JEITA’s Standardization Effort on Reticle Data Management

e-Manufacturing Workshop
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JEITA

Agenda

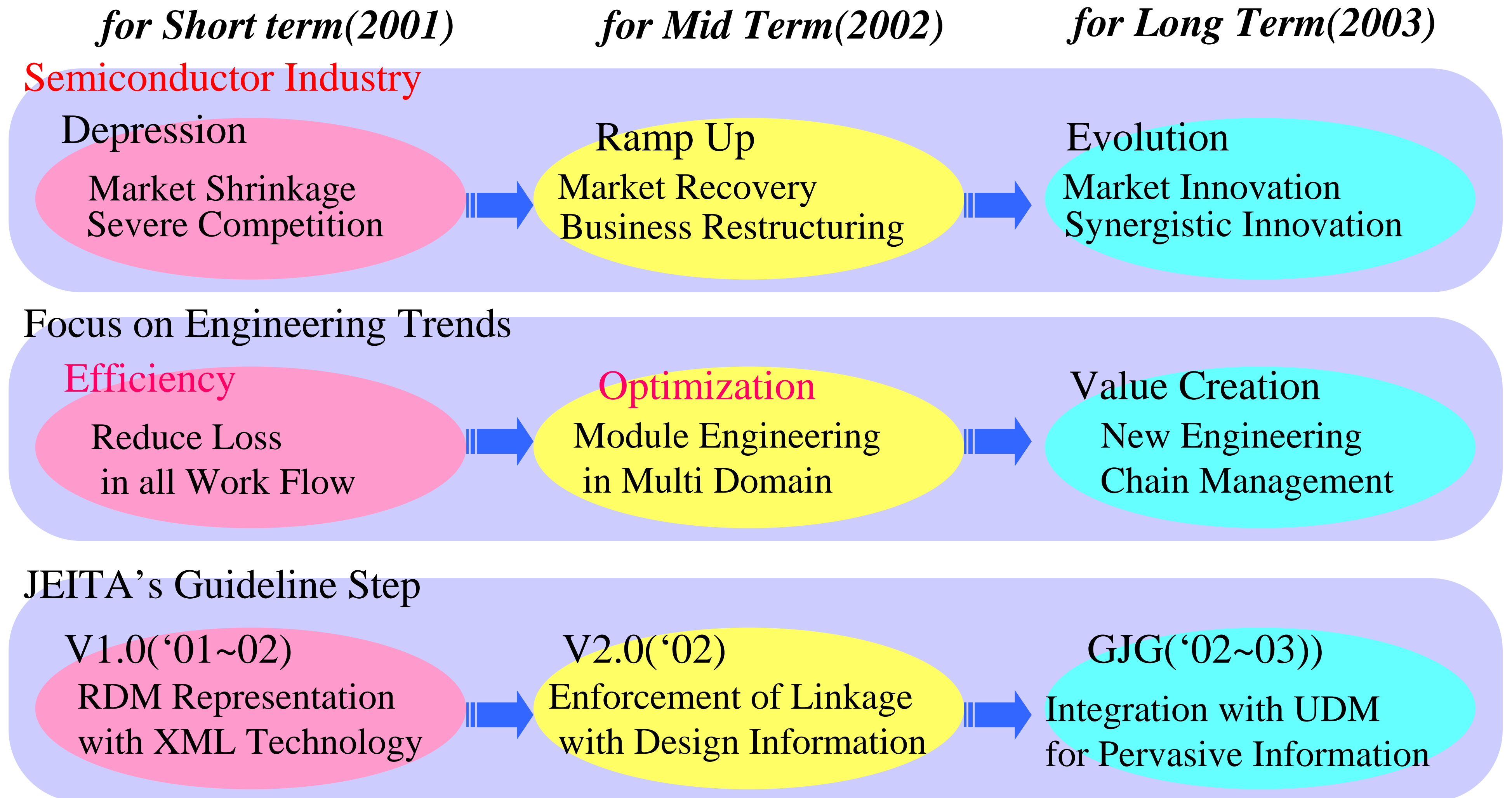
1. Overviews
2. Efficiency Oriented RDM
   Guideline Ver.1
3. Plan of Optimization Oriented RDM
   Guideline Ver.2
4. Our Expectation of UDM
   and Global Joint Guidance

We proposed the guideline Ver.1 for the efficient data handling except pattern data, in order to respond to the time of Engineering Collaboration when production manufacturing and design are performed over plural companies

JEITA had completed
Reticle Data Management Guidline Ver1.0
on 26,April 2002.

You can get The Guideline on
http://www.jeita.or.jp/

Our Guideline Activity Roadmap

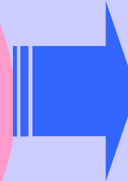


JEITA Reticle Data Management Update

Ver 1.0

Efficiency

Reduce Loss
in all Work Flow



Ver 2.0

Optimization

Module Engineering
in Multi Domain

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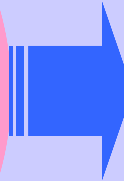


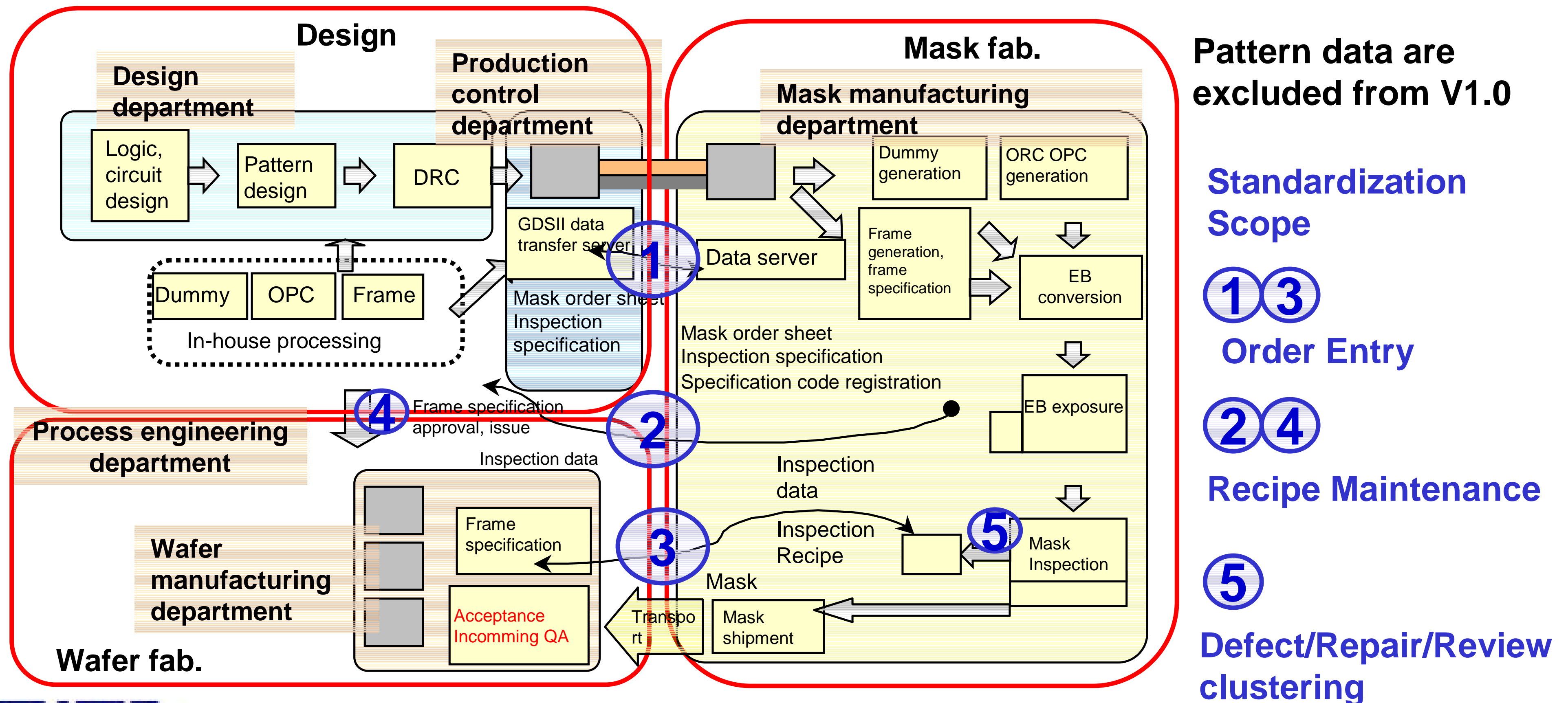
Ver 2.0

Optimization

Module Engineering
in Multi Domain

The Purpose & Scope of Guideline Ver.1.0

For SoC Business, we must improve efficiency of all works concerning each one reticle through Design,Mask Fab,and Wafer Fab.
The Scope focuses communications at interfaces in the work-flow as below



