

THE ROLE OF ERP SYSTEM IN BUSINESS PROCESS AND EDUCATION

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Preliminary notes

In this paper, the results of the questionnaire survey conducted in 30 small to medium-size enterprises in Croatia have been presented. The authors considered the relationship between business and information activities, emphasizing also the following: the degree of knowledge about the ERP systems, employees' response to the ERP system, the efficiency of ERP system in working environment, the possibilities of reorganization of production process, investment to improve the ERP system, integration of all departments and the degree of user satisfaction. According to the collected and analysed data, it can be concluded that the ERP systems have important role in business process, but there are some problems regarding the implementation and use of the ERP system such as inattentiveness, high resistance to change and the lack of employees' motivation. In order to overcome the mentioned disadvantages, in the second part of the paper, MS Dynamics NAV 2009 system has been described from the educational and business process point of view as a great support for the students and employees to acquire practical knowledge and accelerate business process.

Keywords: education, ERP systems, MS Dynamics NAV 2009, questionnaire survey

Uloga ERP sustava u poslovnom procesu i edukaciji

Prethodno priopćenje

U ovom radu prikazani su rezultati istraživanja pomoću ankete, provedene u 30 malih do srednje velikih poduzeća u Hrvatskoj. Razmatrane su veze između poslovnih i informacijskih aktivnosti, s naglaskom na sljedeće: stupanj znanja zaposlenika o ERP sustavima, njihovo povjerenje i odnos prema uvodenju ERP sustava, učinkovitost sustava u radnom okruženju, mogućnost reorganizacije proizvodnog procesa, ulaganje u poboljšanje sustava, integriranost sa svim odjelima u poduzeću i stupanj zadovoljstva korištenjem ERP sustava. Prema prikupljenim i analiziranim podacima može se zaključiti da je uloga korištenja ERP sustava prepoznata u mnogim poduzećima, ali još uvijek postoje određeni problemi vezani uz implementaciju, kao što su nemarnost, protivljenje i nezainteresiranost radnika. Kako bi se prevladali spomenuti nedostaci, u drugom dijelu rada je, s edukacijskog i poslovnog stajališta, opisan ERP sustav MS Dynamics NAV 2009, koji može biti izvrsna potpora za studente i zaposlenike, jer dobivanjem praktičnog znanja mogu ubrzati poslovni proces u poduzeću.

Ključne riječi: anketa, edukacija, ERP sustavi, MS Dynamics NAV 2009

1 Introduction

Today's business environments are extremely complex and the enterprises have recognized that providing the right information at the right time can help them to survive in the world of demanding business relationships. For this reason, the management of a particular enterprise needs an efficient information system in order to improve logistics, reduce costs and, consequently, increase competitiveness. To meet these demands, an increasing number of enterprises have decided to implement the ERP (Enterprise Resource Planning) system that synchronizes all resources of the enterprise, from procurement, production, sales and marketing, human resources, inventory control, finance to distribution. The selection, but to a great extent, the implementation of ERP system are not simple activities, so the extensive preliminary studies should be carried out. These are costly and time consuming processes, and therefore the goals, important dates, working teams, responsibilities and costs have to be clearly defined.

In manufacturing companies in which emphasis is placed on technological and operational preparation of production, the application of artificial intelligence and the involvement of the results of scientific research in the ERP systems would significantly improve the level of organisation in production preparation sectors. In that way, essential prerequisites will be set for improving the activities in the observed sectors [1 ÷ 9].

The authors in [10] presented the problems related to the process of ERP system implementation applying the case study methodology which is focused on business and technical as well as cultural issues. The authors also

discussed the implementation time and evaluated the tangible and intangible benefits from introducing the ERP system SAP R/3. The implementation of the ERP system and the standardization of business processes of the enterprise offer a lot of improvements that affect the quality management, cost control and user satisfaction [11]. In this case study [11] the focus is on the implementation of the Warehouse and Sales and Marketing modules to the MS Dynamics NAV system. A number of studies [12 ÷ 17] were carried out by the use of the questionnaire surveys. The paper [12] focuses on factors influencing the attitudes or predispositions toward the ERP system in the pre-implementation phase as possible important determinants of the ERP system implementation. The attitudes of employees are considered to be a key factor determining the success or failure of the ERP system implementation, as previously acquired attitudes (even before implementation) are resistant to change, which leads to negative behaviour. It confirms that there is a close correlation between user satisfaction and perceived system success [13]. In the study [14], two criteria (user satisfaction and individual impact) were taken into account to determine the effectiveness of the ERP system implementation. Individual impact involves improved individual productivity and task performance as well as efficiency, quality and time needed to make decisions. By investigating the success of the ERP systems implementation in three high-tech industries [15] it is proved that the system quality, service quality, and information quality are the most important factors in determining the success of ERP system post-implementation. The purpose of the study conducted in

