TOOLS FOR CAM	16	AUTOCAD

PROGRAM = COMMENTS

[redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted]

COMMENTS FROM EDA DIGEST MARKET STUDY SURVEY
BY CATEGORY BY QUESTION NUMBER
SURVEY PERIOD 9312 - CURRENTLY USING MCM

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CATEGORY=10-DESIGN TOOLS
(CONTINUED)

QUESTION	RESPONSE NUMBER	COMMENT
74-9C-TOOLS FOR CAM	17	NOT USING NOW, BUT WILL USE INTERGRAPH.
74-9C-TOOLS FOR CAM	18	AUTO CAD
74-9C-TOOLS FOR CAM	19	OWN IN HOUSE SYSTEM
74-9C-TOOLS FOR CAM	20	IN PROCESS DEVELOPMENT
74-9C-TOOLS FOR CAM	23	PC GERBER, ASM 600
74-9C-TOOLS FOR CAM	24	OWN IN HOUSE SYSTEM
74-9C-TOOLS FOR CAM	25	ALLEGRO
75-9D-TOOLS FOR OVERALL	2	CADENCE DESIGN FRAMEWORK II & VALID FRAME, MENTOR FALCON FRAMEWORK
75-9D-TOOLS FOR OVERALL	3	SAME AS CAE-(MENTOR MCM STATION, CADENCE ALLEGRO STATION). NOTHING
75-9D-TOOLS FOR OVERALL	3	"SITS ON TOP OF" THEIR MENTOR OR CADENCE.
75-9D-TOOLS FOR OVERALL	4	PC'S
75-9D-TOOLS FOR OVERALL	5	MENTOR GRAPHICS
75-9D-TOOLS FOR OVERALL	6	CADENCE TOOLS
75-9D-TOOLS FOR OVERALL	7	CADENCE, IBM TOOLS
75-9D-TOOLS FOR OVERALL	8	CADENCE, MENTOR
75-9D-TOOLS FOR OVERALL	9	APOLLO
75-9D-TOOLS FOR OVERALL	10	CADENCE
75-9D-TOOLS FOR OVERALL	11	ON ORDER
75-9D-TOOLS FOR OVERALL	13	MENTOR
75-9D-TOOLS FOR OVERALL	14	MOTOROLA
75-9D-TOOLS FOR OVERALL	16	INTERGRAPH
75-9D-TOOLS FOR OVERALL	17	INTERGRAPH SYSTEM
75-9D-TOOLS FOR OVERALL	18	FOR CAD - MENTOR GRAPHICS, HARRIS FINESSE. FOR MANUFACTURING - CUSTOM
75-9D-TOOLS FOR OVERALL	18	DESIGN SYSTEM.
75-9D-TOOLS FOR OVERALL	19	IBM & CFI COMPATIBLE SYSTEM
75-9D-TOOLS FOR OVERALL	20	MIL SPECS
75-9D-TOOLS FOR OVERALL	24	OWN IN HOUSE SYSTEM
75-9D-TOOLS FOR OVERALL	25	CADENCE, IBM 6000

CATEGORY=11-OVERALL SATISFACTION

QUESTION	RESPONSE NUMBER	COMMENT
79-19-OVERALL SATISFACTION	2	ABLE TO COMPLETE A LOT WITH MCM TECHNOLOGIES, BUT IT HAS POTENTIAL TO
79-19-OVERALL SATISFACTION	2	BE FAR MORE PRODUCTIVE.
79-19-OVERALL SATISFACTION	3	CURRENT ENVIRONMENT HAS PROVEN VERY EFFECTIVE, BUT BETTER TOOLS AND
79-19-OVERALL SATISFACTION	3	PROCEDURES WOULD MAKE IT MORE PRODUCTIVE.
79-19-OVERALL SATISFACTION	4	"IT WORKS!"
79-19-OVERALL SATISFACTION	5	HAVE GOOD POINT SOLUTIONS; BUT INTEGRATION, COLLABORATIONS,
79-19-OVERALL SATISFACTION	5	METHODOLOGIES & INFRASTRUCTURE ARE LACKING.
79-19-OVERALL SATISFACTION	6	MCM DESIGN & FABRICATION IS FEASIBLE; DOING A FAIR AMOUNT OF IT. "WOULD
79-19-OVERALL SATISFACTION	6	BE EASIER IF TOOLS WERE FURTHER ALONG."
79-19-OVERALL SATISFACTION	7	"MY SATISFACTION WILL BE LOW UNTIL STANDARDS ARE DEFINED AND TOOL KITS
79-19-OVERALL SATISFACTION	7	ARE AVAILABLE." HAVE MADE PROGRESS IN EDUCATING PEOPLE IN MCM
79-19-OVERALL SATISFACTION	7	TECHNOLOGIES AND CHANGES REQUIRED TO DESIGN AND MANUFACTURE, BUT
79-19-OVERALL SATISFACTION	7	"...STILL HAVE A LONG WAY TO GO."
79-19-OVERALL SATISFACTION	8	"WE CAN DO MOST OF THE BASICS," BUT CAN'T DO THEM WITH THE FULL RANGE
79-19-OVERALL SATISFACTION	8	OF DESIRED CAD TOOLS OR WITH THE VARIETY OF VENDORS DESIRED.