Pattern data are excluded from V1.0

Standardization Scope

1 3 Order Entry

2 4 Recipe Maintenance

5 Defect/Repair/Review clustering

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General Guideline in Ver1.0

Sharing of reticle data

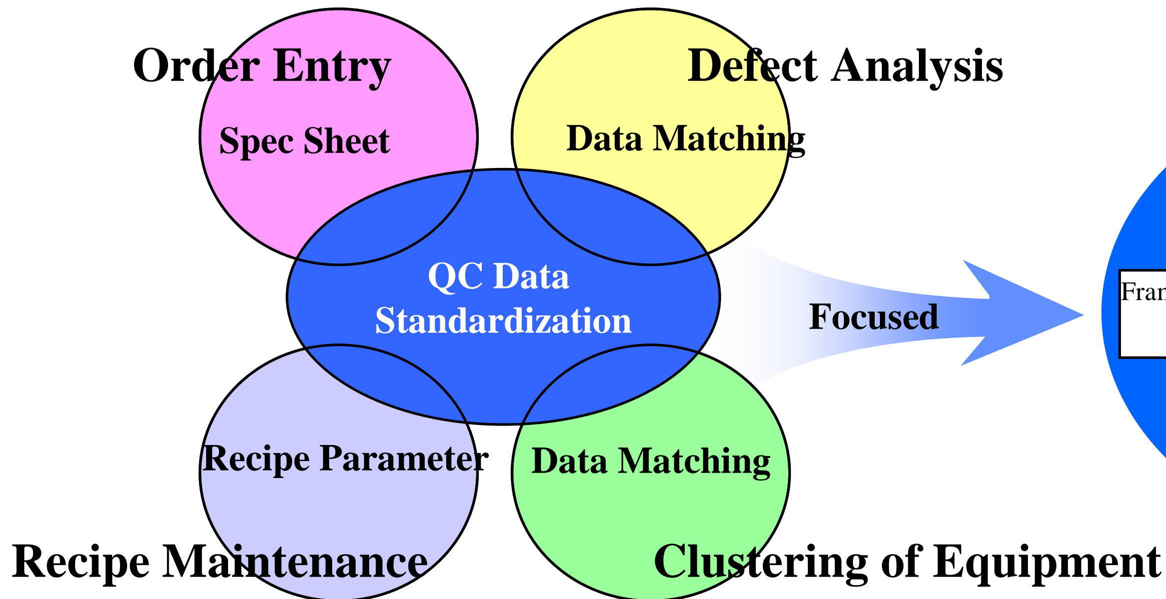
The environment that can be utilized in common from design to wafer fab.
must be established being fulfilled the following conditions.

Conditions

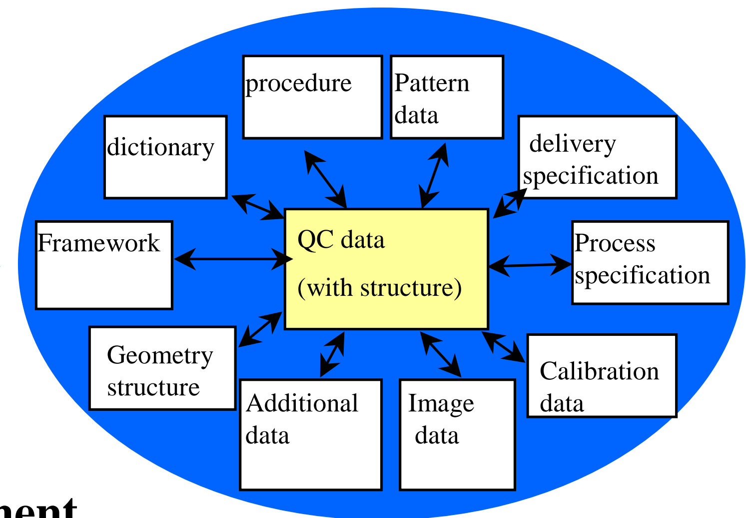
1. **Reticle data and reticle-related data must be correlated with a hierarchical configuration.**
2. **Reticle data and reticle-related data must be delivered in a standardized method at each interface.**
3. **Reticle data and reticle-related data must be defined clearly in their contents.**
4. **Reticle data and reticle-related data must be stored for each fab. so that the required data can be taken out whenever necessary.**
5. **Reticle data and reticle-related data must be protected by the reasonable security system.**

Focused Items to be standardized in Ver1.0

Introduced Application Topics in JEITA Guideline Ver.1.0



QC data Standardization should be Comprehensive



Heterogeneous representation of QC Data in each application area could be integrated to common representation.Then,for example, data used in Order Entry would be reused in Recipe Maintenace or Defect Analysis.

