

FUNCTIONAL AND INFORMATIONAL MODEL OF EXPERT SPECIALIZATION USING IDEF STANDARD

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Abstract: For process of modeling are developed suitable CASE tools. In the course of building this process a standard is used for functional modeling of IDEF0 realized through BPWin tool. Family of integrated IDEF methods presents basic tool of some modern strategies and methodologies of business process improvement, like for example: BPR, CPI, IPD, TQM etc. In paper is given functional and informational model of "Process of expert specialization of employees in education" using graphical language IDEF0 that is, CASE Bpwin tool.

Keywords: CASE (*Computer Aided Software Engineering*), IDEF (*Integration Definition*), BPWin (*Business Process Windows*)

1. INTRODUCTION

IDEF (*Integration Definition*) is represented as assembly of standardized methods for informational modeling of business processes and objects, and improvement of business process. In frame of project ICAM (*Integrated Computer Aided Manufacturing*), that is, USAF (*United States Air Force*), whose goal was to improve manufacturing production productivity, developed by end of 1970, form of SADT (*Structured Analysis and Design Technique*) technique called IDEF technique. Goal of newly developed IDEF technique was to enable experts to comprehend problems from different views and levels of abstraction. Because of that, family of integrated IDEF methods presents basic tool of some modern strategies and methodologies of business process improvement, like for example: BPR (*Business Process Reengineering*), CPI (*Continuous Process Improvement*), IPD (*Integrated Product Development*), TQM (*Total Quality Management*) etc. Applying of family integrated IDEF methods, which can solve narrow class of problem and general methods, attempts to eliminate deficiencies of narrow class of problem and general methods, exists strong software support which integrates IDEF methods, and enables connection of IDEF methods with other tools, above all software for simulation of business processes, software for management of costs based on activity etc. Some families of integrated IDEF methods are: IDEF0 for modeling functions, IDEF1 for modeling information's, IDEF1X for modeling data, IDEF2 for modeling simulations, IDEF3 for modeling processes, IDEF4 for object-oriented projecting, IDEF14 for modeling networks etc. All of them are used in different purposes as technique for informational, that is, semantic, modeling of data and formal graphical language, for needs of relation modeling of data and forming relation database. And one of families of these methods (IDEF1X method, first published in 1993) with NIAM (*Natural Language Information Analysis Method* or previously *Nijssen's* or *An Information Analysis Method*) method presents precursor of EXPRESS software tools for development of STEP (*Standard for the Exchange of Product Model Data*) applications [2, 3, 4, 5, 7-16, 18-26].

For procedure of modeling are developed suitable CASE (*Computer Aided Software Engineering*) tools. During manufacturing of this process is used standard for functional modeling IDEF0 (*Integrations Definition*) realized

through BPWin (*Business Process Windows*) CASE tool. On Figure 1 is shown a general model of system development [18].

IDEF standard is available at Web site: <http://www.ideal.com/> and <http://hiss.nist.gov/ftp/ideal/>.

In early 1990, IDEF Users Group, in cooperation with NITS (*National Institutes for Standards and Technology*), has begun creation of making standards for IDEF0, published in 1992 (U.S. Government standards documents), known as FIPS (*Federal Information Processing Standards*). These standards are under coverage of IEEE (*Institute of Electrical and Electronics Engineers*) and accepted by ISO (*International Standards Organization* or *International Organization of Standards*). IDEF0 and IDEF1X are techniques of modeling based on combination of text graphic which are presented on organized and systematic manner to increase reasonability and to supply logic for potential exchange, specified requests, or in other manner, to support system analysis by levels [1, 3, 5, 6, 11, 13, 17, 22-24, 26].