PROGRAM = COMMENTS

[redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted]

COMMENTS FROM EDM DICE [redacted] SURVEY
BY CATEGORY BY QUESTION NUMBER
SURVEY PERIOD 9312 - CURRENTLY USING MCM

09:25 MONDAY, DECEMBER 6, 1993

CATEGORY=11-OVERALL SATISFACTION
(CONTINUED)

QUESTION	RESPONSE NUMBER	COMMENT
79-19-OVERALL SATISFACTION	9	DOING TOO MANY THINGS AT ONE TIME. NEED TO NARROW FOCUS.
79-19-OVERALL SATISFACTION	10	"WE DON'T HAVE THE PROPER INFRASTRUCTURE IN PLACE YET."
79-19-OVERALL SATISFACTION	11	THEY ARE LACKING TOOLS THAT WOULD MAKE FOR GREATER EFFICIENCY. NEED TO
79-19-OVERALL SATISFACTION	11	MAKE SOME PURCHASES.
79-19-OVERALL SATISFACTION	13	FEELS THEIR NEEDS FOR DESIGN AND ANALYSIS ARE BEING FILLED, "... NO
79-19-OVERALL SATISFACTION	13	HOLES THERE." FEELS THEY ARE WORKING EFFICIENTLY.
79-19-OVERALL SATISFACTION	14	MATURITY WILL BRING NEEDED IMPROVEMENTS TO THEIR MCM ENVIRONMENT.
79-19-OVERALL SATISFACTION	16	MARTIN MARIETTA HAS INVESTED HEAVILY ON CONCURRENT ENGINEERING TOOLS
79-19-OVERALL SATISFACTION	16	WHICH ARE PAYING OFF.
79-19-OVERALL SATISFACTION	17	THE PRODUCT DESIGN IS COMPLEX. OVERALL, ADMINISTRATIVE AREAS ARE THE
79-19-OVERALL SATISFACTION	17	REAL PROBLEM.
79-19-OVERALL SATISFACTION	18	FOUNDRY DOES NOT CURRENTLY SUPPORT ENGINEERING DESIGN.
79-19-OVERALL SATISFACTION	19	HAVE BEEN USING & DEVELOPING FOR 15+ YEARS. WE HAVE PROVEN DESIGN AND
79-19-OVERALL SATISFACTION	19	DEMO OF 1ST TIME PASS.
79-19-OVERALL SATISFACTION	20	"WE'RE THE LEADER IN DEVELOPING TECHNOLOGY." BUT STILL HAVE ROOM AND
79-19-OVERALL SATISFACTION	20	NEEDS TO IMPROVE.
79-19-OVERALL SATISFACTION	22	TECHNOLOGY & TOOLS ARE MODERATELY DEVELOPED BUT MAKING STEPS. MATURITY
79-19-OVERALL SATISFACTION	22	OF TOOLS AND OUR OWN EXPERIENCE ARE MOVING UP ON THE LEARNING CURVE.
79-19-OVERALL SATISFACTION	23	"WE CAN DO WORK WITH TOOLS WE HAVE, BUT IT'S VERY HARD."
79-19-OVERALL SATISFACTION	24	TECHNOLOGICAL IMPROVEMENT NEEDED.
79-19-OVERALL SATISFACTION	25	"EMBODIES STRICT ENGINEERING SUPPORT."

PROGRAM = COMMENTS

[redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted]

GENERAL COMMENTS FROM [redacted] SURVEY PERIOD 9312 - CURRENTLY USING MCM

09:25 MONDAY, DECEMBER 6, 1993

DESCRIPTION	RESPONSE NUMBER	COMMENT
COMPANY NAME	2	MAYO CLINIC
	3	M CHIP INC
	4	ERIM
	5	RAYTHEON CAE OPERATIONS
	6	HARRIS GOVERNMENT AEROSPACE SYS DIV
	7	IBM
	8	USC-ISI-MOSIS
	9	ANONYMOUS
	10	HARRIS SEMICONDUCTOR
	11	ANONYMOUS
	13	EASTMAN KODAK
	14	MOTOROLA
	16	MARTIN MARIETTA
	17	ACUSTAR
	18	TEXAS INSTRUMENTS
	19	IBM
	20	HUGHES
	22	CHARLES DRAPER LABS
	23	INTERCHIP SYSTEMS INC
	24	SMI ELECTRONICS
	25	MOTOROLA
GENERAL COMMENTS	2	"USERS NEED TO WORK WITH MCM AND CAP VENDORS ON STANDARDIZATION AND
	2	INTEGRATION."
	4	"SOUNDS LIKE YOU WORK FOR MENTOR GRAPHICS."
	5	"WAVE OF THE FUTURE."
	8	FEELS THAT ANALYSTS SHOULD NOTE ANY EFFECT THERE MIGHT BE ON HIS
	8	RESPONSES BY THEIR CURRENT ARPA-FUNDED PROJECT.
	11	MCM-C AND MCM-D VENDORS NEED TO WORK HARDER ON COST CONTROLS. NEED TO
	11	TALK LESS AND PROVIDE MORE.
	17	NEEDS BIGGER PUSH ON SILICON VENDOR TO DELIVER TESTED DIE AT COST
	17	COMPETITIVE RATE.
	19	CRITICAL TECHNOLOGY IN MCM. "WE NEED TO INVEST TIME AND MONEY TO MAKE
	19	IT WORK."
	23	MCM IS IN ITS INFANCY, BUT BUSINESS IS DOUBLING YEAR TO YEAR AND WILL
	23	BE SUCCESSFUL AS TECHNOLOGY ADVANCES.
	24	"WANT AND HOPE MCM WILL DO WELL SO WE CAN SELL PRODUCT."
SUVERYER COMMENTS	3	REALLY PRESSED TO FIND OUT THE ORIGINATOR OF THE SURVEY. FOUND
	3	QUESTIONS 7 (8 THROUGH 14 ON REPORT) AND 12 (32 THROUGH 37 ON REPORT) TOO
	3	CONFUSING TO ADDRESS. DID NOT ASK QUESTION 17 (38 THROUGH 42 ON REPORT).
	3	PARTICIPANT'S FIRM IS AN MCM MANUFACTURER. THEIR FIRM HAS SOME KIND OF
	3	INVOLVEMENT AT PRESENT WITH ARPA, SOME FUNDED PROJECT.
	4	DID NOT ASK QUESTION 17-(38 THROUGH 42 ON REPORT), PARTICIPANT IS
	4	PROTOTYPE DEVELOPER.
	6	FOUND THE EXAMPLES CITED IN 11B (NUMBER 27 IN REPORT) TO BE IN CONFLICT
	6	WITH THE DESCRIPTION OF THE CAPABILITY. HE WOULD LIKE A COPY OF THE STUDY
	6	WHEN IT IS COMPLETE, IF POSSIBLE.
	7	"EAGER TO KNOW SOURCE OF SURVEY."
	8	THIS IS THE SECOND OR THIRD COMPLAINT THAT QUESTION 17A (NUMBER 38 ON