[16] is the definition of "critical failure factors", 47 of them, in order to help other industries, consultants and implementers to prevent failures during the ERP implementation. According to the survey in [17], the success of ERP system implementation depends on the organizational fit of ERP, ERP adaptation, process adaptation and organizational resistance. Related enterprises use the following ERP systems: SAP R/3, UniERP, Oracle ERP BPCS and Bann.

There are so many ERP systems available; some of them are mentioned above. One of the specific systems is the MS Dynamics NAV system, due to the possibility given to educational institutions to be the member of Microsoft Dynamics Academic Alliance program [18]. By the membership in MDAA program, each educational institution has the opportunity to use MS Dynamics NAV 2009 ERP system and educational materials in teaching and research, as well as the ability to connect and share experiences with other members of this program. Furthermore, this ERP system is widely used in Croatia.

The main aim of this paper is to present the results and conclusions drawn from the conducted survey in Croatian enterprises, which is focused on the implementation and use of ERP systems. Also, an example of the application of MS Dynamics NAV system is shown as a great support for students to acquire practical knowledge and to be well prepared to labour market since this system is widely used in small and medium sized enterprises worldwide.

2 Description and results of the survey

The survey was conducted in 30 small to medium-sized manufacturing enterprises with a range from 6 to 3500 employees. The objective of this survey was to gather information about the following issues:

- a specific knowledge of employees about the ERP system (familiarity with the meaning and functions of the ERP system)
- the frequency of using a particular ERP system (or modules) within enterprise
- the characteristics of ERP system the enterprise uses (language, ERP vendor, "made to measure" or general adjustable solution...)
- employees' motivation to introduce the ERP system
- the training of employees
- maintaining the ERP system
- what are the advantages and disadvantages of a particular ERP system
- the most common reasons for failure of the ERP system implementation.

In the following paragraphs, the processed data of the research are presented and discussed.

The ERP system is used in 90 % of respondent enterprises, which is quite promising. 19 % of these enterprises use standard "closed system", and 81 % of them a specially designed (made to measure), i.e. modular one. The ERP system designed in Croatia is used in 59 % of related enterprises, while the rest of enterprises (41 %) use the ERP system produced out of Croatia (37 % of systems is translated into Croatian).

Fig. 1 presents the results of self-evaluation of the organizational level within the enterprise. Number 5 is the best grade, while grade 1 presents the worst one. Only 10 % of respondents rated the organizational level to grade 5 while 3 % of them to grade 1.

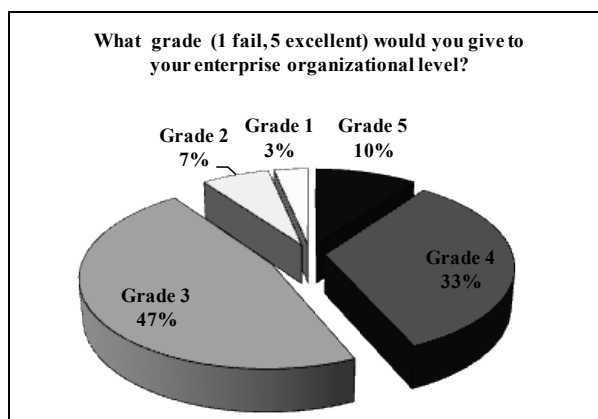


Figure 1 Self-evaluation of the organizational level of enterprise

Self-evaluation of the knowledge about the ERP system is shown in Fig. 2. A half of respondents rated their knowledge as very good.