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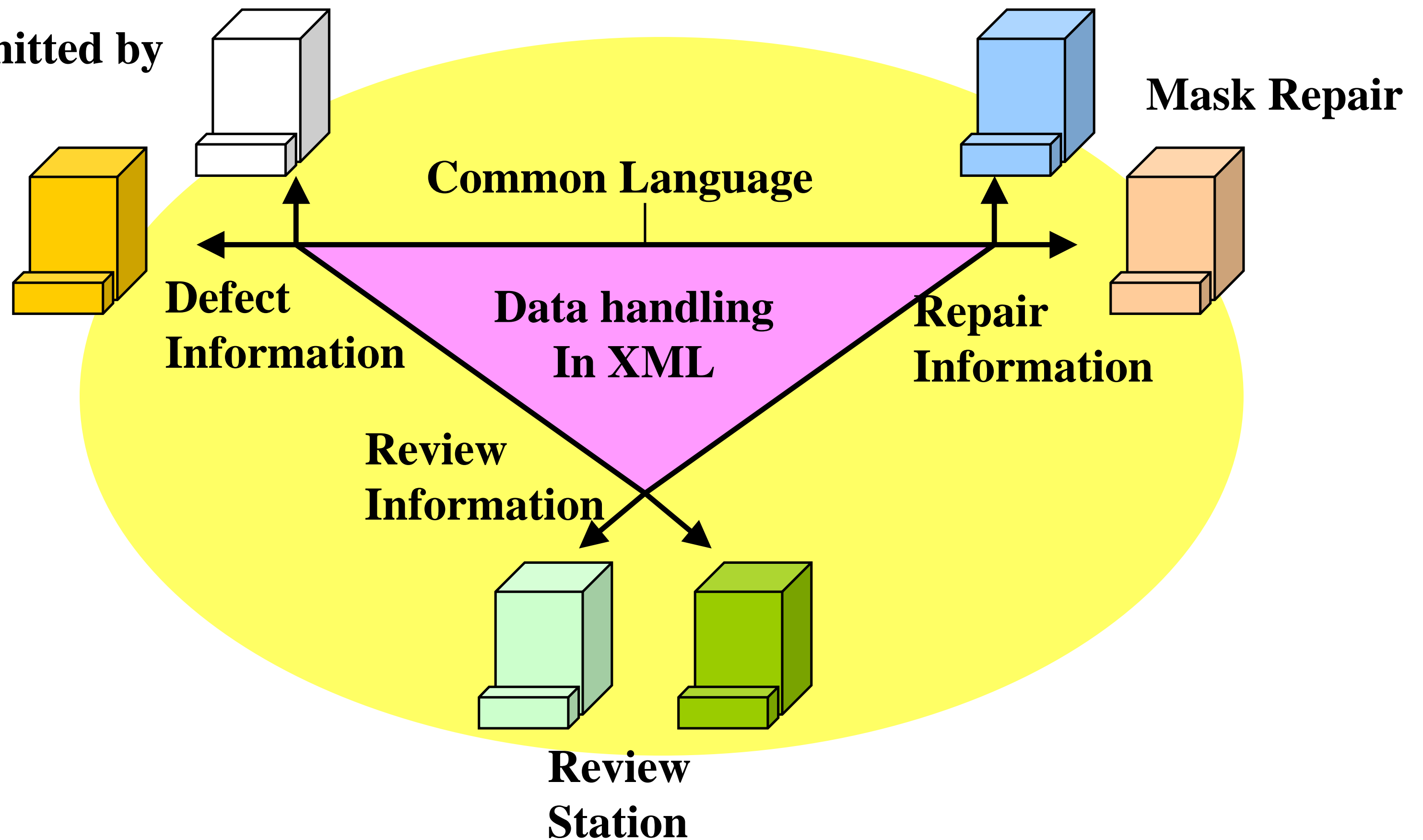
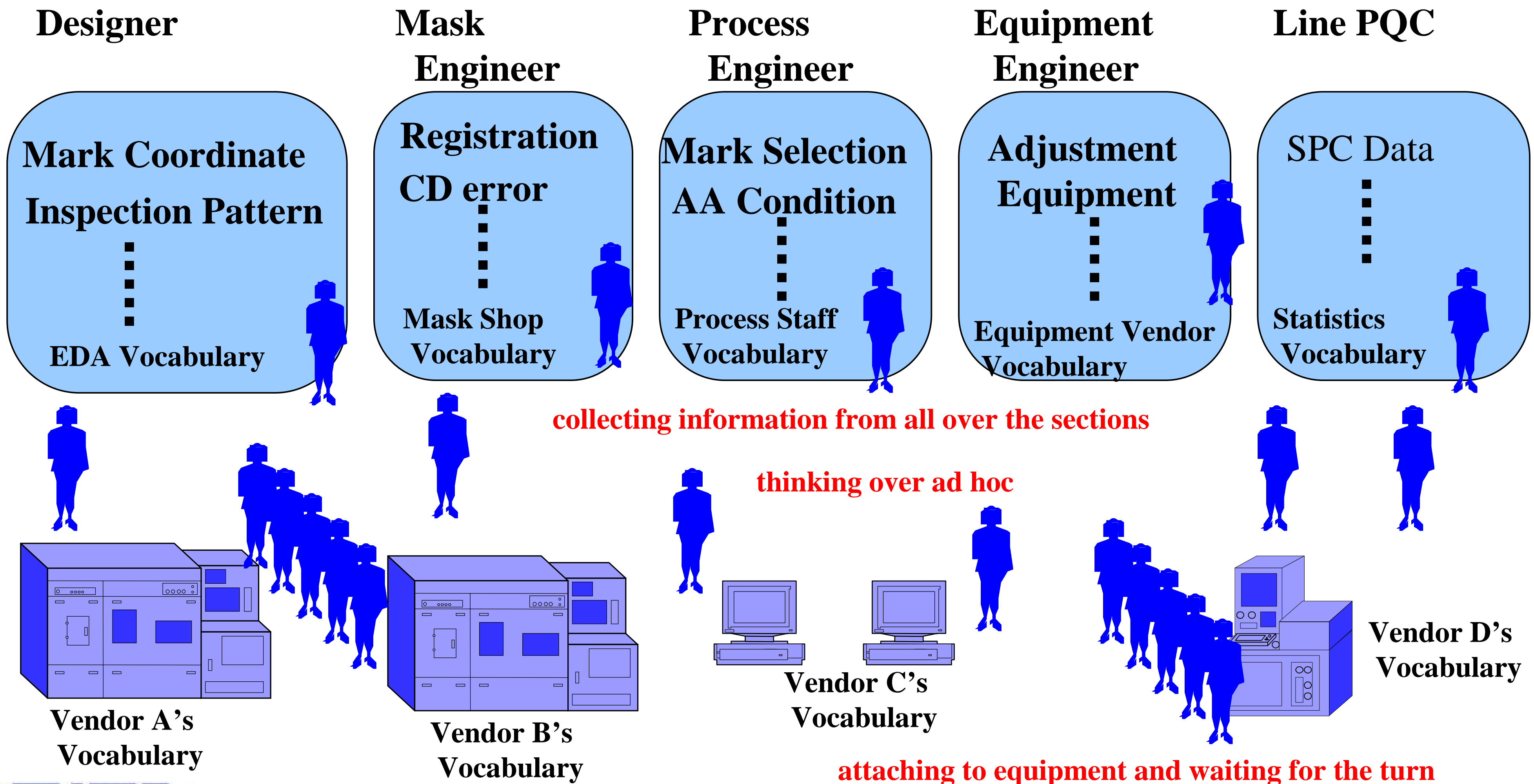
Mask Inspection/Repair/Review clustering

To standardize data specification that apply XML technology to establish more effective operation system,by fitting defect data handling into IT technology.

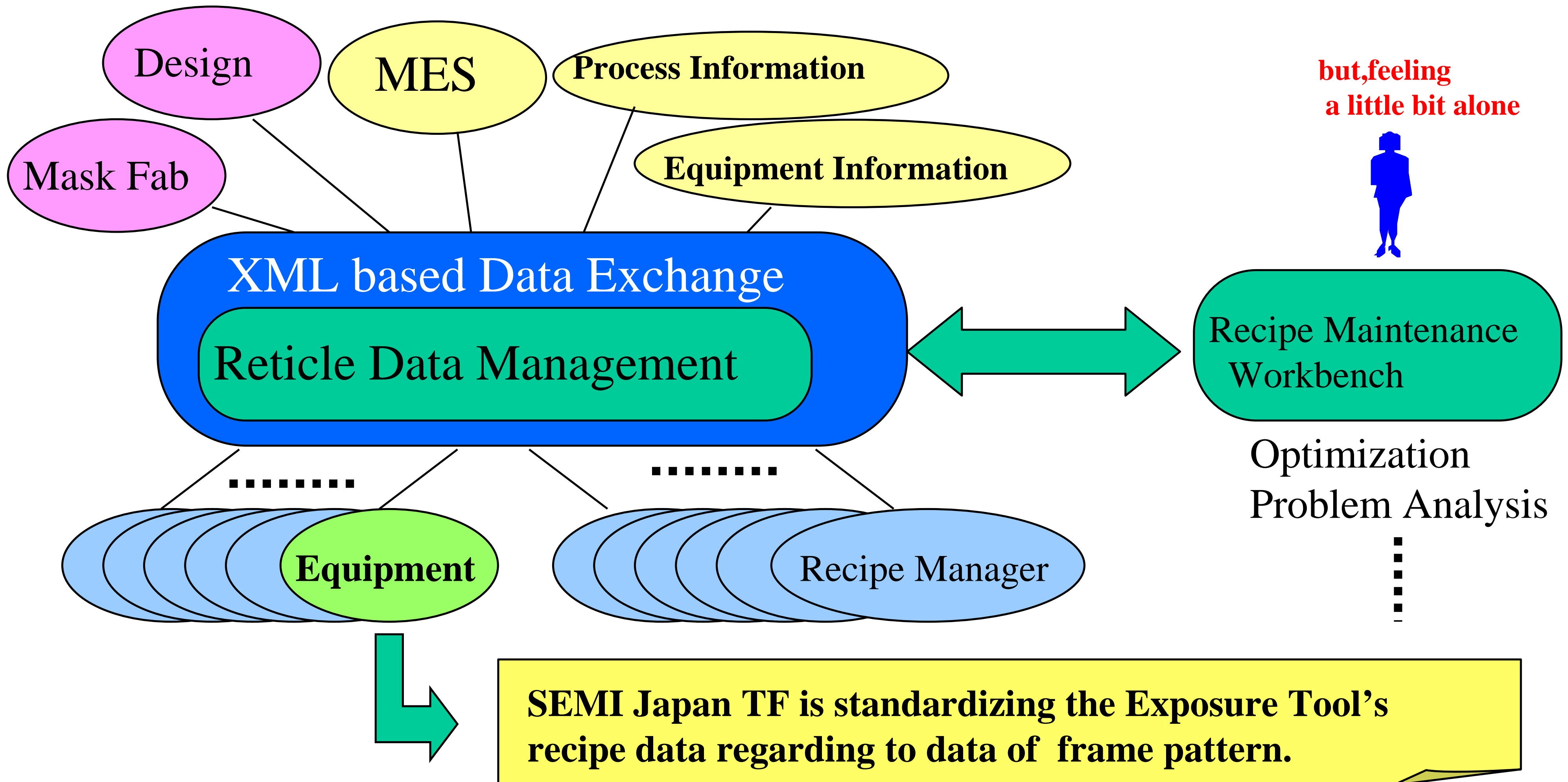
The draft will be submitted by Selete soon