[redacted]

SURVEY PERIOD 9312 - CURRENTLY USING MCM

09:25 MONDAY, DECEMBER 6, 1993

DESCRIPTION	RESPONSE NUMBER	COMMENT
SUVERYER COMMENTS	8	REPORT) IS REDUNDANT. HE WOULD LIKE TO RECEIVE A COPY OF THE STUDY WHEN
	8	IT IS COMPLETE.
	10	PRESSED "HARD" FOR HE TO CONFIRM THAT I WORKED FOR HARRIS CORPORATE
	10	HEADQUARTERS AS HIS TELEPHONE INDICATED. GLENN PETERSEN SAID HE WILL CALL
	10	MR. SALATINO THIS PM TO SMOOTH THE WAY FOR REMAINDER OF SURVEY.
	10	RE-CONTACTED MR. SALATINO AFTER MR. PETERSEN'S CALL, WENT SMOOTHLY.
	18	THIS COMPANY MANUFACTURES MCM'S, SO QUESTION 17 (38 THROUGH 42 IN
	18	REPORT)IS NOT APPLICABLE.
	20	MR. GATES WOULD LIKE A COPY OF FINAL SURVEY WHEN COMPLETED.

[redacted]

SURVEY PERIOD 9312 - FUTURE MCM USE
BY QUESTION
GAP INDEX = 1.91

09:25 MONDAY, DECEMBER 6, 1993

CATEGORY	QUESTION	RESPONSES	MEAN IMP	MEAN SAT	MEAN GAP
01-CONSIDERING MCM TECH.	01-05A-DESIGN	5	10.0	9.0	1.0
	04-05D-TEST	1	10.0	5.0	5.0
	05-05E-DESIGN SOFTWARE	1	10.0	9.0	1.0
	06-05F-ENGINEERING SUPPORT	1	10.0	8.0	2.0
	07-05G-CONSULTING SERVICES	1	6.0	7.0	-1.0
04-DESIGN/MFG OF MCM'S	20-10A-DESIGN AUTOMATION SOFTWARE	5	8.8	7.8	1.0
	21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	4	8.8	8.0	0.8
	22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	3	9.0	5.3	3.7
	23-10D-ACCESS TO CHIP & COMPONENT DATA	5	10.0	5.0	5.0
	24-10E-DESIGN METHODS TO IMPLEMENT MCM'S	4	9.3	8.0	1.3
	25-10F-AUTOMATED TESTING & QUALITY METHODS	3	9.3	6.3	3.0
05-CAPABILITIES	26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	3	9.3	5.0	4.3
	27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	3	7.7	6.3	1.3
	28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	3	7.7	5.3	2.3
	29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	3	8.0	4.7	3.3
	30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	4	7.8	7.3	0.5
	31-11F-MOST S/W PURCHASED FROM ONE VENDOR	4	6.8	6.8	0.0
06-MCM DESIGN ENVIRONMENT	32-12A-SYSTEM SPECIFICATIONS	3	9.3	6.7	2.7
	33-12B-SYSTEM PARTITIONING	3	8.7	6.7	2.0
	34-12C-AUTOROUTING	3	9.0	8.0	1.0
	35-12D-PACKAGING TECHNOLOGY SELECTION	3	9.3	7.0	2.3
	36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	4	9.0	6.0	3.0
	37-12F-OPTIMIZATION OF MANUFACTURING DATA	2	10.0	7.5	2.5
07-SELECTING MCM MFG	38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	4	8.8	6.5	2.3
	39-17B-MFG REPUTATION/EXPERIENCE/RECORD	4	8.3	8.0	0.3
	40-17C-TECHNOLOGY OFFERED BY MANAFACTURER	4	9.0	7.5	1.5
	41-17D-RECURRING COST OF PRODUCTION	3	8.7	6.0	2.7
	42-17E-ENGINEERING SUPPORT & CONSULTING	4	9.5	7.5	2.0
08-DATA EXCHANGE STANDARDS	43-18A-CAD FRAMEWORK INITIATINVE (CFI)	4	7.0	5.5	1.5
	44-18B-STEP/PDES	2	7.0	5.0	2.0
	45-18C-IGES	3	7.3	6.0	1.3
	46-18D-EDIF	3	7.0	5.7	1.3
	47-18E-IPC-350	2	8.0	5.5	2.5
	48-18F-GERBER	5	8.8	7.8	1.0
	49-18G-GDSII STREAM	3	9.3	8.7	0.7
	50-18H-DXF	3	7.3	6.3	1.0

