

## A THEORETICAL RESEARCH FRAMEWORK FOR SHARING KNOWLEDGE THROUGH E-COLLABORATION

Marjan Mohammadjafari<sup>1</sup>, Shamsuddin Ahmed<sup>2</sup>, Siti Zawiah Md Dawal<sup>3</sup> and  
Hadi Zayandehroodiand<sup>4</sup>

<sup>1</sup> Department of Engineering Design and Manufacture, University of Malaya (UM), Kuala Lumpur, Malaysia

<sup>2</sup> Department of Engineering Design and Manufacture, University of Malaya (UM), Kuala Lumpur, Malaysia

<sup>3</sup> Centre for Product Design and Manufacturing, Department of Engineering Design and Manufacture,  
University of Malaya (UM), Kuala Lumpur, Malaysia

<sup>4</sup> Department of Engineering, Kerman Branch, Islamic Azad University, Kerman, Iran

\* [marjan\\_mohamadjafari@yahoo.com](mailto:marjan_mohamadjafari@yahoo.com)

***Abstract-** In the backdrop of rapid changing of product features and varieties, on-time data and information exchange between the departments of a manufacturing company has become inevitable. In case of large or multi-national companies (MNCs), information exchange between the geographically dispersed units might be time consuming, less effective, and in turns more costly than expected. Such environments need to use the modern offers. Electronic collaboration (E-collaboration) offers quick and less costly approach. E-collaboration is a means for sharing knowledge data, and information between different departments within a company or ease reaching out to other companies as well. E-collaboration can create a suitable environment for communication and reduces time and cost in the product pre-production manufacturing phases. Manufacturing of each product is now considered as a project activity. This article presents a theoretical framework on electronic integration of the major departments of a manufacturing company. Implementation of this framework requires abilities and according to these abilities, different products featuring E-collaboration are discussed and one software, namely InfoWorkSpace, is chosen.*

**Keywords:** E-collaboration; Research framework; knowledge sharing; Time and cost reduction Template,

### 1. INTRODUCTION

One of the problems in manufacturing processes is lack of knowledge-sharing and effective coordination between different units related to manufacturing[1]. Sometimes, the relevant departments or units are in different geographic places and they have specific but related responsibilities towards effective product design and production. Therefore, there need to have direct and quick communication between the related departments in order to perform their functions in efficient and effective manner. There can have an environment for sharing their knowledge and integration of the needed information for production through an E-collaboration system to save the design and production time and cost in a product manufacturing process. E-collaboration also allows ongoing management by a project manager through all steps, which enhances profitability. E-collaboration is collaboration among individuals engaged in a common task using electronic technologies. And project management is a methodology for managing a project[2].

### 2. A FRAMEWORK FOR EFFECTIVE E-COLLABORATION SYSTEM

Five departments are typically involved in a production system. These departments include commerce, planning, design, procurement and production [3-7]. It is supposed, if these departments utilize E-collaboration for project management, the profitability of a project increases. To successfully implement the research framework, E-collaboration technology needs certain features. These features include: Electronic documentation, Central server for storage data bank , Documents section for different projects separately, File transfer, History of a project is available, Controlling and managing a project, Project manager tracks project , Online communication, collaboration and conversation, Data access.

InfoWorkSpace is a software E-collaboration technology that features all of the capabilities listed above for implementation the framework[8]. InfoWorkSpace is defined a knowledge management, online communication and data access system. Files can be stored on a central server, and all maintenance support is provided for users. Chat, group chats, online presentations, Voice-Over-IP, whiteboards, desktop

conferencing asynchronous with the real-time communication are also enabled by InfoWorkSpace [8]. This technology offers facilities like: 1-Discussion, 2- Email notification, 3-Online messaging/paging, 4-Chat, 5-Whiteboard, 6-Audio/video conferencing, 7-Screen sharing, 8-Presentation capacity, 9-File and document sharing tools and 10- Document management [8].

The departments of commerce, planning, design, procurement and production have some responsibilities and these duties need E-collaboration. Some of the tasks in these departments should be done by the some tools of E-collaboration such as: Discussion, Email, online messaging. In the following, the relevant tasks are listed and those that need E-collaboration are highlighted.

#### *Department of Commerce*

The duties of the Commerce Department are: 1- Marketing, 2- Order Receiving and Validation, 3- Gathering information about existing status, 4- Consult and sign the contract, 5- Execution of the contract, 6- Renew contract for another period, 7- Financial arrangements, 8- Performance contract, 9- Periodically visit the client for an opinion to perfect and improve the service quality continually, 10-Inform the customer about a delivery date and 11- Distribution.