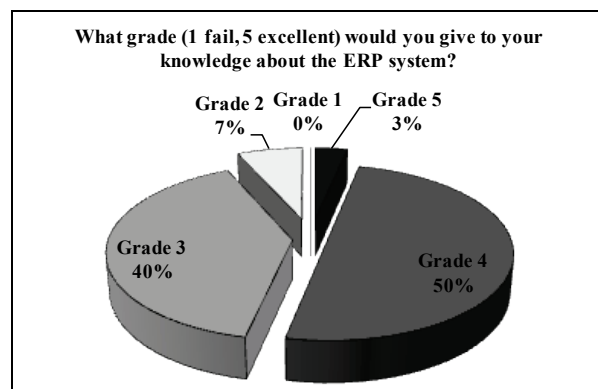


Figure 2 Self-evaluation of the knowledge about the ERP system

The following statements are related to 90 % of enterprises that use ERP system.

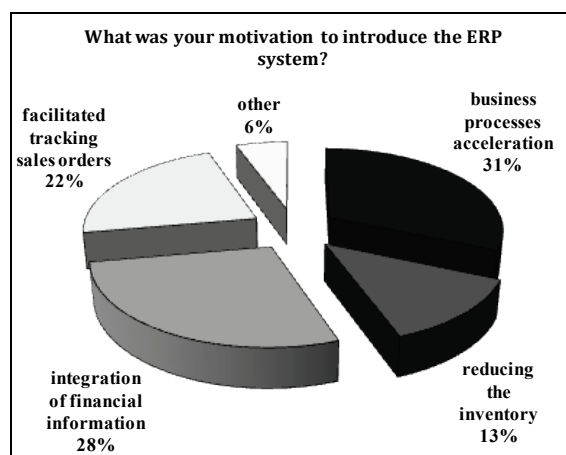


Figure 3 The motivation to introduce the ERP system

As shown in Fig. 3, the business processes acceleration was the motive for the introduction of ERP system in 31 % of respondent enterprises, reducing the inventory in 13 % of them, the integration of financial

information in 28 % of respondents, and finally, facilitated tracking sales orders in 22 % of the respondents.

None of the surveyed enterprises used the modules of maintenance management and quality assurance, while the modules Technology, Planning production orders, Tracking production orders, Inventory control and Production management are used by 8 % to 10 % of respondent enterprises that partially use the ERP system (Tab. 1). The ERP system is used by all departments in only 54 % of related enterprises, while the finance, purchasing and sales modules are mostly used by the rest of 46 % users (which partially apply the ERP system). Finance, purchasing and sales modules of ERP system are more frequently used since the laws on business impose an obligation of regular monitoring and reporting, tax payments and other tasks and activities on the basis of data from these modules. The modules Technology, Planning production orders, Maintenance management and Production management are very specific, that is, their form is strongly dependent on particular enterprise. Nevertheless, these modules are very important because they affect the delivery time and the price and quality of products as well.

Table 1 The percentage of use of the modules (for enterprises that partially use the ERP system)

Modules	% of respondents
Finance	17
Sales	16
Purchasing	14
Technology	8
Planning production orders	8
Tracking production orders	10
Inventory control	11
Production management	8
Maintenance management	0
Project management	2
Human resources management	6
Other	0

By the introduction of ERP system most adaptation is done in the following departments: Purchasing, Finance and accounting, Sales and Production, and least in the Maintenance and Project management. When respondents were asked about the efficiency of ERP system, 89 % of them answered that the use of ERP system shortened the operation time, while the other 11 % revealed that it unnecessarily extended the operation time (Fig. 4).

A large number of respondents, 81 % of them, believe that the users' authority, according to their roles in the ERP system, is well created (protected), while 19 % of the respondents believe that the protection is not adequate.

A small percentage of respondents, 38 %, think that the information updating is simultaneous with the production at any moment and that there is no delay, while 62 % have the impression that there is a considerable delay. Common causes of delays according to the respondents are: negligence of other employees 22 %, insufficient knowledge about the ERP system 22 %, complexity of production 33 %, insufficient adaptation of system to the real activities of enterprises 22 %.

When changes in technical or manufacturing documentation are needed, materials reselection and rebalancing the workshop, machine groups and employees' occupancy are possible in the ERP system in 87 % of the surveyed enterprises, in 9 % of them it is not possible, while in 4 % of respondents it is partially possible.