PROGRAM = STATS

[redacted]

SURVEY PERIOD 9312 - FUTURE MCM USE
RANKED BY DESCENDING IMPORTANCE
GAP INDEX = 1.91

09:23 MONDAY, DECEMBER 6, 1993

CATEGORY	QUESTION	RESPONSES	MEAN IMP	MEAN SAT	MEAN GAP
01-CONSIDERING MCM TECH.	01-05A-DESIGN	3	10.0	9.0	1.0
01-CONSIDERING MCM TECH.	04-05D-TEST	1	10.0	5.0	5.0
01-CONSIDERING MCM TECH.	05-05E-DESIGN SOFTWARE	1	10.0	9.0	1.0
01-CONSIDERING MCM TECH.	06-05F-ENGINEERING SUPPORT	1	10.0	8.0	2.0
04-DESIGN/MFG OF MCM'S	23-10D-ACCESS TO CHIP & COMPONENT DATA	3	10.0	5.0	5.0
06-MCM DESIGN ENVIRONMENT	37-12F-OPTIMIZATION OF MANUFACTURING DATA	2	10.0	7.5	2.5
07-SELECTING MCM MFG	42-17E-ENGINEERING SUPPORT & CONSULTING	4	9.5	7.5	2.0
04-DESIGN/MFG OF MCM'S	24-10E-DESIGN METHODS TO IMPLEMENT MCM'S	4	9.3	8.0	1.3
04-DESIGN/MFG OF MCM'S	25-10F-AUTOMATED TESTING & QUALITY METHODS	3	9.3	6.3	3.0
05-CAPABILITIES	26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	3	9.3	5.0	4.3
06-MCM DESIGN ENVIRONMENT	32-12A-SYSTEM SPECIFICATIONS	3	9.3	6.7	2.7
06-MCM DESIGN ENVIRONMENT	35-12D-PACKAGING TECHNOLOGY SELECTION	3	9.3	7.0	2.3
08-DATA EXCHANGE STANDARDS	49-18G-GDSII STREAM	3	9.3	8.7	0.7
04-DESIGN/MFG OF MCM'S	22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	3	9.0	5.3	3.7
06-MCM DESIGN ENVIRONMENT	34-12C-AUTOROUTING	3	9.0	8.0	1.0
06-MCM DESIGN ENVIRONMENT	36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	4	9.0	6.0	3.0
07-SELECTING MCM MFG	40-17C-TECHNOLOGY OFFERED BY MANAFACTURER	4	9.0	7.5	1.5
04-DESIGN/MFG OF MCM'S	20-10A-DESIGN AUTOMATION SOFTWARE	5	8.8	7.0	1.8
04-DESIGN/MFG OF MCM'S	21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	4	8.8	8.8	0.8
07-SELECTING MCM MFG	38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	4	8.8	6.5	2.3
06-MCM DESIGN ENVIRONMENT	33-12B-SYSTEM PARTITIONING	3	8.7	6.7	2.0
07-SELECTING MCM MFG	41-17D-RECURRING COST OF PRODUCTION	3	8.7	6.0	2.7
07-SELECTING MCM MFG	39-17B-MFG REPUTATION/EXPERIENCE/RECORD	4	8.3	8.0	0.3
05-CAPABILITIES	29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	3	8.0	4.7	3.3
08-DATA EXCHANGE STANDARDS	47-18E-IPC-350	2	8.0	5.5	2.5
08-DATA EXCHANGE STANDARDS	48-18F-GERBER	5	8.0	7.0	1.0
05-CAPABILITIES	30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	4	7.8	7.3	0.5
05-CAPABILITIES	27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	3	7.7	6.3	1.3
05-CAPABILITIES	28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	3	7.7	5.3	2.3
08-DATA EXCHANGE STANDARDS	45-18C-IGES	3	7.3	6.0	1.3
08-DATA EXCHANGE STANDARDS	50-18H-DXF	3	7.3	6.3	1.0
08-DATA EXCHANGE STANDARDS	43-18A-CAD FRAMEWORK INITIATINVE (CFI)	4	7.0	5.5	1.5
08-DATA EXCHANGE STANDARDS	44-18B-STEP/PDES	2	7.0	5.0	2.0
08-DATA EXCHANGE STANDARDS	46-18D-EDIF	3	7.0	5.7	1.3
05-CAPABILITIES	31-11F-MDST S/W PURCHASED FROM ONE VENDOR	4	6.8	6.8	0.0
01-CONSIDERING MCM TECH.	07-05G-CONSULTING SERVICES	1	6.0	7.0	-1.0

