Source Data Model of Integration Manufacturing Information System

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Abstract. Considering the processes of manufacturing enterprise design, plan, technology, manufacture and etc, it analyses the composition and interdependence of enterprise information system data in this paper. Emphasizing the technical and process section data, analyzing these data's source, attribute and outgoing. It creates an integral information system basic data model, obtains a system overlap model of these kinds of source data acquisition, provides a settle method for source data incomplete, inaccurate, and substandard of the manufacturing enterprise information system.

Introduction

The significant character of integrated information system is that it covers all the principal post and operation flow, creates a complete business closed loop where there is not information isolated region exist. The traditional pattern's management focal points are fund and property, integrated finance and business, it exists some shortages such as plan function weak, source data incomplete, acquired inefficiency, information isolated region and a part of master business loop externally, which not only weakens the system value for enterprise ,but also is hard to use longtime and bruises the enterprise activeness. With the development of information age, more and more foreign system suppliers pay attention to these problems, begins to reconstruction the integrated information system where system source data model research has become an important content.

Manufacturing enterprise basic business data and correlation analysis

Manufacturing enterprise basic operation flow. Operation flow of the manufacturing enterprise is complex and it contains amount of information, so for a majority of the enterprises, they organize production following two ways, production by contract or contract containing pre-investment, which have became the key operation mode. For contract and market prediction all come from sales department, manufacturing order is the beginning of the whole production, following production preparation and delivery which form a main line business ring. That is to say, the main line management business of manufacturing enterprises is the flow process of the order material design, process, plan, implement and feedback information among different managerial posts and departments, see Fig1, which represents the enterprise management process macroscopically.

Business information correlation analysis. From the above analysis, it can find that when the enterprise internal order is fixed, the products are also settled, all the succeeding management information, the arrange fund and material flow develop around the products. Production design and process plan are to fix the scale of material requested, containing material kinds and norm which determine the material cost of the products and is the basis of purchase and external aiding plan, process route and man-hour norm which determine the productive cost and is the basis of fixing production plan. Key information and actions of the design and process are listed in table1.