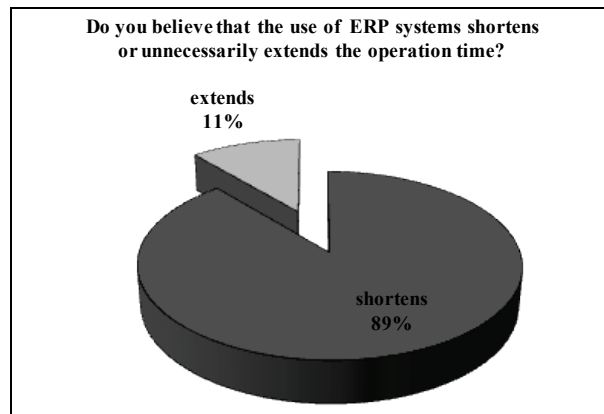


Figure 4 Question about the efficiency of ERP system

The "complete" ERP system is introduced by 28 % of respondent enterprises, while the implementation of subsystems (modules) was in stages in the rest of enterprises (Fig. 5).

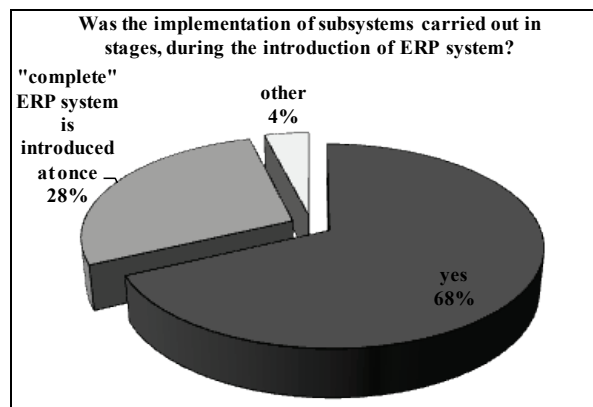


Figure 5 The way of the ERP system introduction

Training for work in the ERP system was conducted in 96 % of the enterprises and 46 % of users said the training was conducted in an unsatisfactory manner, while 54 % of them claimed that training was planned and executed perfectly. In only 24 % of related enterprises employees have resisted to the introduction of ERP system and have not been satisfied.

A large percentage (81 %) of surveyed enterprises have arranged the maintenance of ERP system in detail and are satisfied with the existing system maintenance.

Due to the current global recession none of the surveyed enterprises consider buying a specialized system, 35 % of them think about upgrading existing system, while 65 % do not even think about buying a new or upgrading existing one (Fig. 6).

In Tab. 2, the advantages of ERP system are listed. The biggest one is the costs tracking followed by the time saving and the possibilities to generate different analyses and reports for the long-term planning.

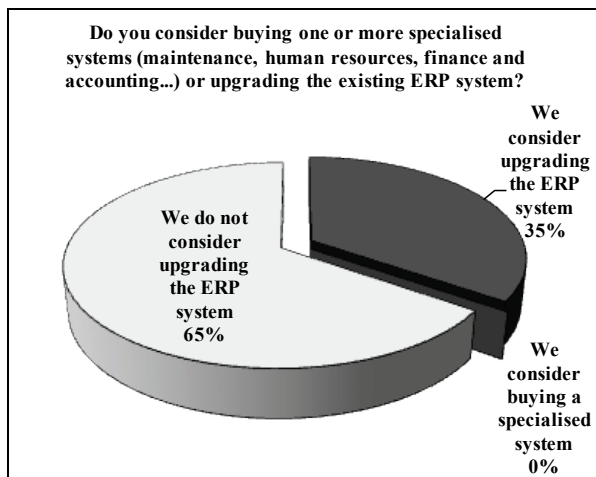


Figure 6 The future of existing ERP system

Table 2 Advantages of ERP system

Advantages of ERP system	% of respondents
Time saving	20
Costs tracking	23
Reducing the warehouse costs	2
Inventory optimization	12
Reports in real time	9
Accelerating business processes in the supply chain, sales and production	13
Analyses and reports of long-term planning	17
Timely payment	2
Other	2

Tab. 3 shows the main disadvantages of ERP system. The biggest disadvantages of the ERP system are initial costs, long implementation period as well as integration and testing.