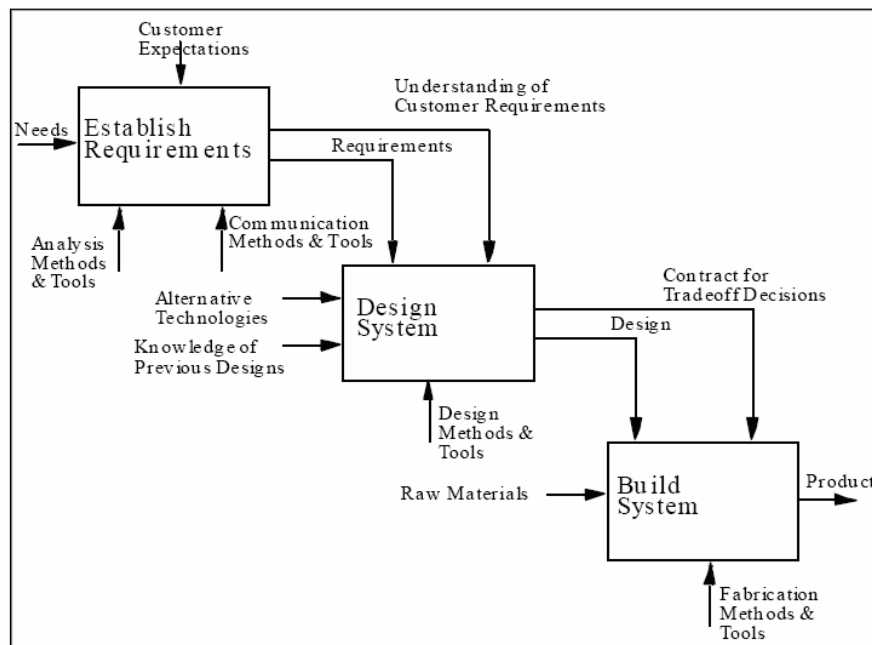


Fig. 1: Develop system (IDEF0 Model)

IDEF0 and IE (*Information Engineering*) standards enable [3, 11, 22-24, 26]:

- 1) Execution of system analysis and design on all levels, for system constructed of man, machines, materials, computers and information's;
- 2) Making documentation as a base for integration of ISO 9000 standard;
- 3) Better communication between analysts, designers, users, better communication between analysts, designer, users and managers;
- 4) Enables discussion in teamwork to accomplish mutual understanding,
- 5) Enables management of large and complex projects.

Set concept of modeling has been accepted by USA government, Pentagon and NATO and neither document can not be defined until it is described using this methodology. Task which achieves this methodology is that it must involve problems connected for client/server architecture, that is, to connect multiple different computers. This approach enables connecting of future IS and demands system of quality defined by standard ISO 9000. This concept is in usage in state office of Republic of Serbia and Serbian Military.

2. FUNCTIONAL MODELING – IDEF0 (BPwin)

Reasons which have motivated creation of activity modeling are [11, 22-24, 26, 27]:

- To serve as documentation and manual for description of complex activity and procedures and manuals demanded by standard ISO 9000. One of the basic rule is if documentation is larger – less the reading. Document of one or two pages with diagram, is going to be cursory previewed and only when there is time for that. Documentation consisting from many pages has a great chance not to be read for months.
- To enable fast organizational changes, because model of activity documents important activities and enables insight into critical activities which need to be performed with suitable resources.

Most important benefit in application of activity modeling is prototype access where in a fast and simple ways are checked alternative ideas. It is much cheaper to draw model of process and data model then to develop new information system. This is a very important attribute, because faster development of information technology and application of internet service conditions a need for reengineering, which demands radical redesign of activity, which is needed to describe before conducting prototype checking.

Semantic of graphical language IDEF0 implicates on meaning of syntax language component and lightens interpretation correction. Interpretation describes parts like notations for activity and arrows and interlines of functional relationships.

By functional analysis of IS, is defined dynamics and is needed to define:

- Diagram of context, that is system boundaries,
- Activity stem, that is, to establish vertical connection between activities,
- Decomposition diagram, that is, to establish horizontal links between activities.