From the above analysis, it finds that all the system basic information are order product design and technology, for the integral manufacture enterprise information system. These information not only layout the technology requirement of the product, but also layout the resource demand, which used to program different plans directly, driving cash flow, object flow and workflow to finish the product. From this view, different plans are to program the detailed layout of how to satisfy the product technology requirement and how to satisfy product resource demand, plan executing and controlling are the specific behavior, all of these come from the information generated from product design and process layout.
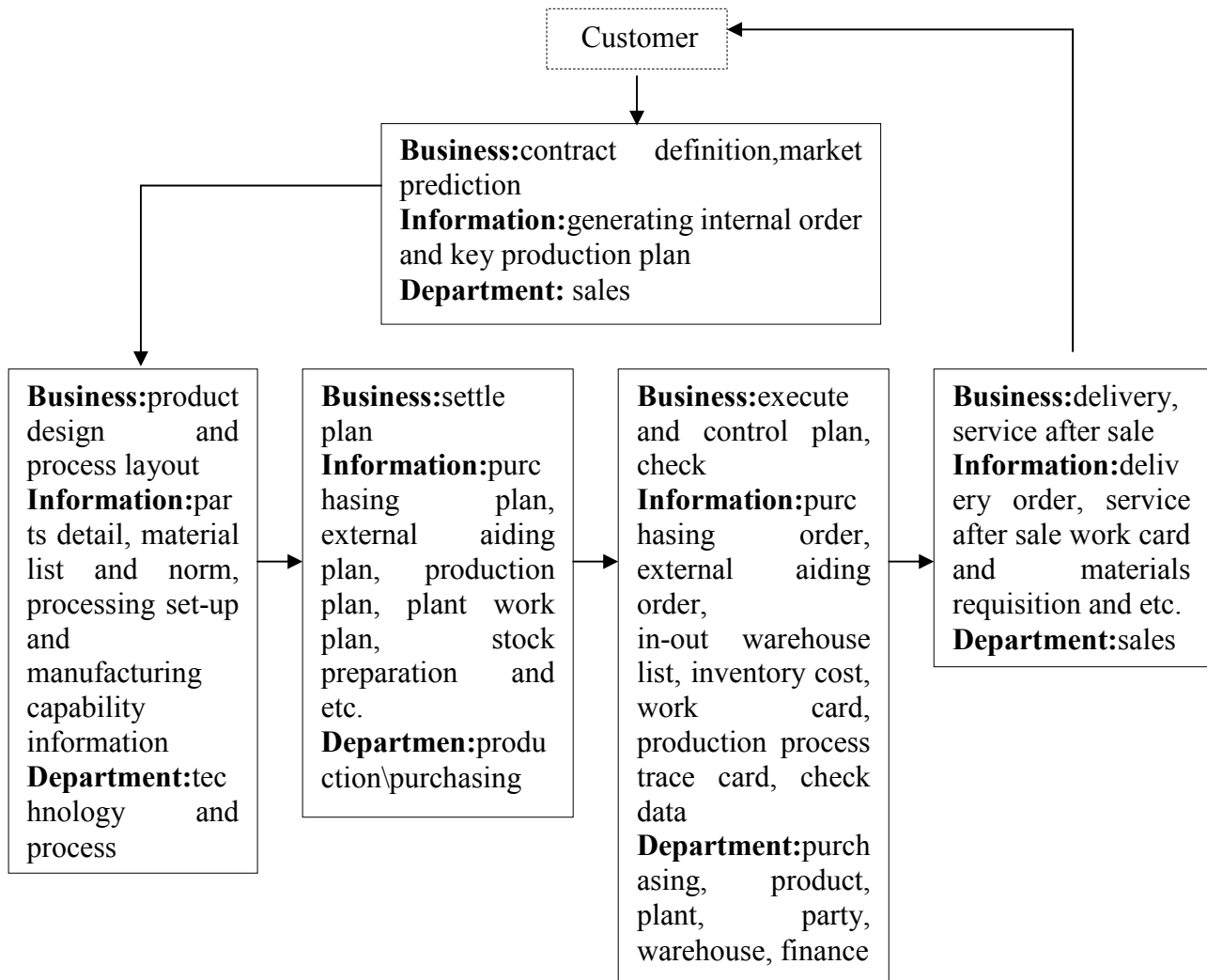
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                              ┌─────────────┐◄──────────────┐
                              │  Customer   │               │
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          ┌──────────────────────────────────────────┐     │
          │ **Business:**contract    definition,market │     │
          │ prediction                                 │     │
          │ **Information:**generating internal order   │     │
          │ and key production plan                    │     │
          │ **Department:** sales                       │     │
          └──────────────────────────────────────────┘     │
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Business:product design and process layout **Information:**parts detail, material list and norm, processing set-up and manufacturing capability information **Department:**technology and process	→	**Business:**settle plan **Information:**purchasing plan, external aiding plan, production plan, plant work plan, stock preparation and etc. **Departmen:**production\purchasing	→	**Business:**execute and control plan, check **Information:**purchasing order, external aiding order, in-out warehouse list, inventory cost, work card, production process trace card, check data **Department:**purchasing, product, plant, party, warehouse, finance	→	**Business:**delivery, service after sale **Information:**delivery order, service after sale work card and materials requisition and etc. **Department:**sales

Fig. 1. Manufacturing enterprise basic operation flow and information flow

Table1 Key information and actions of the design and process

Business	Information	Information actions
Assemblage design	Drawing, Diameter and technology requirement, Scale and parts serial number	Showing the assemblage of the product, key parts shape and check technology requirement and etc. It is the foundation of discriminating parts composition and assemblage requirement. Under current technology, these information delivered by paper and is the main contents of transition drawings business.
	Drawing number, Norm and material kinds in the assemble drawing detail column	Showing the assemble relationship of the product parts, manufacture' attributes of corresponding part, products by itself, external aiding products, standard parts and auxiliary equipment, which is the foundation of forming product structure tree.
	Assembled equipment name	Showing the component name, which is a part of nodal point name and product detail data components.