Table 3 Disadvantages of ERP system

Disadvantages of ERP system	% of respondents
Costs (initial)	21
Training costs	5
Long implementation period	24
Integration and testing	24
Data analysis	5
Dependence on consultants	9
Return of investment	7
Productivity decrease	5
Other	0

Table 4 Failures of ERP system introduction

The reason for failures	% of respondents
Employees do not see the need for a new system	13
Employees have unrealistic expectations of a new system	8
Employees are not familiar with the basic concepts of system	8
Inadequate level of employees' IT education	27
The system is not sufficiently adapted to the end user	23
The system has the technical difficulties	19
Other	2

72 % of the respondents trust in the accuracy of reports generated by the ERP system, 20 % was not sure,

and the reports were prepared and controlled using conventional methods by 8 % of users.

The main reasons for failure of the ERP system implementation in enterprises are as follows: an insufficient and inadequate level of IT education of employees, lack of adaptation of the system to the end user and process, but to a great extent the technical difficulties in the system as well (Tab. 4).

46 % of surveyed users fulfilled their expectations by the introduction of the ERP system in the enterprise, 14 % did not fulfil, at 11 % the ERP system is in the introduction phase, and 29 % reported that it was still too early to make conclusions.

3 MS Dynamics NAV system

MS Dynamics NAV is widely used in small and medium sized enterprises and in education. It is also a flexible and adaptive information system, so we can find many examples of adaption to the particular enterprise. Except from the above mentioned example [11], the development of the specific forensic system from MS Dynamics NAV for using all common applications of an ERP, but also for using all specific processes in forensic, from quote to analysis report [19] is also one more example. The specific characteristic of this ERP system is the Role centre, i.e. each user has different interface depending on the task and activity she or he performs. There are 21 roles [20, 21]. Some of them are: president, accounting manager, bookkeeper, accounts payable coordinator, accounts receivable administrator, shipping and receiving-order by order, warehouse worker-warehouse management system, purchasing agent, project manager, resource manager, sales manager, sales order processor, production planner, machine operator.

3.1 Sales process

The sales process is the initiator of all other processes and activities. In the sales department, the contact with customer is established. Primary role centres are sales manager and sales order processor (Fig. 7). Since the contact with customer is very important, the Customer card should be very carefully filled (general, communication, invoicing, payments, shipping and foreign trade).

Attention must be paid to the addresses (for example, different addresses for the same enterprise for invoice and shipping), postings groups (general business posting group, VAT business posting group and customer posting group), payment terms and methods, invoice discounts (with predefined criteria), product discounts... Relevant documents are Sales quotes and Sales orders. Sales order can be generated from the sales quote and for the "make to order" production type, Production order can be made from Sales order. It can be concluded that there is a strong connection between different actions in the enterprise. Except from the connection between sales and production planning, there is also a strong link between sales and financial department (role centres accounts receivable administrator, bookkeeper, accounting manager) as well as sales and shipping and receiving role and warehouse worker, among others. Apart from Customer card, another

prerequisite to send a quality sales quote to our customer is a properly filled Item card (general, invoicing, replenishment, planning, foreign trade, item tracking, e-

commerce and warehouse). Product and inventory posting groups are also very important for the item because of journals as well as general ledger accounts.