#### *Department of Planning*

The duties of the Planning Department are: 1- Receive customer orders from a commerce department, 2- Determine whether orders can be shipped from stock or must be produced, 3- Determine delivery dates according to contract between a customer and commerce department, 4- Prepare material stoke requisitions for inventory control to support the production of the product, 5- Prepare the detailed schedules, 6- Initiate the movement of movement of material's production to support production schedules, 7- Issue orders to transfer partially completed production orders from an operation to operation in production departments, 8-Receive progress reports on production orders, evaluate the status of orders, and initiate corrective actions as required, 9- Initiate customer requested changes, 10- Revise schedules when production operators' outputs do not conform to schedules or when customer changes are requested, 11- serves as the information interface between production and commerce on status of customer orders, 12- Keep accurate records on the status of schedules and customer orders and 13- Prepare cost estimates on new or revised products[9].

#### *Department of Design*

The duties of the Design department are: 1- Identify a need, 2- Design brief, 3- Drawing the plan, 4-Verify the plan with standard design rules, 5- Check to avoid extra secondary operations in production, 6- Check to avoid process restriction in production, 7- Check that design is appropriate for the expected level of production, 8- Component selection, 9- Choose standard and available materials and components and 10- Teamwork with manufacturing personnel[10-11].

#### *Department of Procurement*

The duties of Procurement department are: 1- Material requirements review, 2- Standards determination, 3- Specification's development, (design, performance, or test requirement for a product or item under development, 4- Supplier research and selection, 5- Value analysis, 6- Financing, 7- Price negotiation, 8- Making the purchase, 9- Supply contract administration, 10- Inventory control and stores, 11- Disposals and other related functions[12].

#### *Department of Production*

The duties of Production department are: 1- Receive plan, 2- Tight quality check on the incoming raw materials, 3- Adjustment of machine settings, 4- Change of tools, 5- Proper allocation of operators to machines with skills, 6- Change in the production plans, like increase or decrease in volume of production, 7- Rigid in-process quality program to avoid rework[13-14].

Some of the main responsibilities in different departments require E-collaboration. They are listed in below:

#### *Department of Commerce*

Among the eleven duties of this department, two of them need E-collaboration.

1- Gathering information about existing status and 2- Performance.

#### *Department of Planning*

In the Department of Planning there are thirteen duties, four of which need E-collaboration.

1- Receive customer orders from the commerce department, 2- Prepare material stoke requisitions for inventory control to support the production of the product, 3- Prepare the detailed schedules, and 4- Receive progress reports on production orders, evaluate the status of orders, and initiate corrective actions as required.

#### *Department of Design*

Five of ten duties within the Department of Design require E-collaboration. 1- Check to avoid secondary operations in production, 2- Check to avoid process restriction in production, 3- Check to appropriate design to the expected level of production, 4- Chose standard and available materials and components, and 5- Teamwork with manufacturing personnel.

#### *Department of Procurement*

Department of Procurement has eleven duties, three of which require E-collaboration.

1- Material requirements review, 2- Financing, and 3- Inventory control and stores.

#### *Department of Production*

Department of Production has seven duties. Among these duties, four need E-collaboration.

1- Receive plan, 2- Tight quality check on the incoming raw materials, 3- Change of tools, and 4- Change in the production plans, like increase or decrease in volume of production.

