# Modeling of process of system changes under conditions of IT applications outsourcing

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***Abstract*—** Every organization needs support of an information system (accordingly support of IT applications), while companies often choose to outsource these IT applications. Outsourcing of IT applications enables companies fully focus on core business activities (products in production sphere, services of public administration institutions), but it also requires specific rules and processes mainly when the change of the system is necessary. Change is driven by improvement of the process, when the company reflects internal and external influences and regulations. Changes in processes create requirements on data and operations with the data, so that the IT environment will fully support the future state. Projects support a big change of systems. Though small changes are more often, they are also crucial for the business. Unexpected and urgent changes cannot be processed by normal projects, because of their difficult and long-term planning. Company could not react fast enough and would not be as competitive as it would be necessary. The institutions (and their customers) need data from 'classical' transactional systems and from geographic information systems (for spatial decision making). Requirements for changes of spatially oriented data are more frequent than requirements for changes in classical information systems. The reason is that technology conditions are developing, territories are changing, demands of users on spatial data are changing, etc. The given organization can also be a guarantor of information source for other users (for example citizens utilize public data within public administration, customers ask for information about quality of products within production sphere). That is why it is necessary to flexibly react on system changes, even under conditions of outsourcing of IT applications which process these data sources. System changes can be considered instances of system change process; therefore, it is appropriate to apply tools of process modeling for their analysis.

***Keywords*—** *IT applications outsourcing, ITIL and RFC, process changes modeling, RACI map, requirements for changes of spatial data, system changes*.

## I. Introduction

INFORMATION environment of a company; that is data sources in other words, can have more roles within the organization. On the one hand, a company needs a support of adequate information environment (for its commodity production or providing services). It may also be an information system which provides data to other users (for example citizens utilize public data within public administration, customers ask for information about quality of products within production sphere). The quality of information system is given by its contribution to performance and effectiveness of company processes, activities and particular users [1] [2]. The quality of information system is therefore perceived in wider context because it is important to which extent the company processes and goals are supported by data and performance of concrete application. Managing of company informatics can be performed with the support of certain framework or model - ITIL belongs among standards (Information Technology Infrastructure Library). ITIL is a framework rather for company IT management, and provides it with instructions, templates, diagrams and other proven methods for IT services managing [3] [4] [5]. ITIL framework consists of recommendations, proven sequences, templates, manuals and their interest areas are IT strategy, services proposals, services operations and continuous improvement of IT services.

Inner influences in the company and above all external influences of customers and regulators enforce the need of continuous improving of the process performance, which lead into the need of changes in IT applications of the information system, which supports the given process. This text is concentrated on modeling of these system changes under the outsourcing conditions.

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## II. Information systems

### A. Information systems outsourcing

Information environment in the company includes various functionalities, thus it includes the various modules of information systems. So it is necessary to employ a sufficient number of specialists to administrate and develop applications providing employees a necessary tool for the respective production. As the information environment covers simple applications (register of services) on one side and also sophisticated complex activities on other side (data warehouse administration) there is often arising a need to entrust specialized companies with the IT applications development and administration, which means information environment is often outsourced. Outsourcing means that a company transfers responsibility for a specific information technology function to an external vendor; in other words the practice of turning

over responsibility of some to all of an organization´s information systems applications and operations to an outside firm [6] [7]. As the outsourcing variants we can define - informatics development outsourcing (it is implementation of each standard application and technology, eventually development of specialized applications according to direct company needs) - informatics operations outsourcing (it is administration of particular applications eventually whole system on hardware and software of a vendor or customer, but in this case vendor takes care also of servicing and innovation of this borrowed hardware - total outsourcing (it is a complex delivery of operations and development to the customer) [8]. For the customer the outsourcing brings advantages of the possibility to focus on core company business or quicker introduction of the latest technology whereas on the other side there are also risks such as insufficient vendor`s knowledge of customer`s subject of enterprise or underestimation of process rules of cooperation [8] [9] [10]. Managing the supply of outsourcing services is very complicated because there are several heterogeneous phases within life-cycles, which require the application of different management techniques; there are recommended for example – project management and risk (according to PMP or PRINCE2), quality management (ISO 9000), operations management (ITIL) [11].