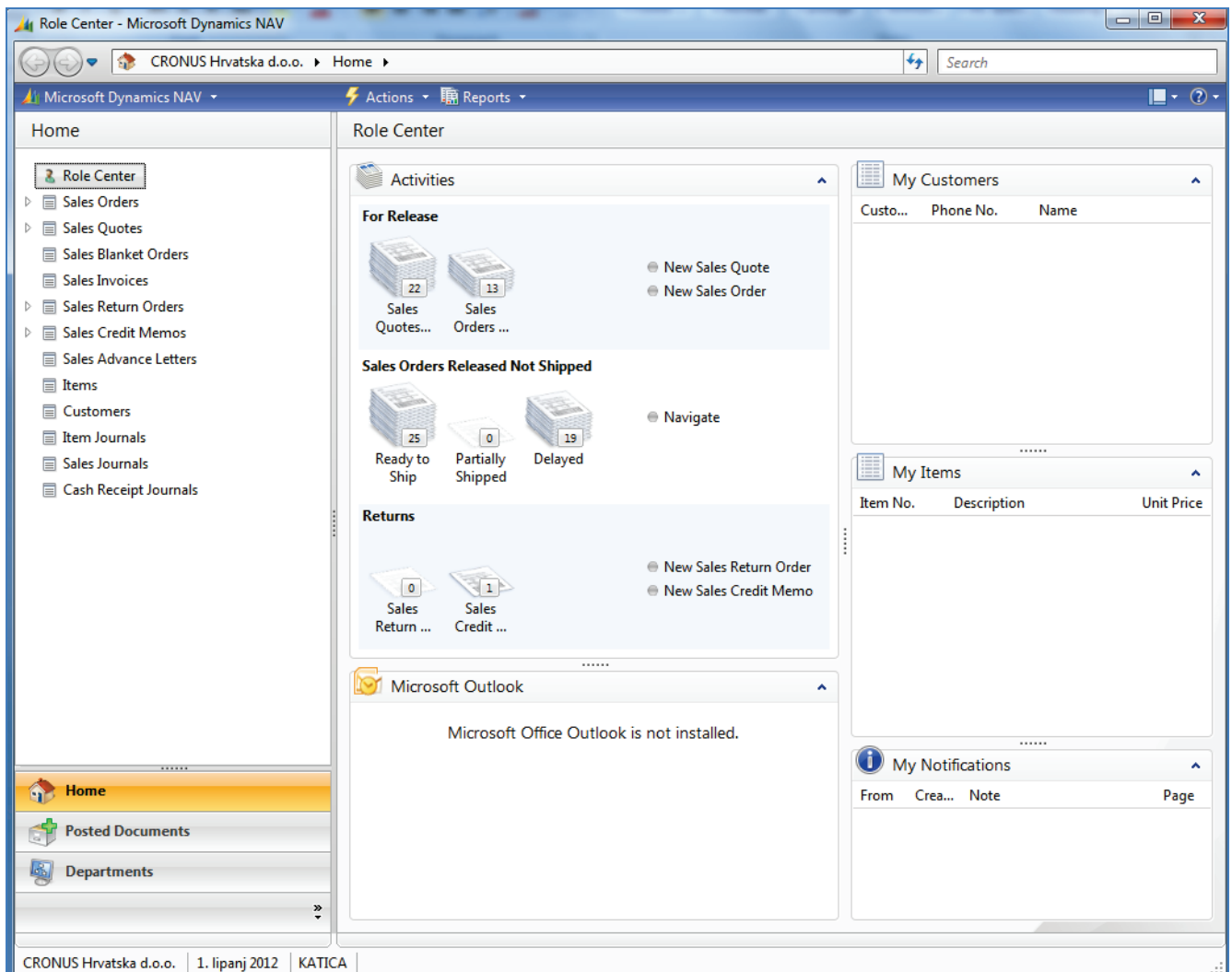


Figure 7 User interface of role centre - sales order processor

3.2 Production preparation process

For the production enterprises, careful planning of production is significant. For this activity, the role centre production planner is responsible, but the tasks of that role are connected with other roles and activities (for example sales, purchasing, warehouse, shop supervisor, machine operator...). Creating the Bill of material, Routing and Production order are the important tasks of this role. Therefore, navigation window of production planner user interface consists of data about the above mentioned activities as well as the data about sales orders (make to order), purchase orders, vendors, items, capacities, journals and worksheets. It differs significantly from the role centre in Fig. 7. Bill of material is a list of parts and raw materials of finished product. To make a bill of material for some product, the data about finished product and raw materials should be previously defined on the Item card. In Fig. 8, there is an example of

Production bill of material for the furniture handle (view Quantity explosion).

Except from the Bill of material, Routing should be defined. Times (setup-adjusting, run-executing, wait-waiting, move-transporting) and machine or work centres for the operations to make product are very important as well as proper data on Work or Machine centre card. Quality Bill of material and Routing are prerequisites for a good planning of Production order (status: planned, firm planned, released and finished). Figs. 9 and 10 present a Routing for the production of semi-finished product Handhold (it is a part of furniture handle whose Bill of material is given in Fig. 8) and planned Production order for the production of 1500 pieces.

After the releasing of Production order, there is a need to post the consumption of materials on the Consumption journal and the executed operations on the Output journal.