Inefficiency of Recipe Maintenance :Annoyance of communication



The Image of Recipe Maintenance improved efficiency



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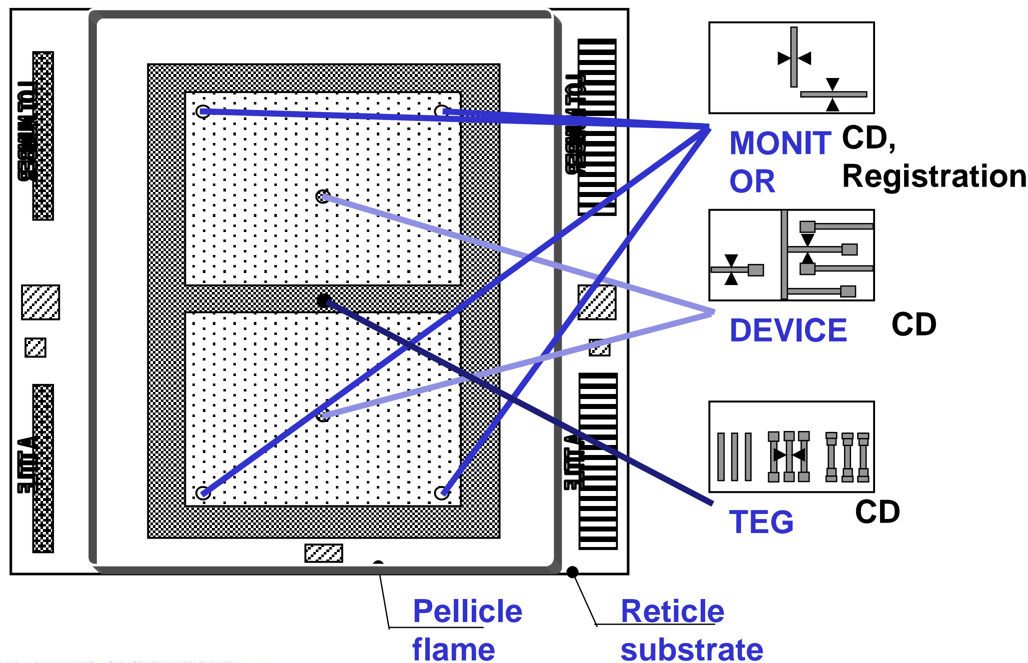
P10 revise activity in SEMI-TF

1. Updated by adding new items in order to match to new technology
2. Considered on optional syntax for sliming and converting to XML schema



Mask order information

P10 Revision

START_ORDER
SEMI_REVISION
CUSTOMER
CUSTOMER_ID
VENDOR
FILE_DATE_TIME
MASK_SET_ID
DESIGN_RULE
END_MASK_SET_OPTIONS
MASK_GROUP_ID
END_MASK_GROUP_OPTIONS
PLACEMENT_TOP_CELL
MASK_ID
MASK_NAME
DELIVERABLE_MASK

Convertible

XML(optional)


```
<?xml version="1.0" encoding="UTF-16" ?>
<P10  xmlns:xsd="http://www.XXXXXXXXXX.org">
<mask_order  ID="ABC0001_12345">
  <semi_revision>P10-XXXX</semi_revision>
  <customer  ID="S000001-A">DEVICE MAKER 1</customer>
  <vendor>MASK SHOP 1</vendor>
  <file_date_time>02-SEP-2002, 10:00:00</file_date_time>
  <mask_set  ID="ABC0001">
    <mask_set_options>
      <design_rule>130NM</design_rule>
    </mask_set_options>
    <mask_group  ID="ABC0001-800">
      <mask_definition  ID="ABC0001-800-10">
        <mask_name>ABC0001-800-GATE</mask_name>
        <deliverable_mask>T</deliverable_mask>
```

The importance of P10

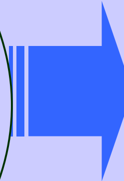
- ✓It is well used world wide standard and it build up the foundation of photomask business.
- ✓It has basically terminology of photomask specifications and ordering information.
- ✓It is now considered to be connected seamlessly to Universal Data Model that is standardized by SEMI-NA for all design information accessibility .
- ✓It will obtain extensibility at AtoA or BtoB communication with XML.
- ✓And ,needless to say, as it is used for only representation of information, it dose not restrict contents of specifications.

JEITA Reticle Data Management Update

Ver 1.0

Efficiency

Reduce Loss
in all Work Flow



Ver 2.0

Optimization

Module Engineering
in Multi Domain

From the draft of guideline Ver2

Background of Ver2

It is considered to introduce production systems such as IP shuttle whichcarries two or more products on one reticle for the purpose of mask cost reduction indispensable to SoC business. It is necessary to share means to solve the complicated data handling accompanying this among designer shops and manufacturers in plural companies.

Background which goes to Ver2 from Ver1

With progress of device scaling, because it become necessary to optimize in every individual product, the optimization which considers lithography and etching process and further optimization of the whole which took the design into consideration have begun beyond the conventional optimization of an exposure process only. Therefore you should improve the efficiency of data handling in order to do the linkage with the design information on an individual mask efficiently.

From the draft of guideline Ver2

Synergistic Innovation

In order to make easy information exchange (it contains when it consists of two or more companies) relevant to the reticle covering mask manufacture and wafer manufacture from a design, the standardization of expression of reticle related information including design information such as pattern data should be established.

Linkage strengthening with design information (extended possibility and reuse possibility)

Corresponding to the future production system of design/manufacture cooperation, the standardized expression should be extensible so that the design side information such as DRC information, adding to pattern data, and the manufacture side information such as process margin evaluation can communicate mutually, and so that it is reusable to optimization of pattern data dependency even with processes other than lithography process.

From the draft of guideline Ver2

Optimization of process modules

Expression standardized should be what can understand from every process in a module and can be reused.

The pattern data usability model

Apart from standardization of the data form of the pattern data itself, expression of referencing pattern data and other relevant information that are associated in case pattern data is utilized should be standardized.

The prospect through the process
(extension from a design to a back process)

The standard expression of data exchange ranging from design to Front End Process intensively (mentioned in Ver1), should be considered so that it is reused in Back End Processes, such as testing and defect analysis.

From the draft of guideline Ver2

Consideration on the collaboration of standard activities

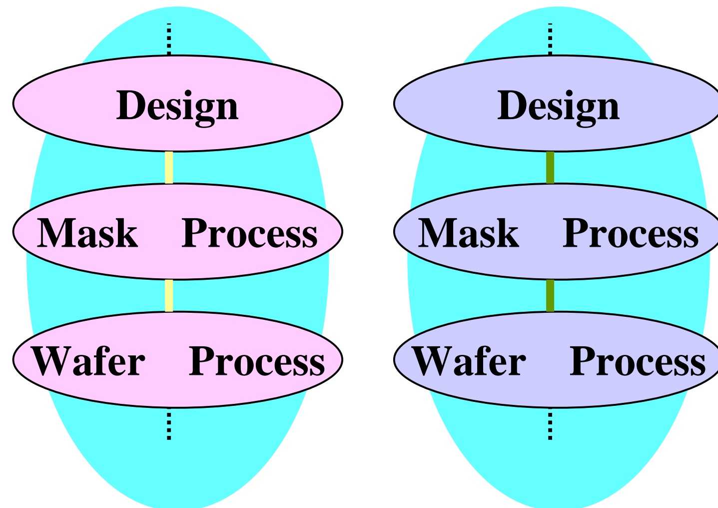
So that standard expression of RDM may cooperate with the standardization activities for the common interface of database storing information used in RDM, they should be considered to be convertible

Plan of Optimization Oriented RDM Guidelines V2.0

Background :
New Engineering Chain Management Concept is emerging for Collaborative Innovation.