Relationship between activities and information's is determined by rectangle (activity) and arrows (information carrier). Relationship is shown on figure 2:

Arrows from the left side of rectangle are defined as Input. Arrows which enter rectangle from above are defined as Output. Exits are data or objects produced by activity.

Elements shown on figure 2 can be described with sentence: "Under Control, ACTIVITY, from Input makes Outputs, using Mechanisms". Arrows on bottom page of rectangle present mechanisms. Arrows pointed up identify meaning which support executed activity.

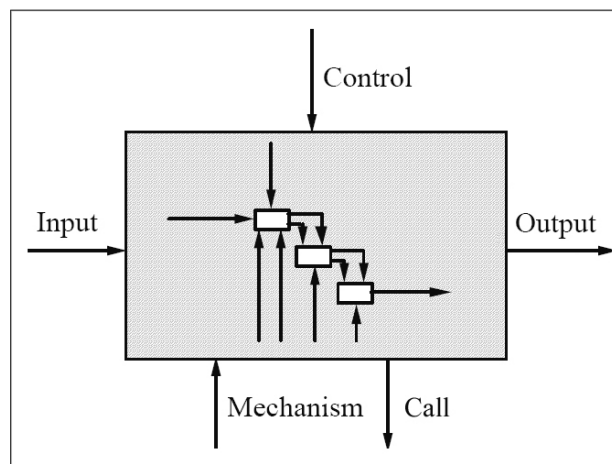


Fig. 2: Basic concept IDEF0 methodology

Arrows of mechanism pointed down are defined as Call arrows. Arrows on diagrams are called ICOM, because they are abbreviations of:

- I - Input, something what is used in activity,
- C - Control, controls or conditions on activities,
- O - Output, activity result and
- M – Mechanism, for example, employees who perform that activity.

A question is asked: which resources carry certain arrow types?

Input arrow presents material or information which is used or transformed with goal to define Output. A possibility is allowed that certain activities need not to have Input arrows. It is allowed possibility that certain activities don't need to have input arrows.

Controls arrows regulate, that is, are responsible for that how, when and if the activity will be performed, will outputs be. Every activity must have at least one control arrow.

Controls are commonly in form of rule, regulation, politics or standards. They influence on activity without possibility to be transformed or performed. There will be cases when a goal of activity is to change a rule, regulation, politics, procedure or standard. In that case, it is expected that arrows that contain that information are actually input.

Output arrows are materials or information's created by activity. Every activity must have at least one output arrow. Activity which does not create output is not to be modeled.

Mechanism arrows are those sources which perform activity, and do not wear themselves. Mechanisms can be humans, machines and/or equipment, that is, objects which supple energy needed for performing activity. By free will of project performer, mechanism arrows can be let out of activity.

Call arrow is a specific case of mechanism arrow and it marks that the calling rectangle does not have its own detail diagram but a more detailed preview is performed on another rectangle in the same or some other model. Multiple calling rectangles can call same rectangle on another or same model. They are named with the number of decomposition diagram which contains called rectangle together with number of called rectangle.

3. FUNCTIONAL AND INFORMATIONAL MODEL OF EXPERT IMPROVEMENT OF EMPLOYEES IN EDUCATION

Based on above defined sets firstly we approach functional modeling, where it will be identified by functional decomposition. Process of expert specialization of employees in frame of functional process model. Process of expert specialization of employees in education. For performing this activity it is necessary to use graphical language IDEF0 that is, CASE Bpwin tool. IDEF0 technique is a unique graphical language which enables description of processes by demands of ISO 9000:2000 standard [1, 3, 5, 6, 11, 13, 17, 22-24, 26, 27].

Functional decomposition is needed to perform through next suborder activities:

- defining model boundaries,
- defining activity stem,
- defining user demands,
- defining decomposition activity diagram

By gained decomposition activity on last level of primitive processes it is needed to describe.

3.1. Defining model boundaries

Defining model boundaries is connected to sets given for process development: "*Process of expert specialization of employees in education*".