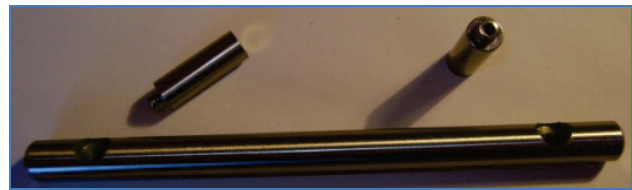
Quantity Explosion of BOM
As of 01.06.12
CRONUS Hrvatska d.o.o.

Level	No.	Description	BOM Qty.	Unit of Measure Code	Total Qty.
Item: No.: 100					
100		Furniture handle			
1	110	Handhold	1	PIECE	1
1	120	Connector	2	PIECE	2

a)



b)



c)

Figure 8 Production bill of material - a) for the furniture handle - b) and c)

110 · Handhold

General

No.: 110 Search Description: HANDHOLD
 Description: Handhold Version Nos.: ARTIKL1
 Type: Serial Active Version:
 Status: Certified Last Date Modified: 26.6.2012

Lines

Operation No.	Type	No.	Description	Setup Time	Run Time	Wait Time	Move Time	Fix
10	TURNING	Machine Center	1100	Turning	25	3	0	0
20	CUTTING	Machine Center	1600	Cutting	10	1	0	0
30	TURNING	Machine Center	1100	Turning	25	2	0	0
40	MILLING	Machine Center	1200	Milling	35	2	0	0
50	CONTROL	Machine Center	1500	Control	10	3	0	0

Figure 9 Routing for the production of semi-finished product Handhold

Edit - Planned Production Order - 101189 - Furniture handle

Actions: Refresh, Copy Prod. Order Docum..., Subcontractor - Dispatch ...
 Replan, Statistics, Change Status

101189 · Furniture handle

General

No.: 101189 Search Description: FURNITURE HANDLE
 Description: Furniture handle Quantity: 1.500
 Description 2:
 Source Type: Item Due Date: 10.7.2012
 Source No.: 100 Assigned User ID: ISVALINA
 Last Date Modified: 26.6.2012

Lines

Description	Starting Date-Time	Ending Date-Time	Quantity	Unit of Measure Code	Unit Cost	Cost Amount
Furniture handle	21.6.2012 10:50	9.7.2012 15:00	1.500	PIECE	64,50733	96.761,00

Figure 10 Planned Production order for the Furniture handle

106124 · NOREX

General

No.: 106124 Order Date: 2.5.2012
 Buy-from Vendor No.: S00320 Document Date: 2.5.2012
 Buy-from Contact No.: CT000272 VAT Date: 2.5.2012
 Buy-from Vendor Name: NOREX Vendor Order No.:
 Buy-from City: Göteborg Vendor Shipment No.:
 Posting Desc. Code: PURCHASE Vendor Invoice No.:
 Posting Description: Order No. 106124 posted as Status: Released
 Posting Date: 2.5.2012

Lines

Type	No.	Description	Location Code	Quantity	Reserved Qua...	Unit of Meas...	Direct Unit Cost ...	Line Amount Exc...
Item	110M	58E Steel bar fi14 x 1000 mm	GREEN	400		KG		
Item	120M	58E Steel bar fi12 x 1000 mm	GREEN	70		KG		

Vendor Statistics

Vendor No.: S00320
 Balance (LCY): 0,00
 Outstanding Ord...: 0,00
 Amt. Rcd. Not In...: 0,00
 Outstanding Invo...: 0,00
 Total (LCY): 0,00
 Overdue Amount...: 0,00

Vendor History - Buy-f...

Vendor No.: S00320
 Quotes: 0
 Blanket Orders: 0
 Orders: 3
 Invoices: 0
 Return Orders: 0
 Credit Memos: 0
 Pstd. Return Shipme...: 0
 Pstd. Receipts: 0
 Pstd. Invoices: 0
 Pstd. Credit Memos: 0

Notes

Click here to create a new note.