PROGRAM = STATS

[redacted]
SURVEY PERIOD 9312 - FUTURE MCM USE
RANKED BY DESCENDING GAP
GAP INDEX = 1.91

09:23 MONDAY, DECEMBER 6, 1993

CATEGORY	QUESTION	RESPONSES	MEAN IMP	MEAN SAT	MEAN GAP
01-CONSIDERING MCM TECH.	04-05D-TEST	1	[illegible].0	5.0	5.0
04-DESIGN/MFG OF MCM'S	23-10D-ACCESS TO CHIP & COMPONENT DATA	3	10.0	5.0	5.0
05-CAPABILITIES	26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	3	9.3	5.0	4.3
04-DESIGN/MFG OF MCM'S	22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	3	9.0	5.3	3.7
05-CAPABILITIES	29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	3	8.0	4.7	3.3
04-DESIGN/MFG OF MCM'S	25-10F-AUTOMATED TESTING & QUALITY METHODS	3	9.3	6.3	3.0
06-MCM DESIGN ENVIRONMENT	36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	4	9.0	6.0	3.0
06-MCM DESIGN ENVIRONMENT	32-12A-SYSTEM SPECIFICATIONS	3	9.3	6.7	2.7
07-SELECTING MCM MFG	41-17D-RECURRING COST OF PRODUCTION	3	8.7	6.0	2.7
06-MCM DESIGN ENVIRONMENT	37-12F-OPTIMIZATION OF MANUFACTURING DATA	2	10.0	7.5	2.5
08-DATA EXCHANGE STANDARDS	47-18E-IPC-350	2	8.0	5.5	2.5
06-MCM DESIGN ENVIRONMENT	35-12D-PACKAGING TECHNOLOGY SELECTION	3	9.3	7.0	2.3
07-SELECTING MCM MFG	38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	4	8.8	6.5	2.3
05-CAPABILITIES	28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	3	7.7	5.3	2.3
01-CONSIDERING MCM TECH.	06-05F-ENGINEERING SUPPORT	1	10.0	8.0	2.0
07-SELECTING MCM MFG	42-17E-ENGINEERING SUPPORT & CONSULTING	4	9.5	7.5	2.0
06-MCM DESIGN ENVIRONMENT	33-12B-SYSTEM PARTITIONING	3	8.7	6.7	2.0
08-DATA EXCHANGE STANDARDS	44-18B-STEP/PDES	2	7.0	5.0	2.0
04-DESIGN/MFG OF MCM'S	20-10A-DESIGN AUTOMATION SOFTWARE	5	8.8	7.8	1.8
07-SELECTING MCM MFG	40-17C-TECHNOLOGY OFFERED BY MANAFACTURER	4	9.0	7.5	1.5
08-DATA EXCHANGE STANDARDS	43-18A-CAD FRAMEWORK INITIATINVE (CFI)	4	7.0	5.5	1.5
04-DESIGN/MFG OF MCM'S	24-10E-DESIGN METHODS TO IMPLEMENT MCM'S	4	9.3	8.0	1.3
05-CAPABILITIES	27-11B-DESIGN MCM ON 2 DIF SYS SIMUL.	3	7.7	6.3	1.3
08-DATA EXCHANGE STANDARDS	45-18C-IGES	3	7.3	6.0	1.3
08-DATA EXCHANGE STANDARDS	46-18D-EDIF	3	7.0	5.7	1.3
01-CONSIDERING MCM TECH.	01-05A-DESIGN	3	10.0	9.0	1.0
01-CONSIDERING MCM TECH.	03-05E-DESIGN SOFTWARE	1	10.0	9.0	1.0
06-MCM DESIGN ENVIRONMENT	34-12C-AUTOROUTING	3	9.0	8.0	1.0
08-DATA EXCHANGE STANDARDS	48-18F-GERBER	5	8.0	7.0	1.0
08-DATA EXCHANGE STANDARDS	50-18H-DXF	3	7.3	6.3	1.0
04-DESIGN/MFG OF MCM'S	21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	4	8.8	8.0	0.8
08-DATA EXCHANGE STANDARDS	49-18G-GDSII STREAM	3	9.3	8.7	0.7
05-CAPABILITIES	30-11E-EA SOFTWARE APPL. BEST IN ITS CLASS	4	7.8	7.3	0.5
07-SELECTING MCM MFG	39-17B-MFG REPUTATION/EXPERIENCE/RECORD	4	8.3	8.0	0.3
05-CAPABILITIES	31-11F-MOST S/W PURCHASED FROM ONE VENDOR	4	6.8	6.8	0.0
01-CONSIDERING MCM TECH.	07-05G-CONSULTING SERVICES	1	6.0	7.0	-1.0

PROGRAM = STATS

[redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted] [redacted]

[redacted] [redacted] [redacted] [redacted]

