

SAP Fiori as a Cause of Innovation and Sociotechnical System

Maciej Suder

High Banking School in Wroclaw ul. Fabryczna 29/31,
53-609 Wroclaw, Poland

Email: maciej.suder@wsb.wroclaw.pl

Tadeusz Gospodarek

High Banking School in Wroclaw ul. Fabryczna
29/31, 53-609 Wroclaw, Poland

Email: tadeusz.gospodarek@wsb.wroclaw.pl

Abstract—Implementation of an ERP system in manufacturing organization is closely related with customization of the standard prototype of the system offered by a software house. In case of manufacturing health-care products some additional aspects to standard information circuits must be added. These mean QC, ISO, FDA requested data should be processes parallel to bookkeeping ones. In this paper the use of SAP Fiori in the QC process in inbound logistic is presented. Adding SAP Fiori to the existing SAP solution allows to create sociotechnical informal group of the users having new key competences. It allows to achieve some benefits measured with CBA method for the organization. It was concluded that integrated IT systems of ERP class may develop sociotechnical systems in organizations used them leading to re-engineering processes and transition changes. A case study of changes inside a map of process of the manufacturing health-care products plant is presented and discussed.

I. INTRODUCTION

THE world is changing, and all manufacturing organizations want to be competitive and strictly focused on customer demands and requirements (Kotler, 2007). The customer wants to receive a product of better quality, faster and cheaper. One of possible supports for managing organization fulfilling such demands is implementing the integrated IT system of the ERP class. It will help managers to take rational decisions based on optimization costs and a profit, based on constant monitoring of a feed-back between the initial values of a set of key performance indicators and the received response from the surroundings being recognized as the value created (Gospodarek, 2012).

There are some well-known ERP solutions for industrial enterprises, like IFS, QAD, SAPS4/HANA, Oracle E-Business Suite, (Kimberling, 2020). Each of them has some pros and cons. There are some comparisons and rankings on the Internet regarding functionality and operability, e.g., “Top 10 ERP”¹, The Top 14 Manufacturing ERP Systems in 2022², Manufacturing ERP Software³, Best ERP Software for Manufacturing Businesses⁴, and more. All of ERP systems must be customized and specifically implemented in concrete organization, regarding to its map of processes and the value chain. In all cases it is necessary to define what

does it mean the ERP system, because the gap between imagination how it should work from the user and the supplier point of view may be the problem in proceeding with the project realized the way using dedicated methodic approach.

A lot of specific solutions of implementations of the ERP systems are available over the Internet. In this paper some advantages of using the SAP Fiori tool⁵ in the manufacturing organization of healthcare scope is presented. SAP Fiori is a design system that enables one to create business apps with a consumer-grade user experience, turning casual users into SAP experts with simple tools that run on any device (e.g., tablets and smartphones). Implementation of the SAP Fiori may be recognized as the reengineering process of the ERP use. The users are deeply involved in process of modifications its functionality and the distribution of knowledge in the organization. It resembles the SECI model of knowledge socialization (Takeuchi and Nonaka, 1995) and forming a sociotechnical system STS (Mumford, 2006) realizing the scrum idea (Takeuchi and Nonaka, 1986) during design the modification (Ghosh & Sahney, 2010). This sociotechnical informal structure inside the organization creates innovative solutions of managing the related map of processes and becomes the valuable VRIN⁶ class human resources with specific key competences⁷ (Barney, 1995; Gospodarek, 2012).

The aim of this research is to prove that economic aspects of introduction SAP Fiori are effective in increasing functionality of the exploited integrated IT system. It is especially suitable for agile incremental, spiral variant of expanding usability of the existing SAP system. This approach involves the users into deep interactions with technology what allows to form non formal STS increasing productivity of the whole department.

II. THE ERP SYSTEM

The base model of ERP function in organizations is presented on the Figure 1. The system is understanding as the tool of measurement the performance of the organization regarding influence of the surroundings on the economic score. Feedback is the base for time-depending comparisons

¹ <https://www.top10erp.org/>

² <https://tipalti.com/manufacturing-erp-software/>

³ <https://softwareconnect.com/manufacturing/>

⁴ <https://www.softwaresuggest.com/erp-software/manufacturing-industry>

⁵ <https://www.sap.com/products/fiori.html>

⁶ VRIN – Valuable, Rare, In-imitable, Non-substitutable (The term derived from the resource based theory).

⁷ <https://embapro.com/frontpage/vrioanalysis/6661-discrimination-job>

of a state of the organization. The ERP system collects source data derived from different units of the organization and processes them resulting useful information supporting a decision-making process. In the most advanced form a set of key performance indicators (Parmenter, 2019) are calculated and compared along time.