In frame of model boundary determination it is needed to clearly define goals which must contain following elements:

- why is model being modeled,
- what will activity show,
- what will user of model make of it and
- what is model used for.

Answers to these questions should help in focusing of set problem.

Following questions on which an answer is needed are:

- what are assignments on given task or,
- what is the schedule of performing steps,
- how is control performed and
- which resources are used.

Context diagram is defined by one rectangle which represents boundary of model which is examined. In that model and out of it flow information's through arrows.

Context diagram is the highest level of abstraction which is transformed by decomposition diagrams into lower level of abstraction. Model boundaries are defined so we know where to stop with modeling.

This problem can be seen from aspect:

- width (defining of observed elements) and
- depth (defining levels of detail).

Model width is connected with defining context diagram (which are in IDEF0 notation marked as A0) and first level of decomposition wears a mark A1. In frame of context diagram it must be taken into care that it should define input sets, controls and mechanisms, which produce output sets, that is, on this level to simplify observed problems with fewer details.

Model depths is defined by levels of decomposition, where are defined levels of detail. Decomposition goes by possibility of defining primitive processes. It is recommended that it should begin to define output arrows, so by moving towards inputs, resources and controls. It is started with fact that every activity owns suitable inputs which can be identified. By defining outputs it should be taken in consideration negative outputs, which provoke so called feedback arrows.

Following elements which need to be defined are input arrows, which in specific way transforms due to creating suitable outputs, supported by suitable mechanisms and control. Having in mind standard IDEF0 also demands ISO 9000:2000 standards, is defined as first step of suitable diagram context, and are set as boundaries of observed model.

3.2. Functional model context diagram for process participating in programs development of expert specialization for employees in education

On figure 3 is shown a functional model context diagram for process participating in programs development of expert specialization for employees in education that is definition of model boundaries.

Context diagram has following elements:

- 1) Input information's are:
 - Information's about expert specialization of employees,
 - Appointments of participants,
 - Compliance for participants,
 - Time frame of specialization maintenance process.
- 2) Output information's are:
 - Meaning of expert specialization,
 - Report about process of expert specialization,
 - Permit for undisturbed application of expert specialization,
 - Report for local autonomy,
 - Report for expert activity.
- 3) Mechanisms are:
 - Expert activity of teacher,
 - Teachers, course performers,
 - Organization of expert specialization,

- Administration of expert assembly.
- 4) Controls are:
- Law of elementary education,
 - Statute of school and work plan,
 - Standards in education.