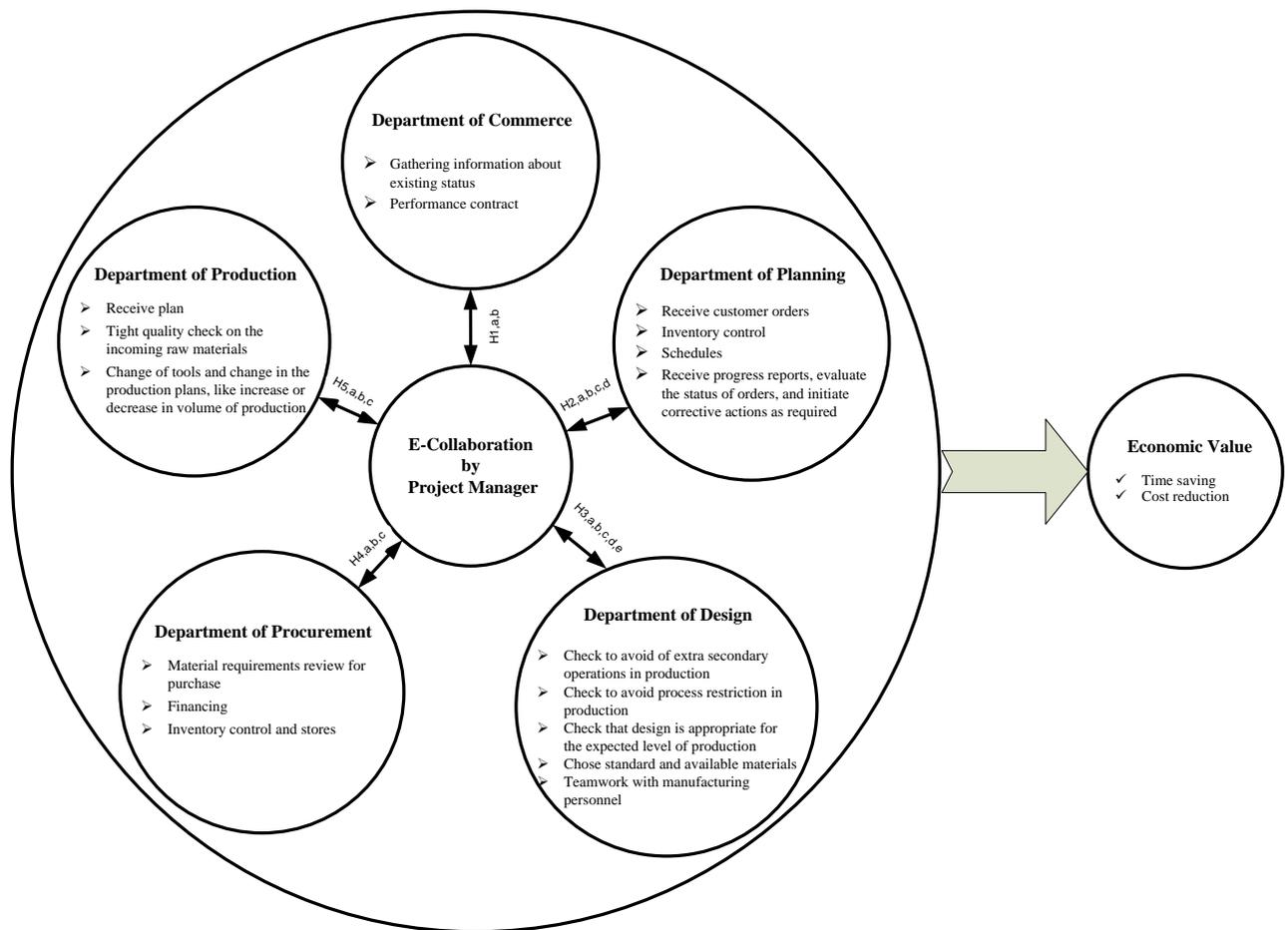


Figure 1: E-collaboration framework for a project-based manufacturing

## 2.1 Explanation of the Proposed Model

The first department is the commerce department for every company. In this department, the marketing manager does her/his job for getting the order from the customer. After receiving and validating an order, the counsel between the customer and commerce manager implements a contract. Before signing the contract, the commerce manager must be aware of current status of materials and production within the company. For example, she/he has to know if there are any uncompleted project in the production line, or if the each department has time for doing the new project. With E-collaboration, the contact with the other departments can be done by discussion and Audio/Video conferencing tools. After signing the contract, information about the new project will be sent to the planning department through file and document sharing tools and Email tools.

In the Department of Planning, the control project manager receives the information about the new project. In this department, counsel is done between Departments of Production and Procurement by whiteboard or audio/video conferencing tools. These departments can utilize E-collaboration tools to determine if the project must be built from new material, or if it can be pulled from existing inventory. If

that project needs to be built, the control project manager sends the received information from a commerce manager to Departments of Design, Procurement and Production through the file and document sharing tools, because he/she has to know the needed time for implementation of the project in each department. For example, how many days will be needed for design of this project in the Department of Design? How many days will be needed for purchasing the needed material for the project? How many days will be needed for production? According to each departments' response, the control manager prepares a schedule with consideration of the promised date to the Commerce Department and customer. The prepared schedule is sent to all departments through a file and document sharing tool. Also, the control project manager prepares material stock requisitions for inventory control to support the production of the product. And control the movement of movement of material's production to support schedules. The control project manager receives progress reports on the other departments, evaluates the status of orders, and initiates corrective actions as required. During the process, the customer may want to change a part of their order. The Commerce Department receives these changes and sends the information to the Department of Planning by

Email or file and document sharing tool. The manager in this department can send this change to the related departments and after getting feedback from Departments of Design, Procurement and Production, he/she inform the Commerce Manager about price or delivery date changes. The Commerce Department informs the customer.

The Design Department will be starting the design of the project according to received information by file and document sharing tool from Planning Department. In the Design Department, there are several engineers in different fields. For example: electrical engineer and mechanical engineer. All of these engineers work under the design manager, and also they use some tools of E-collaboration for the internal organizations. The designed plan should make effort to avoid any extra, secondary operations in production. It should also avoid process restriction in production; the design also has to be appropriate to the expected level of production. Before starting the design, the designer sends information to the production manager by screen sharing tool and explains the plan. The production manager will inform the designer of any relevant information regarding the equipment or any changes in the production line, because each change in the production line changes the plans. After completing the design, the designer explains the plan to the manufacturing personnel by Audio /Video conferencing. The designer prepares the list of material and sends this list to the Procurement Department by file and document sharing and discussed with a personnel department of procurement by online messaging and presentation capacity tools. The chosen materials have to be standard and available in the market, then even before choosing material the Department of Design and Department of Procurement contact each other through chat and online messaging and share their knowledge.