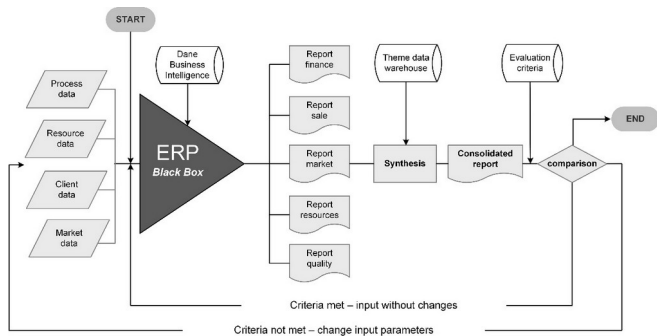


Figure 1. The ERP class integrated IT system as a tool of feed-back measurement [Source: Gospodarek T., 2015]

Practical realization of any ERP support in the manufacturing organization requires description of its value chain (Porter, 1965; Gospodarek, 2015). It needs to represent a map of organizational processes divided on single business unit or divisional parts in an architecture of processing of the ERP system. Usually, modules of the ERP system are closely related to the organizational structure of business logic.

It means that each module supports a group of specific business processes logically joined together like finance, procurement, or manufacturing – and provides employees in the related department with the information transactions and insight they need do their jobs. Every module included in the ERP system are the source of input data and the receiver of the elaborated information. Therefore, the ERP system may be treated as a single source of truth, accurate, shared data across the whole organization.

SAP A.G. is one of the world's leading producers of software for the management of business processes, developing solutions that facilitate effective data processing and information flow across organizations. In the health care business, some different from standard bookkeeping documents are used. It requires precise data collection. One of them is ISO norm fulfillment what requires for all components of a final product the source of origin and some related data. It must be determined for all processes and stages. The number of a charge of the product must be related to the place in stock. Finally, selling documents must contain the number of a product serie and date of its usefulness. It strongly complicates standard information circuit of the exploiting ERP adding some extra collections of data to the map of processes as: ISO information circuit, period of usefulness, inbound and outbound logistic information, QC control information and some more related to the CRM subsystem in the organization.

When inner auditors in subject organization analyzed how many operations had to quality technician did to release some raw materials, the organization management had decided to Implement SAP Fiori UX system for optimizing the map of processes and information circuit. SAP Fiori is a design system which enables to create business apps with a consumer-grade user experience. Common users of the SAP ERP may become experts thank to simple screens that run on any device. They better understand the processes and information exchange because some hidden knowledge is delivered from the mentioned modification of the SAP ERP system. Using the SAP Fiori design guidelines and available tools included, one can easily build and customize the existing apps adding new functionality at minimum knowledge about architecture and structure of the used integrated IT systems. This is the starting point for arising the sociotechnical subsystem and transformation of the involved in handling the process persons from costs makers for the organization to its resources offering some new key competences. It is the hidden value which appears after implementation new concept of processing data describing the process.

SAP Fiori enables multiple device applications that allow users to start a process on their desktops/laptops and continue it on a smartphone or on a tablet. It seems to be the optimum solution for multidivisional manufacturers of corporational structure at reasonable costs. For that reason, it is interesting to estimate some profit of the Fiori implementation using the cost-benefit analysis (CBA) (Sartori at all, 2015).

III. KEY STUDY OF THE ANALYZED PROCESS

In this research, the processes of quality control and inbound logistic of a raw material supply were chosen. Both are performing in the production department of the analyzed plant. Map of the standard version of the process is presented on the Figure 2A.

The plant operates 41 raw material items which are checked daily in 2 shifts. The material is delivered to stock and an appropriate document is generated for accounting records. Semantic model representing some FDA's requirement for a material released is based on the Supplier's Certificate of Analysis and in site visual control.

Before any material reaches the production department, it must undergo laboratory control. This requires certain activities not necessarily registered in the ERP system but using the related thematically IT subsystem. There are some possibilities to optimize the process structure and its map.

IV. DESCRIPTION OF THE PROCESS (STANDARD SAP ERP WORKFLOW)

Process name – Release Raw Material
 Category – Main Process
 Type related – Inbound delivery
 Purposes – releasing raw material for production
 The owner - Production manager
 Participants – Warehouse operator (WH), Extended warehouse manager (EWM), Quality

technicians (QT), Production manager (PM).

IT supporting modules - SAP Quality Module, SAP Extended Warehouse Management.