OVERALL SATISFACTION
SURVEY PERIOD 9312 - FUTURE MCN USE

09:23 MONDAY, DECEMBER 6, 1993

OBS	RESPONSES	OVERALL SATISFACTION AVERAGE
1	7	6.71

PROGRAM = STATS

[redacted]
MCM-GAP SUMMARY
SURVEY PERIOD 9312 - FUTURE MCM USE

09:25 MONDAY, DECEMBER 6, 1993

QUESTION	ITEM	FREQUENCY COUNT
01-MMT USAGE	FUTURE MMT USAG	7
04-FUTURE ASSEMBLY		3
04-FUTURE CONSULTING SERVICES		2
04-FUTURE DESIGN		6
04-FUTURE DESIGN SOFTWARE		4
04-FUTURE ENGINEERING SUPPORT		6
04-FUTURE SUBSTRATE FABRICATION		1
04-FUTURE TEST		4
06-FUTURE MCM-C CERAMIC LOW TEMP COFIRED		4
06-FUTURE MCM-C CERAMIC THICK FILM		3
06-FUTURE MCM-D THIN FILM ON SILICON OR CERAMIC		3
06-FUTURE MCM-MDI CHIPS-FIRST		1
06-FUTURE MCM-L LAMINATE		4
06-FUTURE OTHER		1
09-DESIGN TOOLS	FOR CAE	6
	FOR CAD	7
	FOR CAM	6
	FOR OVERALL	7
13-CURRENT ENGINEERING	YES	7
16-INVESTING IN DESIGN AUTOMATION SYSTEMS	EXTREMELY IMPOR	4
	VERY IMPORTANT	2
	IMPORTANT	1

PROGRAM = DEMO

CATEGORY=01-CONSIDERING MCM TECH.

QUESTION	RESPONSE NUMBER	COMMENT
03-03C-ASSEMBLY	12	NO PERSONAL INVOLVEMENT.
04-03D-TEST	12	NO PERSONAL INVOLVEMENT.
04-03D-TEST	27	INFRASTRUCTURE NOT THERE. STILL VERY IMMATURE.
06-03F-ENGINEERING SUPPORT	12	WOULD BE EVALUATING HIMSELF. NOT CONFORTABLE WITH.

CATEGORY=01-CONSIDERING USING MCM

QUESTION	RESPONSE NUMBER	COMMENT
68-6D-MCM-D THIN FILM ON SILICON OR CERAMI	12	"CHIPS & WIRE" APPLICATION UNDERWAY.
69-6E-MCM-MD1 CHIPS-FIRST	12	NOT SURE
70-6F-OTHER	1	PROPERTIES OF MATERIALS NOT YET INVESTIGATED. COST IS PRIMARY
70-6F-OTHER	1	CONSIDERATION.

CATEGORY=04-DESIGN/MFG OF MCM'S

QUESTION	RESPONSE NUMBER	COMMENT
20-10A-DESIGN AUTOMATION SOFTWARE	27	FINE FOR DIGITAL.
21-10B-INTEGRATION OF DESIGN TOOLS FOR MCM	21	STILL WORKING ON IT.
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	21	NOT WELL DEVELOPED YET.
22-10C-STANDARDS DATA TRANSFER-DESIGN/MFG	27	NEVER AS TRANSPARENT AS PEOPLE CLAIM.
23-10D-ACCESS TO CHIP & COMPONENT DATA	21	HARD TO COME BY.
23-10D-ACCESS TO CHIP & COMPONENT DATA	27	VENDORS NOT SET UP. MUST CHASE DOWN PRODUCT ENGINEERS AND MANAGERS
23-10D-ACCESS TO CHIP & COMPONENT DATA	27	TO ACQUIRE INFORMATION.
25-10F-AUTOMATED TESTING & QUALITY METHODS	27	ABILITY TO ACQUIRE KNOWN GOOD DIE, NO GOOD SOLUTION. FIXTURING IS A
25-10F-AUTOMATED TESTING & QUALITY METHODS	27	PROBLEM WITH DIGITAL -- ANALOG ON IT'S OWN.

CATEGORY=05-CAPABILITIES

QUESTION	RESPONSE NUMBER	COMMENT
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	21	STILL NOT FULLY DEVELOPED YET.
26-11A-BI-DIRECTIONAL TRANSLATION OF DATA	27	NOT AS TRANSPARENT AS PEOPLE CLAIM.
28-11C-MOVE DES/DATA AMONG SIMILAR APPL.	21	NOT DEVELOPED WELL.
29-11D-STORE MCM DATA IN NEUTRAL FILE FRMT	21	NOT AWARE IT CAN BE DONE.
30-11E-CA SOFTWARE APPL. BEST IN ITS CLASS	15	VERY HARD FOR ONE VENDOR TO DEVELOP JOB AND SUPPORT DESIGN.

CATEGORY=06-MCM DESIGN ENVIRONMENT

QUESTION	RESPONSE NUMBER	COMMENT
32-12A-SYSTEM SPECIFICATIONS	27	DON'T DO IT.

PROGRAM = COMMENTS

CATEGORY=06-MCM DESIGN ENVIRONMENT
(CONTINUED)

QUESTION	RESPONSE NUMBER	COMMENT
33-12B-SYSTEM PARTITIONING	27	HIGH LEVEL SIMULATION NOT THERE.
34-12C-AUTOROUTING	12	CONSIDERING MULTILAYER. USING SINGLE LAYER NOW.
35-12D-PACKAGING TECHNOLOGY SELECTION	27	DON'T GIVE HELP IN SIMULATION AND VARIATION. HAVE TO DRAW ON PAST
35-12D-PACKAGING TECHNOLOGY SELECTION	27	EXPERIENCE.
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	12	"HASN'T GONE ALL TOO SMOOTH."
36-12E-SUPPORT MCM FOUNDRIES W/DESIGN KITS	27	DON'T DO IT; WHEN THEY DO, WON'T GUARANTEE. COST.