In the Department of Procurement, the purchasing of material will be starting according to the list of material from the Department of Design. In the first step, the procurement manager investigates the different suppliers and chooses the best one. The next step is estimating the prices for material of the project and negotiation between a Commerce Department and Procurement Department about financing. They contact each other through chat and the presentation capacity tools. The Procurement Department contacts the Department of Planning and Production in order to check inventory and the raw material during the project. Purchasing is reported to the Department of Planning step by step through a file and document sharing tool.

In the Department of Production, the raw material is checked before the commencement of a project and there is negotiation among departments of Planning and Procurement by Audio/Video conferencing tool. Adjustments of machine settings and proper allocation of skilled operators to machines is done by a production manager. Change in the production plans, like increase or decrease in volume of production, or change in the tools in a production line are reported to the Departments of Planning and Design through a file and document sharing tool as these changes may affect the

schedule or plan.

According to the received information and plans from the Design Department and prepared material by a Department of Procurement, the project can start in the production line. To avoid rework, quality control is checked step by step in the production line. Also, the commerce manager sometimes visits the process of the project. Various departments can receive the report from the Department of Planning by file and document sharing. The commerce manager informs the customer about the status of the project.

It should be noted that one project manager in each project manages all steps within their project. He/she can see all saved files and shared documents and take the report from each department if the work is not going according to schedule. The project manager manages the entire team for a given project

### 3. CONCLUSION

In this study, it is proposed that E-collaboration between Departments of Commerce, Planning, Design, Procurement and Planning in order to share knowledge and information before starting the process of production. It can help companies achieve benefit in terms of time, cost and profitability. The research framework is designed with the following tools: 1- Discussion, 2- Email notification, 3- Online messaging/paging, 4- Chat, 5- Whiteboard, 6- Audio/Video conferencing, 7- Screen sharing, 8- Presentation capacity, 9- File and document sharing tools and 10- Document management which is necessary for implementation of the framework. InfoWorkSpace is the one technology offering all of these capabilities that is fully integratable with existing software.

### 7. REFERENCES

- [1] F. HASSANDOUST and M. F. KAZEROUNI2, "Implications Knowledge Sharing through E-Collaboration and Communication Tools," *Journal of knowledge management, Economics and information technology*, 2010.
- [2] A. Ramaprasad and A. N. Prakash, "Emergent project management: how foreign managers can leverage local knowledge," *International Journal of Project Management*, vol. 21, pp. 199-205, 2003.
- [3] Arshinder, *et al.*, "Supply chain coordination: Perspectives, empirical studies and research directions," *International Journal of Production Economics*, vol. 115, pp. 316-335, 2008.
- [4] L. Bals, *et al.*, "Barriers of purchasing departments' involvement in marketing service procurement," *Industrial Marketing Management*, vol. 38, pp. 892-902, 2009.
- [5] A. Gunasekaran, *et al.*, "E-Procurement adoption in the Southcoast SMEs," *International Journal of Production Economics*, vol. 122, pp. 161-175, 2009.
- [6] B. J. Hicks, *et al.*, "Understanding information systems infrastructure in engineering SMEs: A case study," *Journal of Engineering and Technology*

- Management*, vol. 27, pp. 52-73, 2010/6// 2010.
- [7] R. Rauniar, *et al.*, "Shared knowledge and product design glitches in integrated product development," *International Journal of Production Economics*, vol. 114, pp. 723-736, 2008.
- [8] G. Bafoutsou and G. Mentzas, "Review and functional classification of collaborative systems," *International Journal of Information Management*, vol. 22, pp. 281-305, 2002.
- [9] Gaither.N and G. Frazier, *Operation Management*, 9th ed.: Academic Internet Publ, 2006.
- [10] J. G.bralla, *Handbook of manufacturing progresses:how products , components and materials are made*, Illustrated ed.: Industrial Press, 2007.
- [11] J. G. Bralla, *Design for manufacturability handbook*, Second ed., 1999.
- [12] A. J. V. Weele, *Purchasing and Supply Chain Management : Analysis, Strategy, Planning and Practice*, 5 , illustrated ed.: Cengage Learning EMEA 2009.
- [13] R. Panneerselvam, *Production and operations management*: PHI Learning Pvt. Ltd., 2006.
- [14] Gaither.N, *Production and operations management*, 1982.