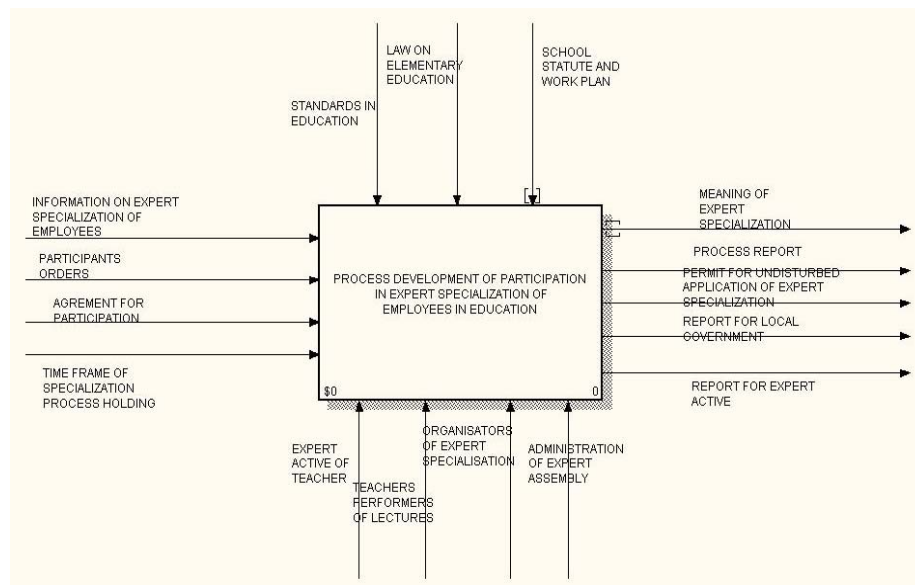


Fig. 3: Context diagram by which is defined model boundaries

3.3. Stem of activity process of expert specialization for employees in education

On figure 4 is given an overview of activity process of expert specialization for employees in education. First step in work is establishing decomposition diagram that is, defining horizontal line between jobs/activity defined in first level.

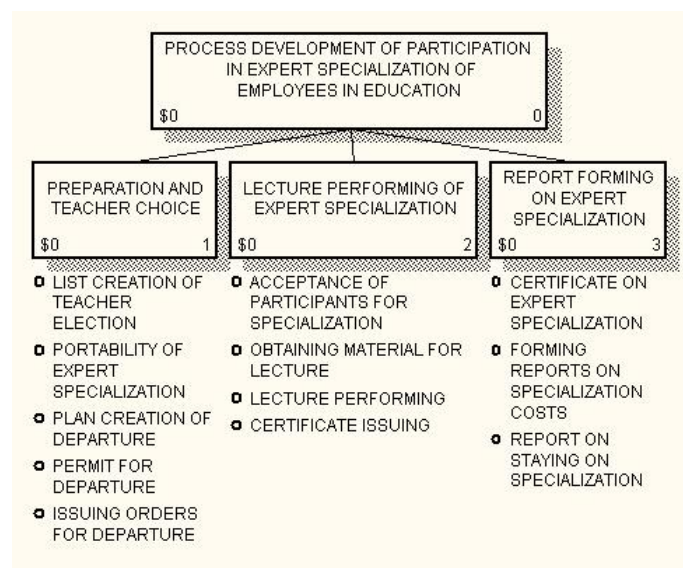


Fig. 4: Stem of activity process of expert specialization for employees in education

3.4. Decomposition diagram of process model of expert specialization for employees in education

Decomposition diagram of process model of expert specialization for employees in education is decomposed into three global activities, figure 5:

- Preparation and teacher choice,
- Performing courses for expert specialization and
- Reports generation about expert specialization.

Respecting IDEF0 standard, suitable arrows present sets of documents which we define as information's. Every information is shared on next level, all to level of activity, where as arrows is defined a concrete document. In the following text comes detailed discussion of suitable ancillary jobs/activities.

3.4.1. Jobs/activity and internal communications – preparation and teacher choice

Internal communication presents line of activities, whose basic task is good information availability for employees in educational sector, and in aim to follow the trend of modern education and new teaching methods and teaching resources in educational process, to increase productivity of knowledge and increase efficiency in comprehending and education of employees. This process is certainly great motivation, especially for teachers in goal of more qualitative knowledge presenting and coordinating work in a classroom, and transferring impressions of expert specialization to those who haven't participated in that process (figure 6).

Activity 1.1.: making a list (election) of teachers, which is choice of subject (compulsory and mandatory) is a job of school director, teacher council, expert actives and as support Ministry of education, Local self-government.