CATEGORY=07-SELECTING MCM MFG

QUESTION	RESPONSE NUMBER	COMMENT
38-17A-DESIGN KITS AVAIL. FROM MFG/VENDOR	27	DON'T HAVE. DON'T GUARANTEE.
40-17C-TECHNOLOGY OFFERED BY MANUFACTURER	21	LIMITED AT THIS POINT.
41-17D-RECURRING COST OF PRODUCTION	21	COST TOO HIGH.

CATEGORY=08-DATA EXCHANGE STANDARD

QUESTION	RESPONSE NUMBER	COMMENT
44-18B-STEP/PDES	12	NOT FAMILIAR WITH.
45-18C-IGES	12	*HAVEN'T USED.*
45-18C-IGES	15	HARD TO DO WITH DIFFERENT TOOL SETS AND INTERFACE EXP.
46-18D-EDIF	12	HAVEN'T USED.
47-18E-IPC-350	12	HAVEN'T USED.
47-18E-IPC-350	15	USED AS GUIDE. LONG TIME COMING OUT.
50-18H-DXF	12	VERY LITTLE USE.

CATEGORY=09-PHASES OF MCM PLANNED

QUESTION	RESPONSE NUMBER	COMMENT
59-4B-SUBSTRATE FABRICATION	12	MAYBE; SOME IN HOUSE, SOME SUBCONTRACTED.
60-4C-ASSEMBLY	1	MAYBE
61-4D-TEST	1	MAYBE
62-4E-DESIGN SOFTWARE	12	WILL DO OWN DESIGNING. WILL USE HARRIS VIEWLOGIC.
64-4G-CONSULTING SERVICE	1	MAYBE

CATEGORY=10-DESIGN TOOLS

QUESTION	RESPONSE NUMBER	COMMENT
72-9A-TOOLS FOR CAE	1	SYNOPSIS VIEWLOGIC, CADENCE, VARIOUS SIMULATORS.

PROGRAM = COMMENTS

CATEGORY=10-DESIGN TOOLS
(CONTINUED)

QUESTION	RESPONSE NUMBER	COMMENT
72-9A-TOOLS FOR CAE	15	MENTOR GRAPHICS
72-9A-TOOLS FOR CAE	21	MENTOR
72-9A-TOOLS FOR CAE	26	MENTOR GRAPHICS
72-9A-TOOLS FOR CAE	27	VIEWLOGIC
72-9A-TOOLS FOR CAE	28	MENTOR
73-9B-TOOLS FOR CAD	1	HARRIS EDA
73-9B-TOOLS FOR CAD	12	HARRIS FINESSE, MCM SOFTWARE
73-9B-TOOLS FOR CAD	15	HARRIS FINESSE, MENTOR GRAPHICS
73-9B-TOOLS FOR CAD	21	MENTOR
73-9B-TOOLS FOR CAD	26	THEDA, EUCLID
73-9B-TOOLS FOR CAD	27	FINESSE
73-9B-TOOLS FOR CAD	28	MENTOR
74-9C-TOOLS FOR CAM	1	INTERNALLY DEVELOPED TOOLS
74-9C-TOOLS FOR CAM	15	CONSILIUM
74-9C-TOOLS FOR CAM	21	IN HOUSE DESIGN
74-9C-TOOLS FOR CAM	26	IN HOUSE LITTON DEVELOPED SYSTEM
74-9C-TOOLS FOR CAM	27	DON'T KNOW, TO BE DETERMINED.
74-9C-TOOLS FOR CAM	28	IN HOUSE DESIGN
75-9D-TOOLS FOR OVERALL	1	DEC STATION
75-9D-TOOLS FOR OVERALL	12	SUN SYSTEM
75-9D-TOOLS FOR OVERALL	15	MOVING TO MENTOR GRAPHICS
75-9D-TOOLS FOR OVERALL	21	MENTOR, VHDL
75-9D-TOOLS FOR OVERALL	26	SUN
75-9D-TOOLS FOR OVERALL	27	MENTOR
75-9D-TOOLS FOR OVERALL	28	MENTOR

CATEGORY=11-OVERALL SATISFACTION

QUESTION	RESPONSE NUMBER	COMMENT
79-19-OVERALL SATISFACTION	1	"TOOLS ARE NOT HIGHLY INTEGRATED."
79-19-OVERALL SATISFACTION	12	USING "CHIP & WIRE" ON THIN FILM SUBSTRATE IS SO DIFFERENT FROM PRINTED
79-19-OVERALL SATISFACTION	12	CIRCUITBOARD THAT THEY'VE HAT TO MAKE ADJUSTMENTS IN PROCEDURE. NEW
79-19-OVERALL SATISFACTION	12	SOFTWARE IS EXPECTED TO TAKE CLUMSINESS OUT.
79-19-OVERALL SATISFACTION	15	USE OF CONCURRENT ENGINEERING AND CLOSE INTERFACE WITH MANUFACTURING.
79-19-OVERALL SATISFACTION	21	STILL IMPLEMENTING SYSTEM. DON'T HAVE FULLY INTEGRATED SYSTEM, PLANS
79-19-OVERALL SATISFACTION	21	TO IMPROVE.
79-19-OVERALL SATISFACTION	26	"WE'RE IN THE INFANCY STAGE, NOT REALLY ON BOARD YET."
79-19-OVERALL SATISFACTION	27	STILL IMMATURE, "HAVING TO TWEEK". MANUAL NOT AUTOMATED, BARE DIE
79-19-OVERALL SATISFACTION	27	PROBLEM.
79-19-OVERALL SATISFACTION	28	TECHNOLOGY IS STILL IMMATURE. "ALL SYSTEMS ARE BEING DESIGNED AS WE
79-19-OVERALL SATISFACTION	28	LEARN."