	Assembled equipment weight	Showing the equipment global weight, which is a important foundation of determine material norm and shop output value checking.
	Other information	The contents same as part drawing .
Part design	Drawing, Diameters and technology requirement, Scales	Showing the requirements of part structure, size, manufacture and check requirements, it is the foundation of identifying parts for technical personnel. Under current technology, these information delivered by paper and is the main contents of transition drawings business.
	Name	Showing the name of the part, it is the one of components of product structure tree.
	Drawing size	Reflected directly in detail columns of assemble drawing, it is the main foundation of forming the product structure tree.
	Material	Indicating the product material, it is the key basis of manufacture process, using for fix the material detail, purchasing plan, send and receiver material order, cost checking and etc.
	Weight	Showing the part design weight, it is the key data of fixing material norm and output value checking.
Process route layout	Material	Showing the part material, it's action is same as above.
	Material norm	Showing the part material norm limitation, it is used for controlling cost and scheduling purchase plan.
	Blanking dimension	Showing the blanking requirement, it is key references of scheduling purchase plan, delivered to staff on process cards.
	Brocess number	Showing the manufacture precedence, it is the foundation of scheduling workshop job time sequence.
	Process name	Showing the manufacturing method, it is the foundation of scheduling job time sequence, manufacture party and section.
	Process quirement	Showing the technology requirement of some process manufacture time, delivered to staff on paper.
	Department	Showing the finish department of some manufacture process, it is the foundation of scheduling the job plan time and manufacture position.
	Manufacture equipment	Showing the manufacture equipment of one process, it is the foundation of dividing equipment job.
	Knife tool and accessory	Showing the requirement of knife tool, accessory and etc during the process, which determine the manufacture cost.
	Man-hour norm	Showing the process time requirement, it is the time foundation of programming workshop job plan, determining the manufacture cost.

Basis information model

It has been determined from the above that product design information and process layout information are the source and foundation of plan and plan executing and controlling. This information flow format is the objective behavior of enterprise main line business management flow, it must to be a following law of manufacture enterprises integral information system. On this basis, information transition among different business flow should satisfy that product design and technology layout course must supply complete, accurate, standard and unique information in time for the sequence plan from design and process view firstly, secondly from plan layout view, which is an important labeling of integral information system. Under the current technology, some data in table 1 must to be delivered on paper providing convenience for workman, other information must flow timely, accurately, completely and standard in integral information system, then the source data model is got, shown in fig2.
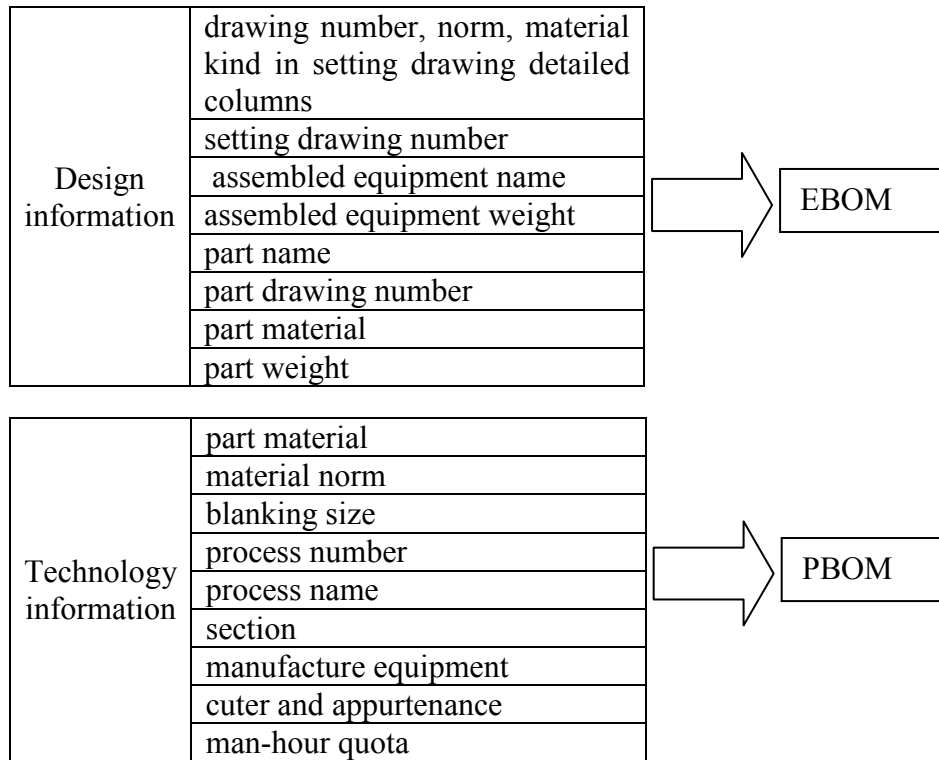
Design information	drawing number, norm, material kind in setting drawing detailed columns
	setting drawing number
	assembled equipment name
	assembled equipment weight
	part name
	part drawing number
	part material
	part weight