### *B. Specifics of the spatial data*

Solving spatially oriented problems and making spatially influenced decision have been recognized as highly important for several years. The corresponding decision making is considered by solving spatial problems using spatial means to achieve desired spatial ends [12]. The interest of managers and users in utilization of spatial information and services increases rapidly. The environment impact assessment [13], environment protection [14] [15] and route planning belong to significant branches of spatial decision making. Spatial decision making can be significantly simplified by geographic information systems (GIS). GIS integrates spatial and alphanumeric data, allows utilization of new processing methods and provides high-quality presentations of processed data. Spatial analysis and modeling are of course completed with the analysis of the alphanumeric data, for example in the context of quality of life [16] or in the context of environmental modeling.

Spatially oriented data are changing frequently, thus users requests on these data (on this kind of information system) are changing very often. Frequency of changes is more frequent than changes of 'classical' transactional information systems. Non-spatial alphanumeric data in transactional information systems are stabilized to a certain extent and formats of these data do not change often. But demands for spatial data are subject to frequent change. It is caused by multiple factors:

- Technologies, which manage and provide spatial data, have been changing and developing nowadays.
- Territories are changing, thus registers of territories are subject to frequent changes.
- The group of users, which need spatial data, has been expanding because of it.

Geographical information systems with spatial data have the same purpose as transactional systems (i. e. management of certain data) and apply the same standards and principles. Although it is necessary to take into account that demands on data are subject to frequent change. Therefore demands on system changes are also frequent.

### *C. System changes – projects and RFC*

The extent of IT system changes varies. The wide extent changes are analyzed and realized in the form of a project when company handles demanding interventions into current systems or new functionalities development. The project is defined as a unique set of activities leading to the previously defined goal. It has a defined beginning and end and it demands cooperation of various professions, binds their capacity and their effort and for the creation of final outcomes uses (or consumes) information, material, money, abilities and skills of participated people [17].

Small system changes are usually identified by terms such as Change request, Work Request or in compliance with ITIL methodology as a Request for change (RFC). In each company there are always more RFCs than big changes realized by projects. Projects are more crucial, have always impact on wider customer groups and brings bigger revenue whereas small system changes rather helps company to be still on top with the published information and not run behind the fast changing market and needs put on systems, which are mostly dedicated to employees to work with. Small changes are characterized by the fact that it`s necessary to do them in shorter time than projects and their severity is lower. Their separate solution is a key one for a company. Being part of a project, the requested changes may not be actual any more by its launch, changes based on law wouldn't be dependent on given date but on planned project launch or the company`s reaction on market situation would not be so flexible as it would be necessary. For the companies it does not mean a big system change - just a financial calculation system change, which means it is sufficient to change it to the new principle of calculation. RFC in compliance with ITIL represents a system change proposal. Under the outsourcing conditions (in compliance with ITIL) the focus is concentrated on SLA (Service Level Agreement), where it goes about the agreement between IT service provider (vendor) and a customer. The agreement about the service standards describes the IT service, documents the goals of the service standards and specifies responsibilities of IT service provider and a customer.

RFCs are from its character unique nevertheless in the frame of analysis and implementation there are repeated processes and activities, which are executed by both customer and vendor [18]. So we speak about particular instances of analysis and implementation of RFC, which means that these particular / unique RFCs are 'repetitive' instances of change process. Change process could be modelled with the help of process modeling tools. The advantage of a process approach

is a continuous management of links between particular steps as well as their combination and common influence [19], whereas the most significant is to understand the requests and their fulfillment.