Steps (actions):

1. Warehouse receives raw materials from a supplier.
2. WH moves the material to the quality stock.
3. QT receives a certificate of analysis from the supplier which is checked with parameters requested.
4. QT prints the list of materials available at batch quantities in the stock fulfilling quality requirements.
5. QT sends information containing material list to WH by e-mail and demands to prepare samples for control purposes.
6. WH prints additional label for the subjective material including some processes data, as: batch number, quantity, code for ISO purposes, etc.
7. WH collects necessary materials and moves them to a quality bin.
8. WH uses EWM SAP module and moves material from the Quality Stock to the quality bin.
9. WH informs QT that samples are ready to check.
10. QT goes to the quality bin, doing visual control of the selected material and decides which material could be release for production line.
11. QT send mail to WH and requests to move back all material from the quality bin to the quality stock.
12. WH moves back material from the quality bin to the quality stock (and issues suitable document).
13. QT uses SAP Quality Module and puts some records resulting and releases the controlled material for further processing.
14. Released raw material is moved to the production department.

One can note that the set of processed data is different from the standard ERP information circuit. Warehouse operator and Quality Technicians make nine steps, some possible to reduce:

Warehouse: Printing additional label, preparing and placing the sample elsewhere, moving material inside the system, returning back material to its physical location, returning back material into the system (5 activities).

Quality controller: Downloading the list, sending mail to WH, writing which material could be release, sending mail to WH (4 activities)

V. MODIFICATIONS INSIDE THE WORKFLOW DERIVED FROM FIORI IMPLEMENTATION

New look of the workflow is presented on the Figure 3. The set of actions:

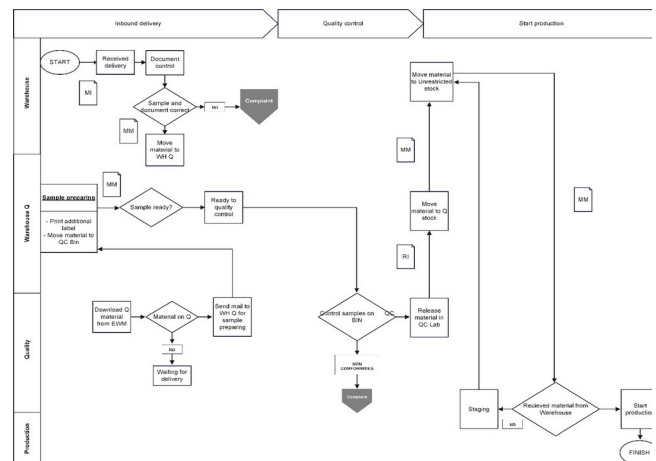


Figure 2 UML diagram of the subjected process. A – standard SAP ERP mode

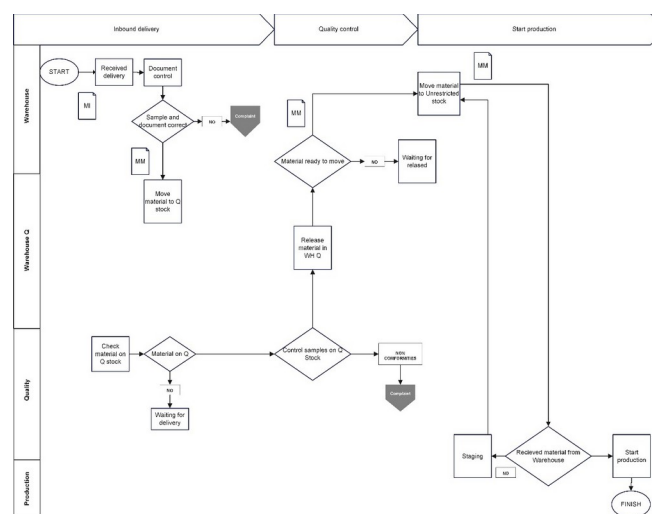


Figure 3 UML diagram of the subjected process modified SAP Fiori mode.