→ EBOM

Technology information	part material
	material norm
	blanking size
	process number
	process name
	section
	manufacture equipment
	cuter and appurtenance
	man-hour quota

→ PBOM

Fig. 2. Integral manufacture enterprise information system source data model

Integral information system source data acquisition mode

For the finance and business integral information system, the function can not overlay product design and process layout, so the source data needed are got from building BOM concentrically where existing many deficiency such as it can not guarantee the information complete, in time and accurate, system function and enterprise post cannot match, working efficiency low and alter difficulty. While integral information system emphasizes cover the whole main line business flows, all the information come from unique source and match to enterprise post and function. So integral information system source data is accompany with design and technology, delivered to plan system after abstracted and summarized automatically.

Currently, CAD,CAPP,PDM(PLM) technology have matured, manage the CAD/CAPP data forward, integral highly with ERP backward, which can settle the problems existing in source data abstracting and delivering, shown in fig3.
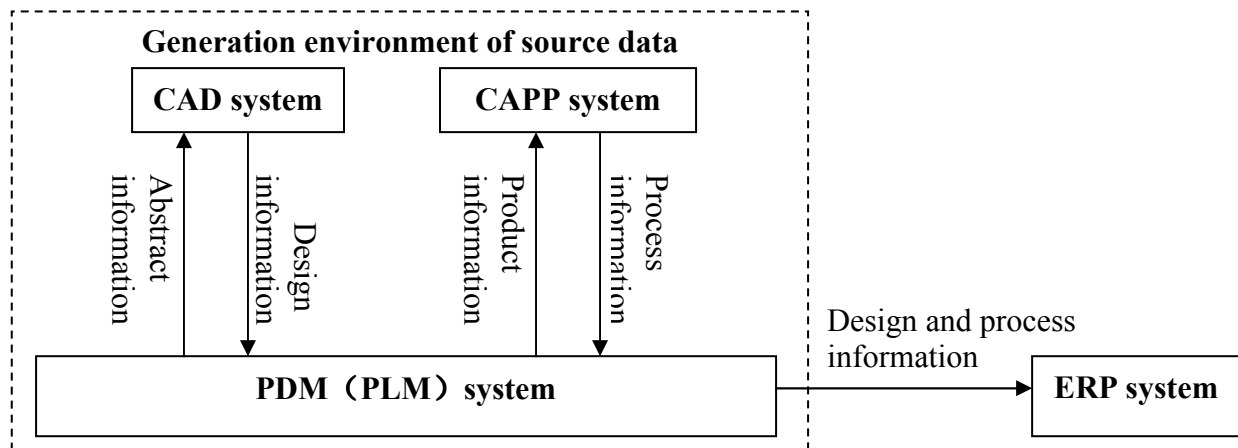

Fig. 3. Method of manufacture enterprise integral information system building and source data abstracting

Conclusion

During the process of operating enterprise information strategy, integral main line system settle scheme covering all he main line business is the first choice comparing with domestic and foreign mature system. It can help enterprise prepare source data for integral information system timely, correctly, completely and uniquely. On the basis of the model, enterprise should analysis the system data and flow generally, coming form the management practice, integrate closely the CAD/CAPP and PDM(PLM)to create the source data system, then to integrate PDM(PLM)and ERP to realize delivering data automatically.

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