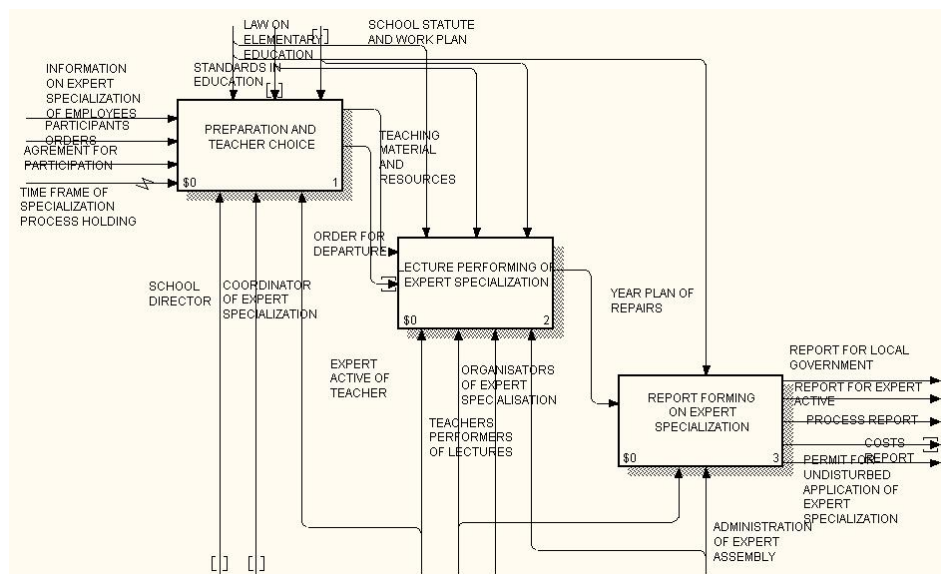


Fig. 5: Decomposition diagram of process of expert specialization for employees in education

Activity 1.2.: Defining justification of expert specialization is one of key facts so specialization and trend monitoring and innovation in education, could exist in all parts of country, all levels of education regardless of years of experience in process of education and other relevant jobs tight to education in cause of reduction of stereotype in education process and adopting innovation and trends of education from World and countries of European Union.

Activity 1.3.: Construction plan of exit itself is certainly one of relevant segments of process itself. That of course starts from obtaining Catalog from Ministry of education and list of items for which is secured expert teaching of compulsory and mandatory subjects that is specialization. Then, director of organization (after Teacher Council) gives green light to Expert actives of school for listed (determined from catalog) subjects, which will make a list of students on expert specialization, as for participants make a work plan. Work plan

starts from choice itself of employee in frame of his Expert active for certain subject and whole way from literal approval of school director and passing of those to secretary and cashier for issuing orders etc. Employees in cooperation with Expert active make concrete Subject from Catalog and analyze conditions of participation with front set benefits for organization. After that is established time of departure and time of length of expert specialization, as well as costs.

Activity 1.4.: Permit for departure (final) is gained by organization director, and after report of Expert active or subject group, where employees will be lastly sent for verification of permit for departure. Same will serve well with Organization of expert specialization, which will after finishing in form of certificate confirm participation by gaining conformation about successful finishing of specialization.

Activity 1.5.: Issuing orders for departure is a definitive conformation and verification of all listed activities, which is permits for departure itself, which sign secretary and cashier, and also school director. Its known exact time of departure and reservations are confirmed.