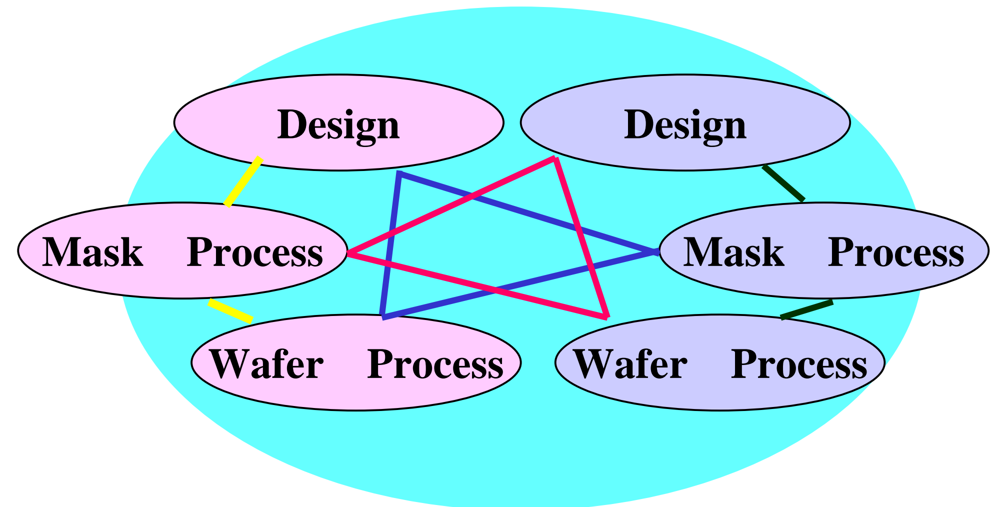
20th Century

Integrated Domestic Manufacturing (Vertical Integration)



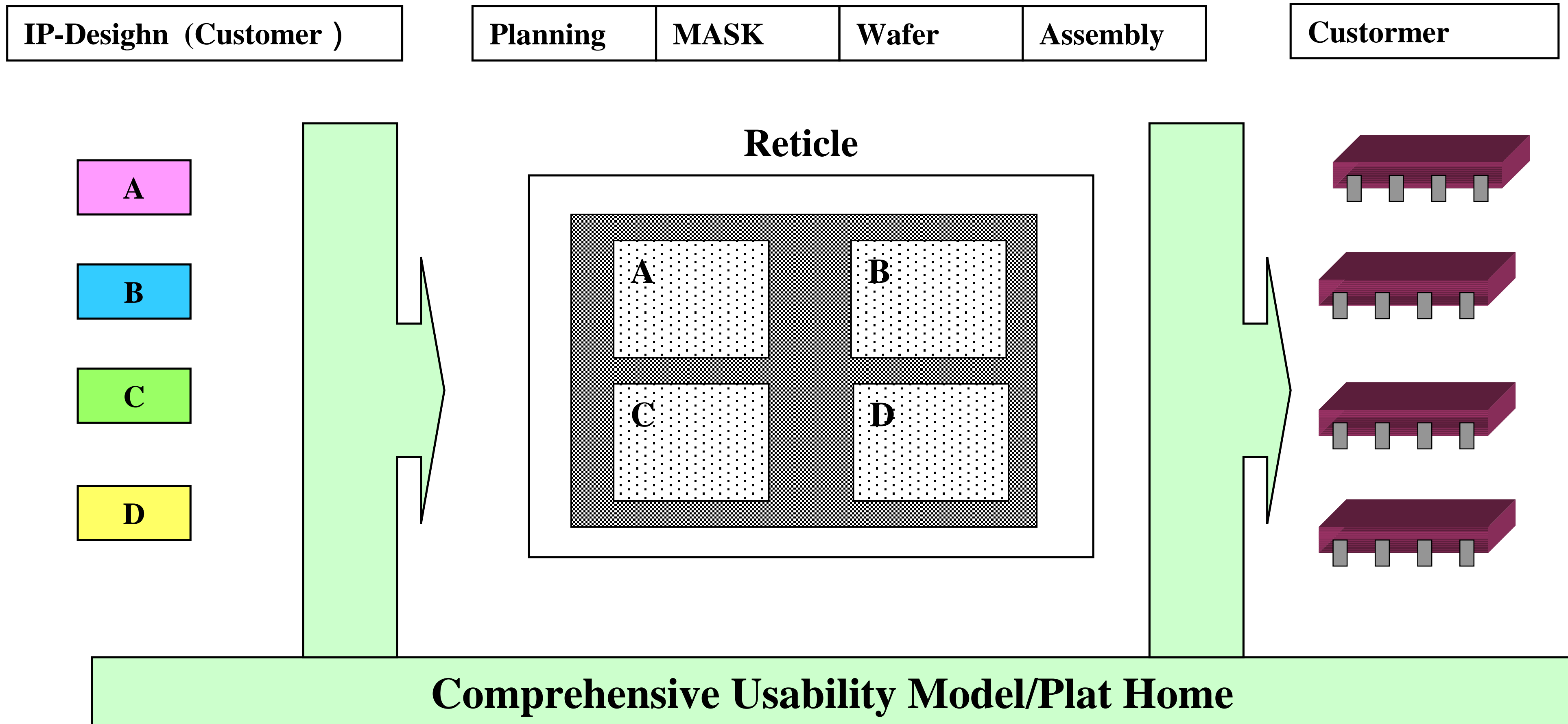
21st Century

Synergistic Innovation



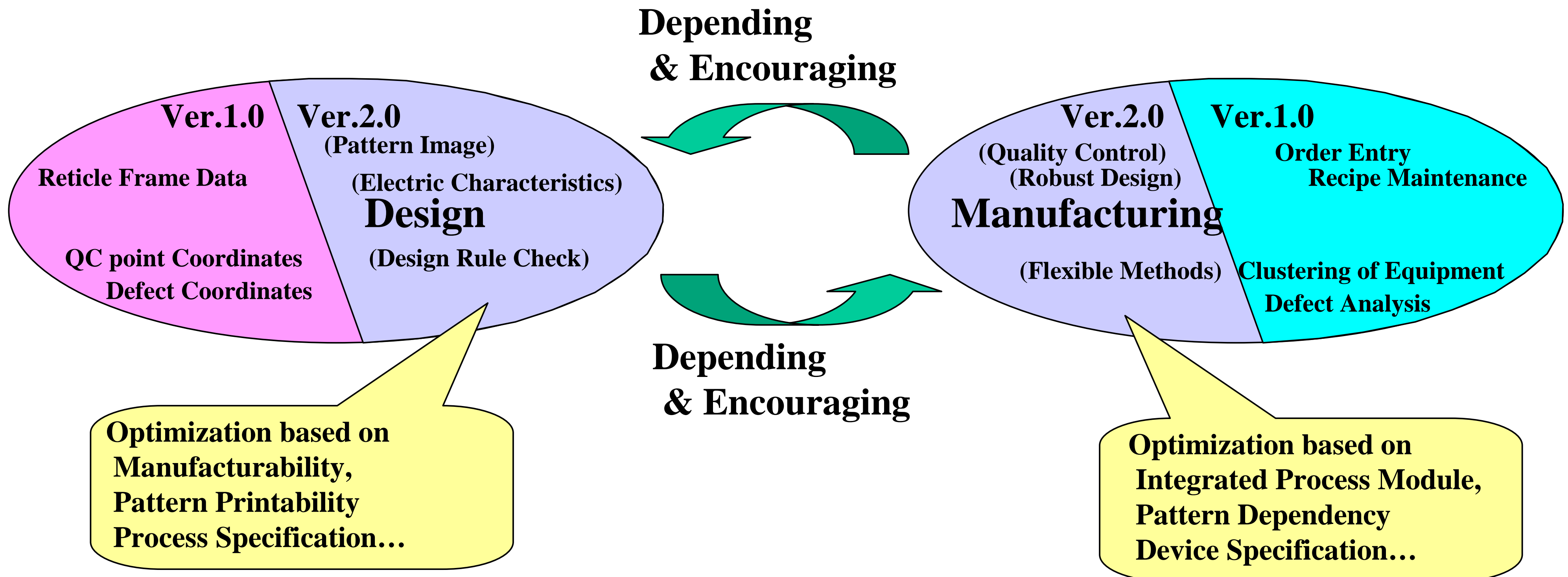
IP Shuttle Image

IP Shuttle model reduces The Reticle Cost by Customer Member of Conventional Method.