Steps

1. Warehouse receives raw material from the supplier
2. WH moves the material to the Quality Stock
3. QT receives certificate of quality from the supplier
4. QT goes to the quality stock, controls the subject material, records the results and makes a decision
5. The released raw material may be move to production

As it is easy to see, only 4 steps are taken in case of the SAP Fiori use. It means 2 for WH and 2 for QT. It means reduction of additional steps for the Quality Department to 66.7%, and for the Warehouse 71.5% respectively. This way WH and QT

VI. COST BENEFIT-ANALYSIS OF INNOVATION

The cost-benefit analysis is the comparison the projected or estimated costs and benefits or possible ones, associated with a project decision (in our case – implementing SAP Fiori technology). (Layard and Glaister, 1994). It allows to

Table 1 Direct benefits obtained

Item	I shift	II shift
Saved time of release material [hour]	4	4
Number of technicians involved [EA*]	1	1
Man-hour cost [USD]	10	10
Daily savings [USD]	40	40
Total direct benefit [USD/year]	28800	

* EA – Employed active

determine whether the decision makes sense from an economic perspective. The main concept of the CBA approach is a monetization of the score and find a simple measure of the economic effects (Sartori at all, 2015). From the methodical point of view, the first step in CBA is to determine all components in relation to the analyzed business project. It is closely related to the Total costs of ownership approach (Cossio, 2018) applied to implementation of the SAP Fiori and its maintenance from start of the project.

Costs

1. Direct costs -related to implementing the Fiori system (such as licenses, equipment, labor, services, time wastes, learning costs, etc).
 - 6 iPads 4200 USD
 - Training new users by the Internal Subject Matter Expert 40 hours 350 USD
 - Validation of the system and documentation by a regulatory affairs associate and an Internal Subject Matter Expert: 20 hours, 1400 USD
 Total direct cost: 5950 USD
2. Indirect costs: Other expenses not directly related to the product, such as rent, utilities, or transportation costs.
 - iPads insurance 600 USD
 - iPads accessories 50 USD
 - Shipping 25 USD
 - iPads configuration 50 USD
 Total indirect cost 725 USD
3. Intangible costs: Any other costs possible to quantify e.g., brand damage if the market doesn't respond positively to the product, decreasing of production capacity if project fails. The subject organization didn't observe any intangible cost and decided to implement FIORI in the next business unit in another country.
4. Opportunity costs: The loss of opportunities caused by the decision taken. One could choose to manufacture a product more profitable. Increasing costs of licenses (Apple, Fiori).
5. Costs of potential risk (estimated): Any business project is exposed to a variety of risks. It should be considered the following:

Table 2 Indirect benefits obtained

Item	SAP	FIORI
Nonconformities identification and traceability [unit/year]	5	0
Onboarding new employees for process handling [hour]	24	16
Operations inside the process map [pcs]	14	5
Time of release material for production [hours]	20	10

- Behavioral question against use FIORI,
- Potential equipment damage,
- Stress at work job head count,
- Possible errors in handling the system.

Benefits⁸

1. Direct Benefits: The measurable benefits in monetary value that one can get from the project. In this case, the revenue and cash flow increasing.
2. Indirect Benefits: Benefits that you can perceive but not necessarily measure such as increased brand awareness, some risk reductions, making the STS structure inside the organization, time saving, errors reduction

It may be concluded that implementation the FIORI together with forming the STS structure grouping around the workflow presented on the Figure 2 brings measurable positive effects in the subject plant.

VII. CONCLUSION

A lot of manufacturing plants are involved in raw material control process. Additional requests for data handling out of the scope of standard ERP system cause necessity to look for new IT solutions. The most important aspect in such problem is reorganization of the map of process according to technological functionality of the offered software. Sometimes such update of the map of processes creates enhancement of economic effectiveness of the subjective organization. The best situation is observed when a group of employed for handling the modified process will take part in knowledge socialization and become a sociotechnical system. Such informal substructure may introduce a lot of benefits for the organization.

ERP systems and their modifications expanding functionality outside the set of key performance indicators mainly focused on the balanced scorecard monitoring may be good base of founding sociotechnical systems inside the organization. We've found that SAP Fiori modification is one of ef-

⁸ All benefits described below were determined by an audit after a year of functioning the system.

fective examples of such mechanism. The process of moving raw materials from a stock to the production department of medical care goods was reengineered and its workflow was redesigned using the Fiori software. It was estimated direct yearly benefits round 28 800 USD (see table 1) and some indirect benefits (see table 2), which influence the profit of the organization. Reduction of quantity steps in the map of process are direct related to form the sociotechnical system operating between Warehouse operators and Quality technicians. This STS eliminate errors in handling samples for QC and reduces knowledge socialization from 24 to 16 hours for new employees.

Less number of operations for quality control and warehousing reduce no conformities of the material with requests and improve delivery raw materials faster for production. Quality control doesn't influence material flow and less backorders from customers have been observed since a year of Fiori implementation. Fiori reduced daily paper works. It was observed no nonconformities during internal audits of identification and traceability of the raw materials.

Scientific problem derived from this research seems to be very prospective. The relationship between the IT integrated systems and stimulation of forming the STS systems will be investigated in the nearest future.

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