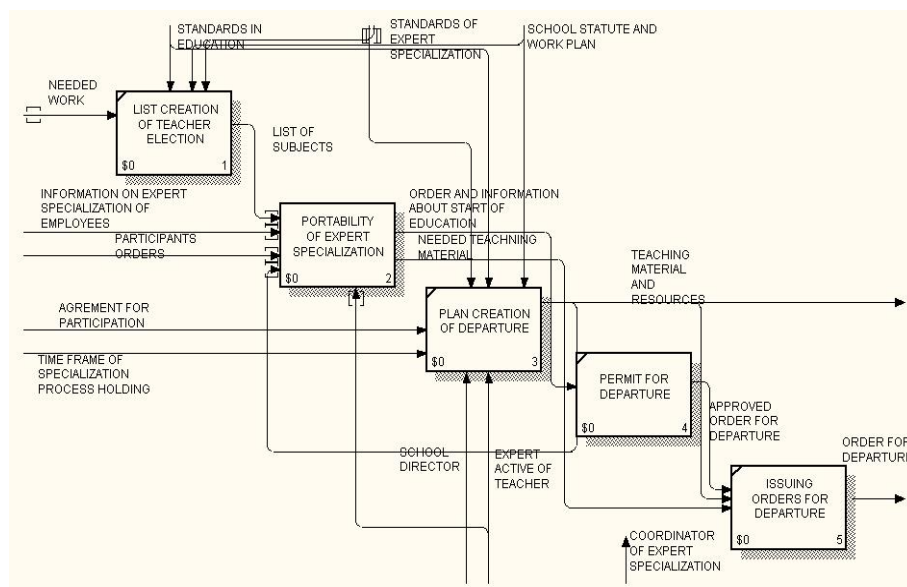


Fig. 6: Decomposition jobs diagram of first internal communication

3.4.2. Jobs/Activities 2 – Teaching performance of expert specialization

Job/Activity 2 – performing teaching of expert specialization is performed in many phases, on exact activity schedule. Depending on how managers or coordinators have imagined realization of all activities, participants will behave and be informed on time, in which manner will activities flow. Agenda will be delivered to participant's right after registration of participants or during registration, they will have information for accommodation, food, work material and resources and etc. (Figure 7).

Job/Activity 2.1.: Acceptance of participants for specialization is conducted exactly at precise time which is delivered by call or defined in Catalog. By calling to administration of organization is becoming a participant, who must respect activity agenda in exact determined time and about type of activity. Participant gives order for participation and gets conformation for participation.

Job/Activity 2.2.: Acquiring material for teaching is immediately by signing in and classification in subject group. Specific material and teaching materials will be delivered during performance, teaching monitoring, and based on previous requirement of teaching material and teaching resources and equipment needed for successful process realization.

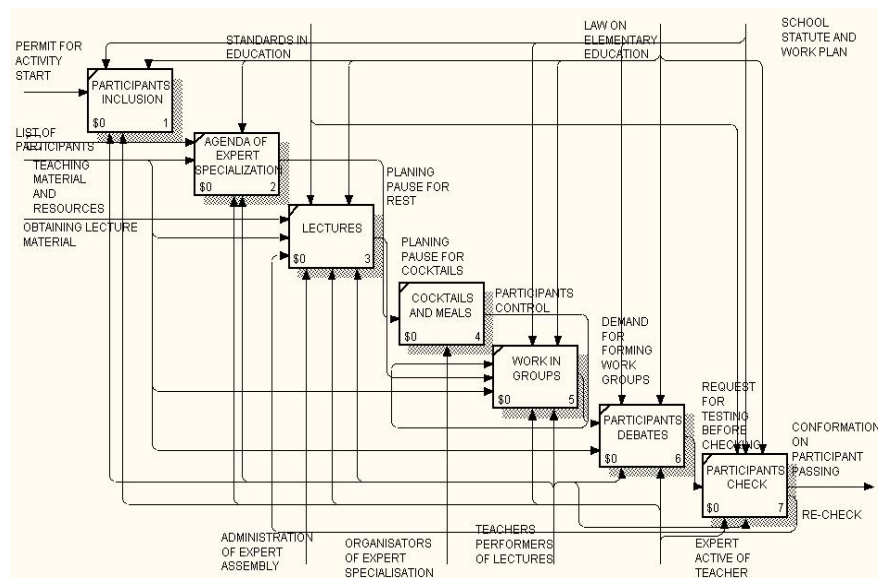


Fig. 8: Decomposition diagram of teaching performance

Job/Activity 2.4.: Certificate issuing comes after successful plan realization of all activities by organization and after checking participants and issuing conformations from all teachers about passing. A certificate is issued about expert specialization of employee involving realization and accurate name of activity by subjects. Certificate will serve as a proof to jurisdiction entities, and to school director, Teaching council, Expert active, cashier, local self-government and etc.