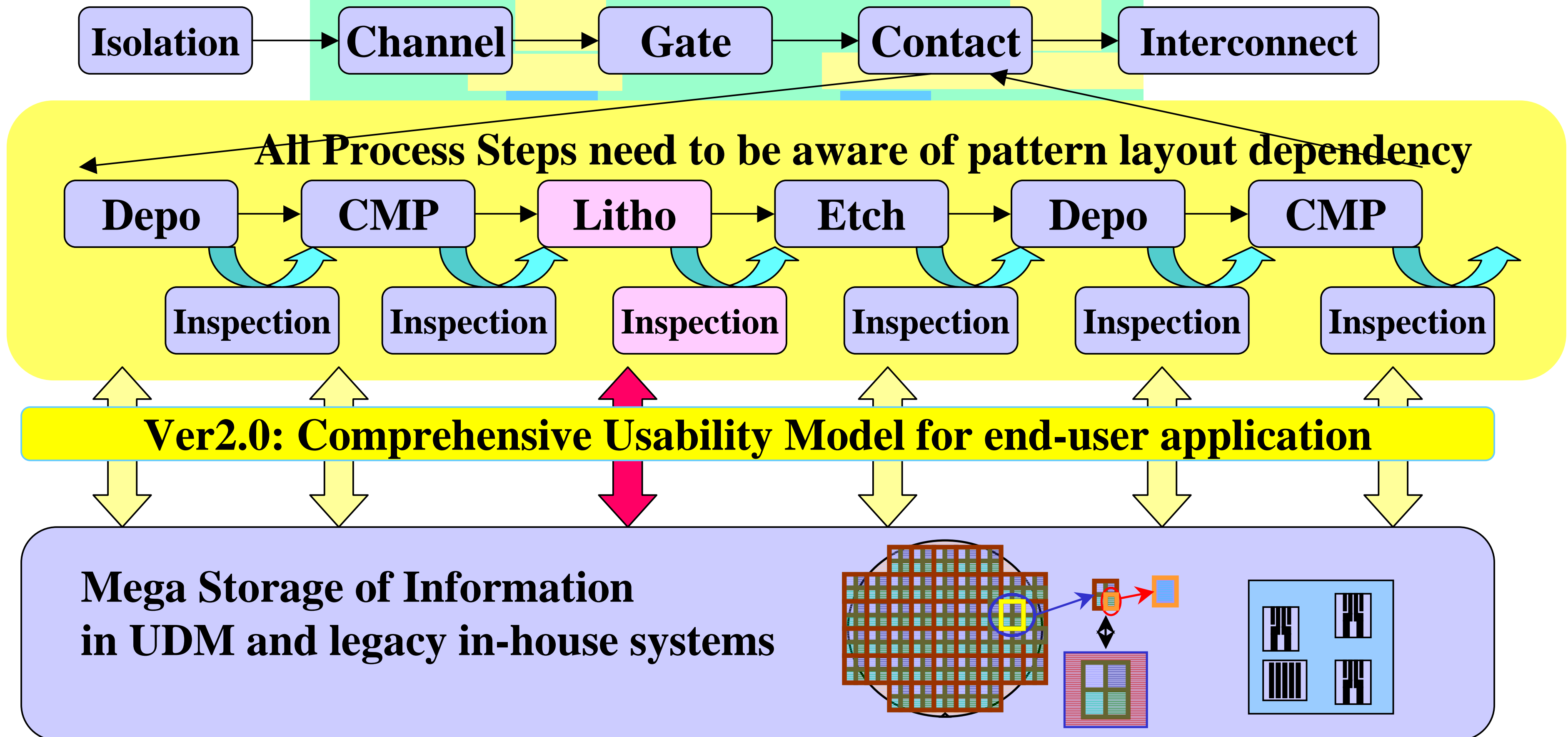


Enforcement of Linkages between Design and Manufacturing

The Key of Synergistic Innovation is Linkages between Design and Manufacturing

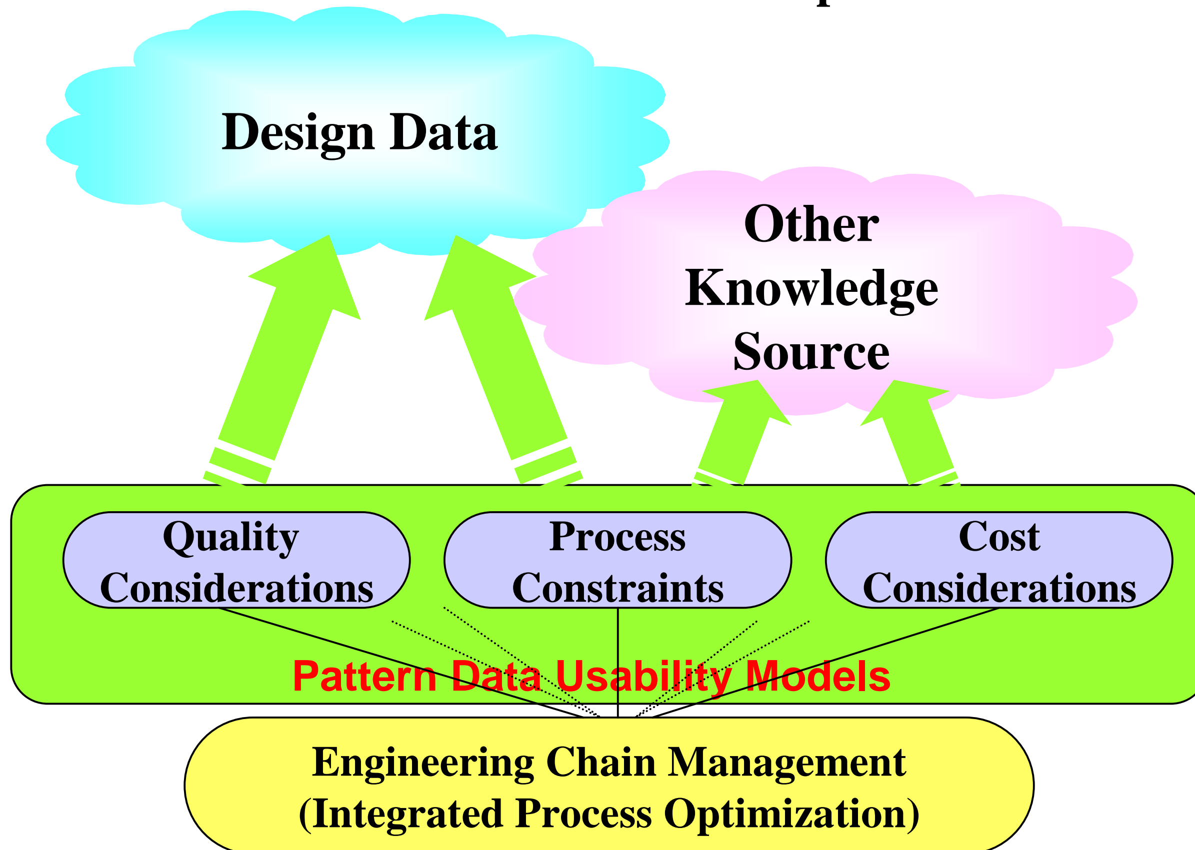


Expanding to Process Module

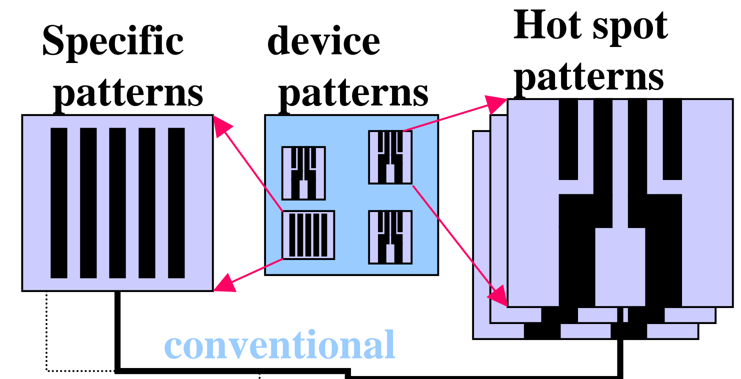


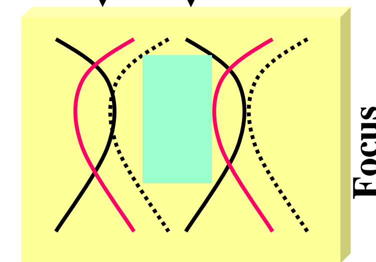
Pattern Data Usability Models

Usability Models would be proposed that are abstracted and constructed based on consideration about such examples.