Invoicing S00320 | 2.5.2012
Shipping
Foreign Trade
E - Commerce
Prepayment 0 | 2.5.2012
Payments

Figure 11 Purchase order for the raw material

3.3 Purchasing process

In order to have needed raw materials in stock and to be possible to release Production order, some activities in the purchase process have to be accomplished. Contrary to the sales process, where the communication with customer is important, at the purchasing process, contact with vendors is significant. So, the data have to be entered to the Vendor card. Prior to the Purchase order, there is a possibility of sending request for Purchase quote to a particular number of vendors and to make decision on the best supplier. Fig. 11 presents the Purchase order made from Purchase quote of the chosen vendor, for the raw material needed for the production of semi-finished products handhold and connector which are on the Bill of material of the product Furniture handle (Fig. 8).

3.4 Shipping and receiving

A special role is Shipping and receiving in the warehouse which has to receive items from the vendor, but also to pack and ship items to the customer from the warehouse. Therefore this role has to deal with sales orders to ship (outbound) and respected purchase orders to receive (inbound) and also with purchase and sales returns. Very important documents are sales shipments and purchase receipts. After the receiving or the shipping there is a need of posting (receive/ship, invoice, receive/ship and invoice). As previously mentioned, the

actions of this role also affect the changes in other modules (financial changes after the billing; inventory is increasing or decreasing...).

4 Conclusion

The use of ERP system can help and improve making decision in business process; actually it is impossible to do business without ERP system and to be competitive. Therefore, the main objective of the questionnaire survey conducted by the authors of this paper was to collect information and make conclusions about the application of ERP system in some enterprises in Croatia. According to the survey, it is possible to review the performances of ERP systems used in a variety of enterprises in Croatia as well as the opinion of enterprise management and other employees about the advantages and disadvantages of ERP system. In order to improve different activities regarding the organizational level in their enterprises, the respondents suggest introducing new employees, where it would be good to track workflow activities by manufacturing units in the first few months of each employee. Since 90 % of respondents evaluated their knowledge about IT or ERP systems as excellent and very good, it should focus on the improvement of organizational level. Given that 90 % of enterprises use some ERP system it can be concluded that the role of ERP systems in Croatia is well recognized especially in enterprises with a large number of employees. There are a

large percentage of enterprises not having ERP system integrated into all departments (especially into maintenance and quality assurance). The survey does not give a clear answer to this phenomenon, and consequently the analysis for each individual enterprise in order to assess the justification for lack of integration can be done. As most adjustments made in purchasing, finance, accounting, sales and production, a conclusion can be drawn that these departments have a great need for the introduction of an ERP system. A large percentage of respondents believe that the information from production activities is not simultaneous and updated well to the system. The possible reasons lie in the circle: employee - the knowledge about the system - the complexity of production - adjustment of system. These subjects present a foundation to further investigation of attitudes and knowledge of employees, flexibility of ERP system and optimizing production. Finally, as the main advantages of ERP systems, respondents mention time savings and costs tracking. The main disadvantages seem to be the initial costs, the long implementation period as well as integration and testing. The main reasons for slow introduction of ERP systems to Croatian and neighbouring countries' companies are as follows:

- In today's difficult economic situation when the future of the enterprises is often uncertain, the introduction and implementation of ERP system could present a serious and risky business activity.
- Very often it is not defined and known who is responsible to start the activities of buying and implementation of ERP system.
- The employees (but sometimes management) do not want to control and share the data and information in many situations.
- High costs of computerization (software, IT equipment and implementation) as well as long-time introduction.

As seen from Chapter 3, where an example of ERP system (MS Dynamics NAV) is shown, there is a great possibility to integrate all departments of a particular enterprise. Also, a wide variety of analyses and reports is possible to get in MS Dynamics NAV (the best vendors and customers, statuses of different documents and tasks, statistics of sale for salespersons, expected and actual costs...). As previously concluded from the investigation, a good organizational level and familiarity with the meaning and functions of the ERP system are required as some of the prerequisites for successful business process. The familiarity with the meaning and functions of the ERP system can be reached through the use of MS Dynamics NAV system in education since it is a great support for students to learn about the flow of information and documentation in a production process. The theoretical knowledge given to students through the lectures can be well illustrated, improved and enriched with practical work by using the MS Dynamics NAV. Practical learning experiences can be acquired and the students will be well prepared to adapt to the requirements of the world-wide labour market. Knowing the main flows and functionalities of the mentioned system, the students will be able to apply specific skills

about the ERP systems and to improve organizational level and consequently the competition of the enterprise.

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