DESCRIPTION	RESPONSE NUMBER	COMMENT
COMPANY NAME	1	DIGITAL EQUIPMENT CORPORATION
	12	MICRO NETWORKS
	15	HAYES MICROCOMPUTER PRODUCTS
	21	RAYTHEON
	26	LITTON AMECOM
	27	ANONYMOUS
	28	RAYTHEON
GENERAL COMMENTS	15	ITS NEW TECHNOLOGY, NOT AT COMMERCIAL PRICING.
	2	IMPORTANT THAT ARPA CONTINUE TO FUND RESEARCH SO TECHNOLOGY CAN
	21	CONTINUE TO GROW.
	27	TECHNOLOGY IS COMING. NEED TO SOLVE DESIGN AUTOMATION PROCESS AND
	27	AQUIRE GOOD BARE DIE AND INFO ON BARE DIE ON NON-DIGITAL PROD.
	28	HOPE MCM TECHNOLOGY TAKES OFF. WORKING ON INFRASTRUCTURE TO KEEP COST
	28	DOWN.
SURVEYER COMMENTS	1	MR. ATKINSON WOULD NOT RATE THE DEGREE OF SATISFACTION HE EXPECTED TO
	1	EXPERIENCE AND WOULD SAY ONLY THAT HE EXPECTED TO HAVE HIS ENGINEERS "BE
	1	HAPPY". (SEE QUESTIONS 5, 10, 11, 12, 16, 18G)
	21	THIS IS AN R&D FACILITY AND HE DID NOT FEEL HE COULD ANSWER THE
	21	SATISFACTION PART ON SOME QUESTIONS.
	26	COULD NOT GIVE SATISFACTION RATINGS BECAUSE..."WE ARE JUST GETTING INTO
	26	MCM'S."
	27	WOULD LIKE A COPY OF STUDY WHEN COMPLETE.
	28	COULD NOT ANSWER SATISFACTION RATINGS, JUST GETTING INTO IT.

G. EDA Commercial Vendor List

EDA Commerical Vendor List

3F Designs
Accel Technologies
Actel
Acugen
Advanced Microcomputer Systems
Advantest
AET Associates
Aldec
Altera
Ansoft Corp.
APSI
Ariel Corp.
Array Microsystems, Inc.
Ascent
AT&T
Automated Logic Design
CAD Artisans
CAD Software
CAD Solutions
Cadence
CadSoft
Computer
CADstar
Calay
CAM Software Research
Capilano Computing
Cascade
Checklogic
Chronology Corp.
CLSI
Comdisco
Compact Software
Compass
Computervision
Concept Circuit Design
Concurrent Logic
Consultek Software Systems, Inc.
Contec Microelectronics
Cooper & Chyan Technology, Inc.
Crosspoint
Cypress Semiconductor
Data I/O
Design Computation Design Automation
Deutsch Research
Douglas Electronics
Eagleware
EEsof
Engineerium
Epic
Epoch
Evaluations Per Second
Exemplar Logic, Inc.
Fintronic
Flomerics, Inc.
GenRad
Hanson Engineering
Elcad
Harris EDA
HDL Systems
HP
Hyperception
i-Logix
IBM/Altium
ICT
IKOS
Impex Design Solutions
INCA
Infinite Graphics
Integrated Circuit Applications
Integrity Engineering
Interactive CAD Systems
Interconnex
Interference Control Tech.
Intergraph
InterHDL Design
Intusoft
ISDATA
Layout Concepts
Lehdar Systems Corp.
Lewis Systems
Lightwave
LMSI
Logic Modeling Corp.
Logical Devices
~~Logical Devices, Inc.~~
LSI
Mag Soft Corp.
Massteck
Mental Automation, Inc.
Mentor
Meta-Software
Microsim
MINC
Model Technology
NEC Electronics
NeoCAD
Nextwave
OEA International
Omation
Orcad
PADS Software, Inc.
PCAD
Penzar
Philips
PIE Design Systems
Plus Logic
Powertronic Systems, Inc.
Precision Graphics
Protel
Technologies
Quad Design
Quantic Labs
Quicklogic
Quickturn
Racal Redac
Ready Systems
Redwood Design Automation
Rohde and Schwarz
Router Solutions
Rubow Systems
Seed Solutions
SES
Signetics Company
Silicon Automation Systems
SimQuest
Simucad
Simulation Technologies
Simutest
SONET
Source III, Inc.
Spectral Innovations
Spectrum Software
Spectrum Signal Processing, Inc.
Sunrise
Sunrise Test Systems
SWIFT Enterprises
Synopsys
Syntest
T-Cubed Systems
Tanner Research
Tatum Labs, Inc.
TD Technologies
TEAM
Teradyne
TESoft
Testniques, Inc.
The Great SoftWestern
Texas Instruments
Ultimate Technology
Vantage
Viewlogic
Vista Technologies
VLSI
Wellspring Solutions
Wintek Corp.
WISE Software Solutions
Xilinx
Zuken
Zycad