for example....
Flexible mask specification





Lithography Window with mask errors

Flexibility identified patterns to decide mask specification

S.Nojima et. al.(TOSHIBA) /PMJ 2002

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Example adaptation to Flexible Mask Specification

MEF(Mask Error enhance Factor)
- Mask CD deviation
- Wafer CD deviation

Mask Specification for Hot Spot Pattern
- Average
- Standard Deviation

Exposure Condition and critical pattern

ED-Tree
- FEM(Focus Exposure Matrix)
- Focus-Exposure Window

Exposure Condition

Hot Spot Pattern
- DRC output
  - Detected Minimum Space
- Nominal Value
  - Tolerance :

If we can start from
such simple reference
to access
the mega-storage of RDM
with design information,
it will improve
knowledge management
that has become complicated
more and more
in semiconductor manufacturing.

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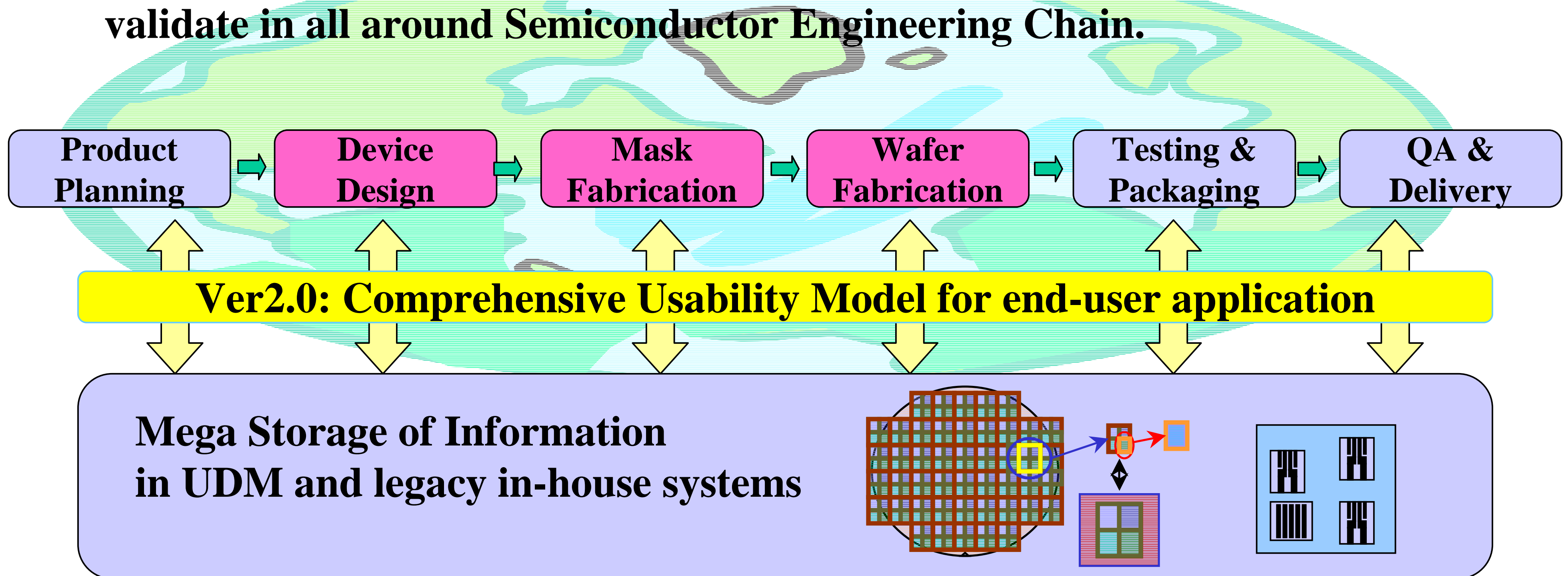
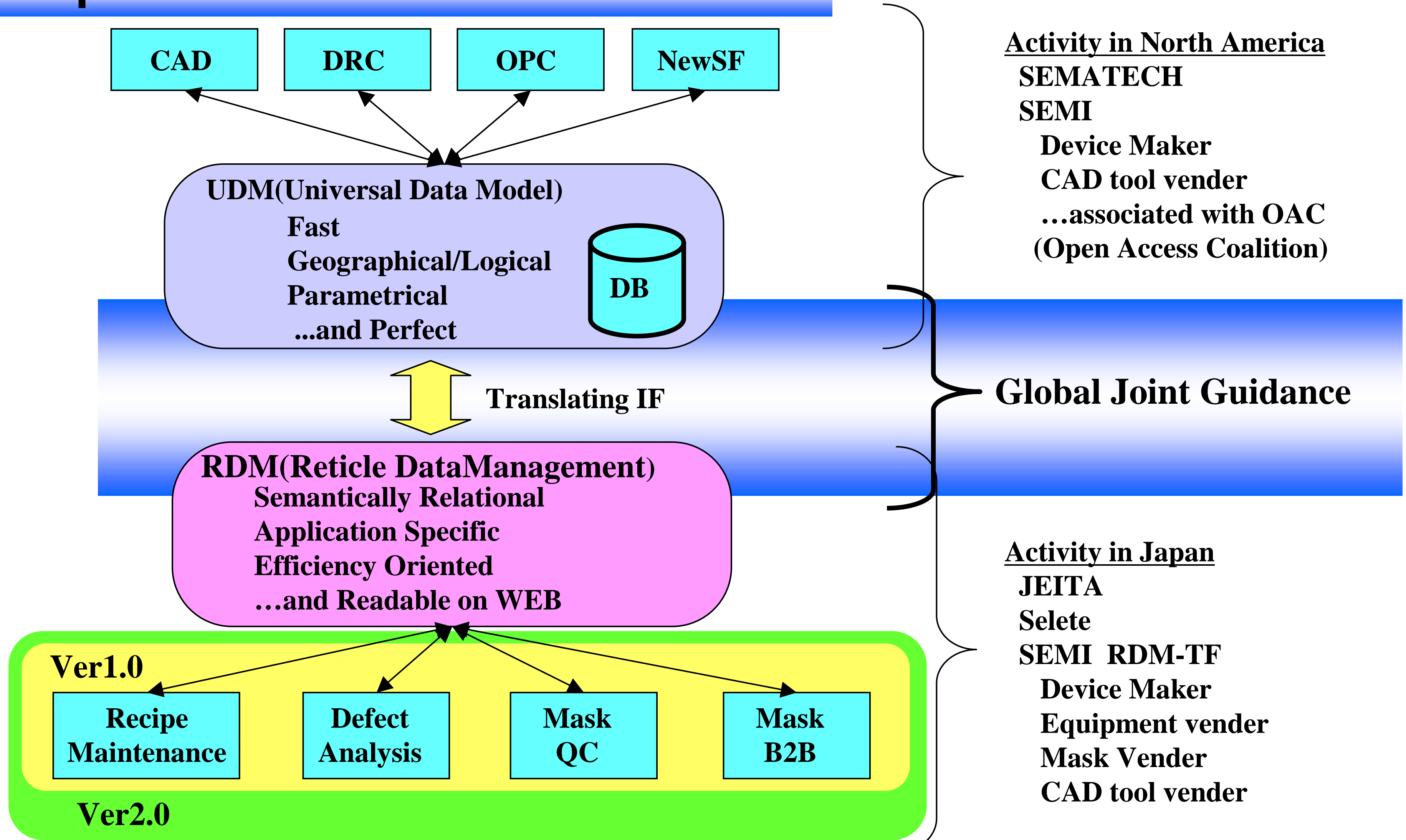
Prospects Through The Process:Design to Delivery



Our Guidelines are intensive only on Reticle Data Usability Model, but naturally,they would be reused in all the Engineering Chain.