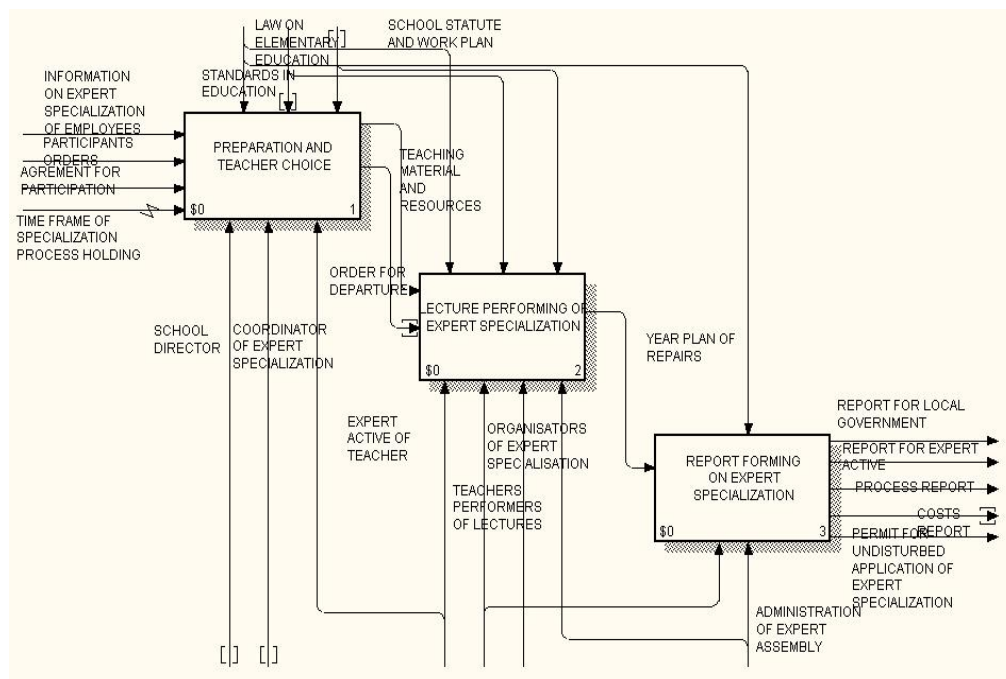


Fig. 9: forming decomposition diagram of all reports

3.4.3. Jobs/Activities 3 – report forming about expert specialization

This decomposition diagram will help in forming all kinds of reports connected with expert specialization of participants on planned assembly. Every side must be informed about all activities from process, especially about alone assembly by organization for Ministry of education and for expert team, that is reports of all participants to their organizations, school director, Teaching council, Expert active, cashier, local self-government and etc. and especially when they transfer impressions and innovation on other participants and etc. (Figure 9).

Job/Activity 3.1.: Certificate about expert specialization which is accessed from organization for expert specialization, was end goal of every participant and conformation that participant was active and finished assignment form school director, Teaching council, Expert active, cashier, local self-government and etc. He can serve as evidence for further progress and engagement in science, which is support for continuing of specialization into higher level.

Job/Activity 3.2.: Report forming about costs of specialization comes to total material costs and that: participation fee, hotel costs, meals, travel costs, per Diem, expert literature etc.

Job/Activity 3.3.: Report about staying in expert specialization comes to successfulness and evaluation of science assembly, impressions are carried to all important entities of organization, parliament, media and etc. Report will be a part of organization administration, that is, coverage of expenses and justifiable of expert specialization and in the end support to other employees and society in general.

4. CONCLUSION

We need to apply all we know, recognize that which we don't know and to act with methodical observation in aim of expanding our area of comprehension.

Being concurrent today is not a matter of success, but question of survival. Creating, application and knowledge keeping are twisted together and supplemented. In longer periods, only knowledge preparation is not kept. In order for old knowledge to have meaning, people must connect it to its current problems and activities, translate it to a modern language and frame it with current problems. As the time goes by, so are changed social and technological conditions, more is increased a need for "translation" and knowledge application is more like creating knowledge. In order for new knowledge to have sense, people should fit in their current believes and points of view, and extra closeness with existing knowledge creates expertise.

Company/Organization or similar is a long term successful if links its success in internal potentials and strengths.

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