Proposal for Global Joint Guidance



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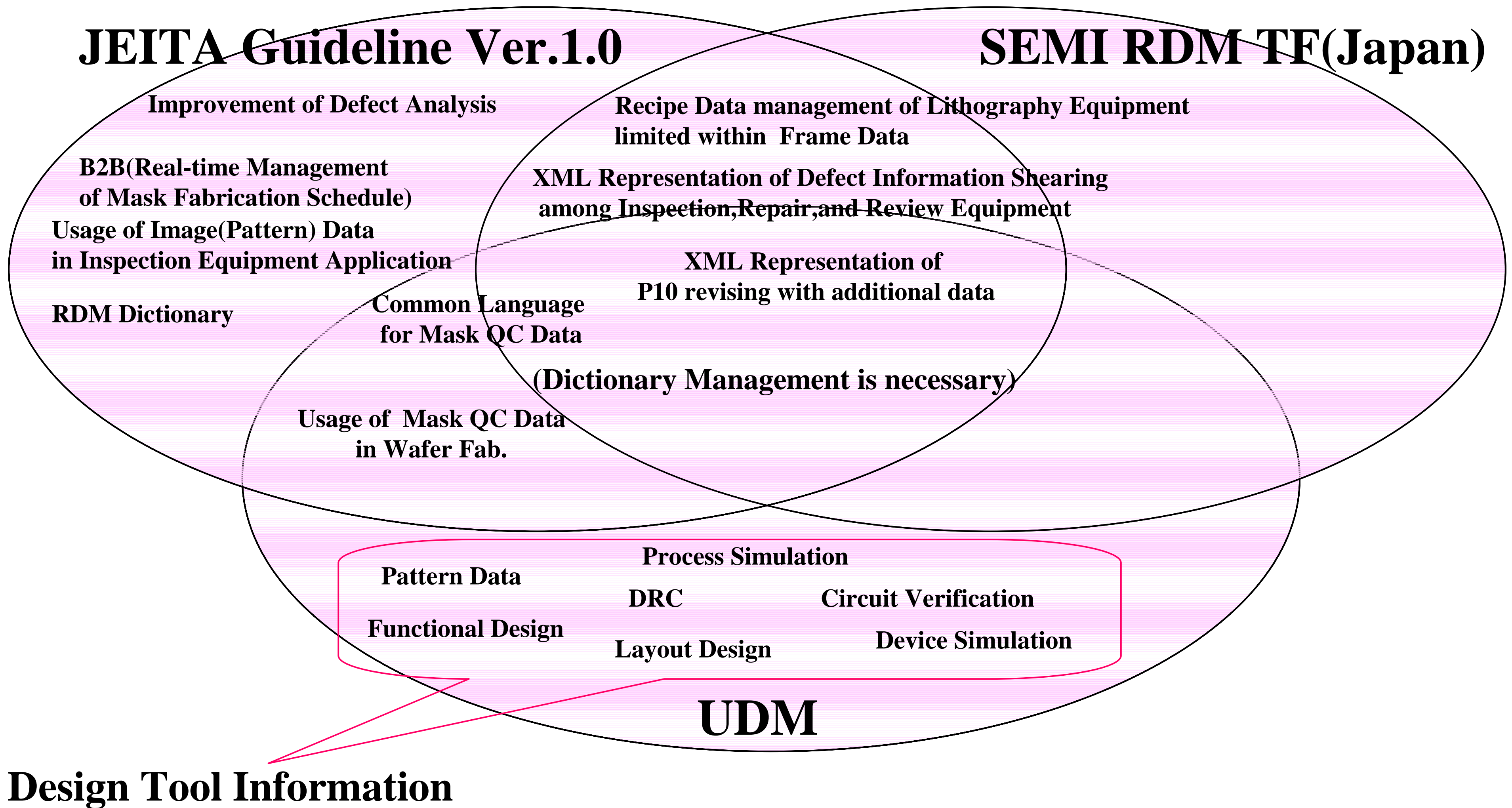
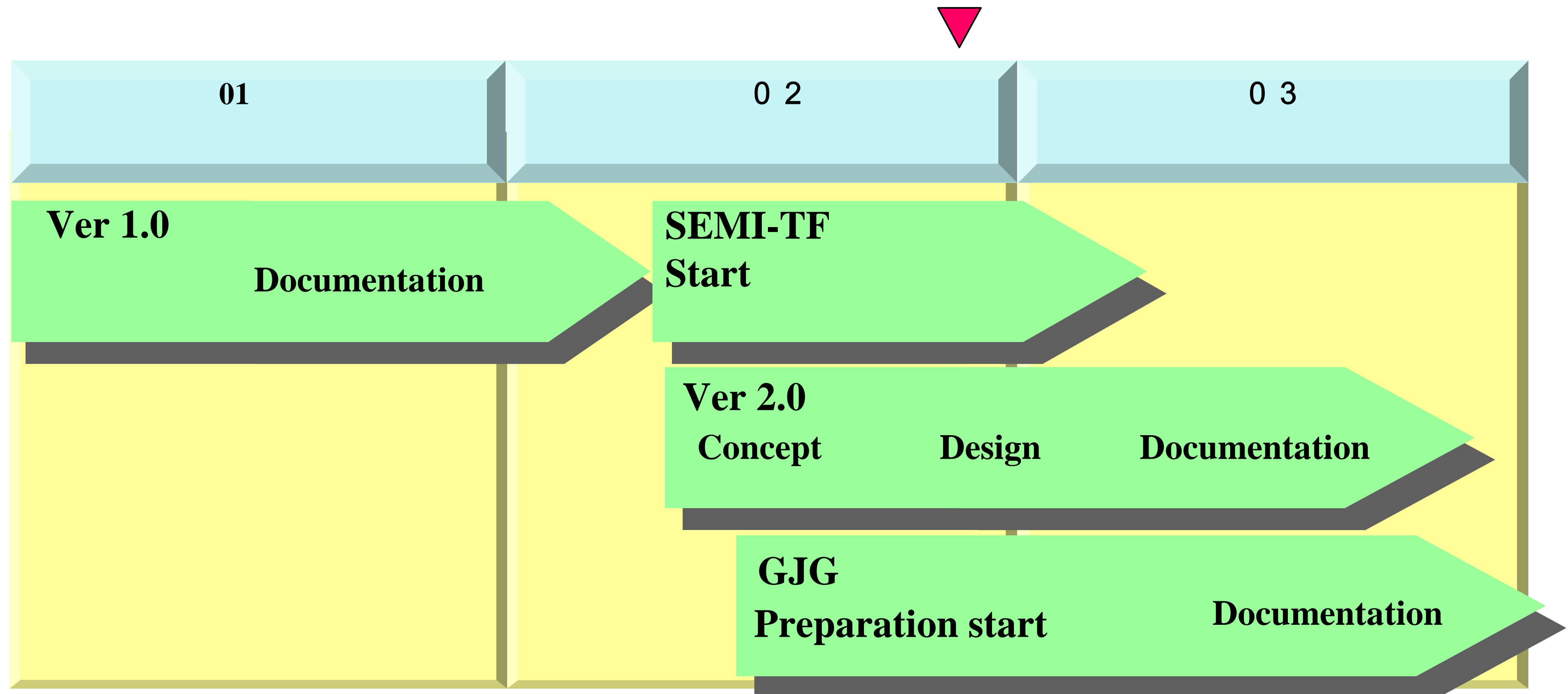
Relation of Scope (JEITA's Guideline Ver.1.0)



Schedule

Schedule in outline is as below.
It is thought that the preparation for GJG would be need to start, if possible.



Summary

1) JEITA proposed Guideline Ver1.0 ,
and SEMI RDM TF is progressing.

2)JEITA has started Guideline Ver2.0 Activity.

3)Ver.2.0 would be considered in terms of module optimization and enforcing linkages between design and manufacturing.

The image of this plan is assumed currently as below

i) Requests in the times of synergistic innovation

ii)Usability Models of pattern data

iii)Enforcing the linkage between design and manufacturing

iv)Expanding integrated process module

v)Prospect through the process raging from design to delivery

4)We would like to consider about Global Joint Guidance
that can connect our activity to UDM.

Member

JEITA Reticle Management Subcommittee

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