*D. Modeling approach, tools of business process modeling, metrics*

Modeling is a thought abstraction, a reproduction of real existing system via special-constructed models [20]. It is necessary to distinguish model content and model tool. Model content is essence of idea / message – what the model creator is trying to take down and express. Model tool is outer form – how will the creator express the content, which expression elements will he/she use to impart his/her thoughts. Models are created by means of special tools, which are diagrams and other expression elements.

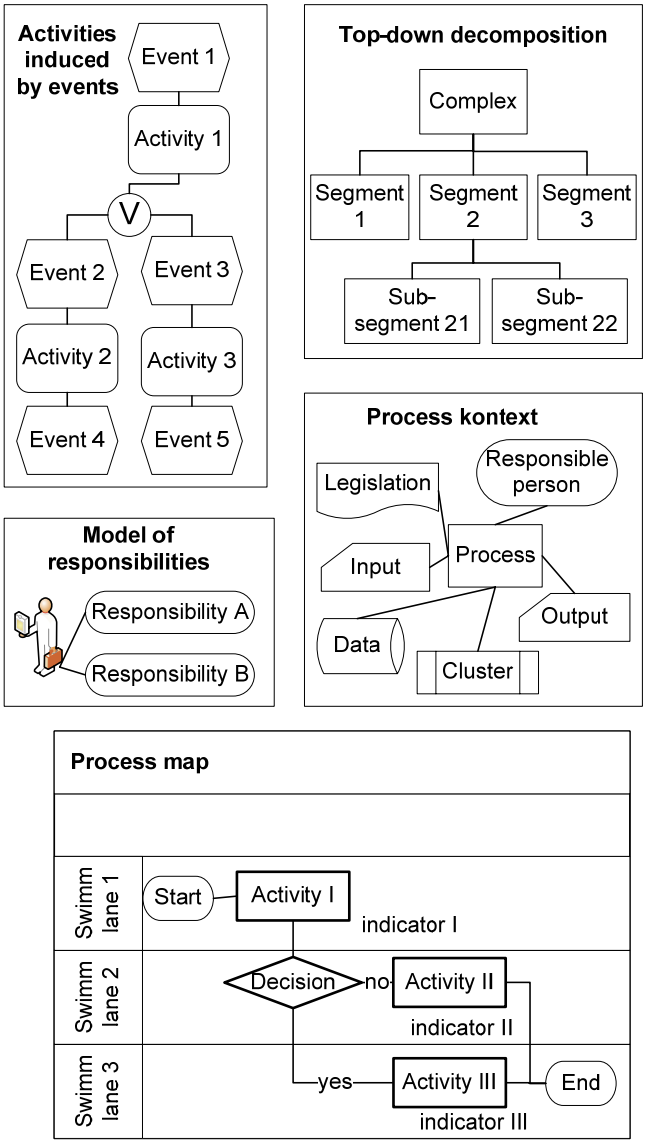


Fig. 1 tools of process modeling

Modeling is performed according to selected methodology, which delimitates necessary methods and procedures for solving query, based on defined goal. Goal of the methodology is to formalize procedures and guides, to define responsibilities and rules of communication [21]. Methodologies offer various types of models, defined most often in graphical fashion, which means by diagrams. Various SW tools are usually used for modeling, whereas the same diagrams can slightly differ. Nevertheless, for certain types of models we can find appropriate diagrams in most of methodologies. The graphical tools of business process modeling can be used as a starting point. The graphical tools are for example [22] [23] (see figure 1) – hierarchical diagram (top-down decomposition of model domain from higher levels to lower ones), diagram of process context (interception of all the significant process contexts) and process map (event-driven process chain diagram; overview of activities induced by events). Model is not a goal; model is a technique for problem formulation and for communication beyond problem. That is why modeling should not be too much of a burden, should not be too complex activity, but relatively simple and quick formal procedure, which can be applied in actual (demanding) problem solving. From this point of view we cannot use general practices recommended by methodology. Instead we have to choose form suitable types and extents of models, which managers / users should design or co-design.

Simultaneously with the development of models it is necessary to define appropriate metrics. Metrics are used for evaluation and measuring of performance, whether the area is corporate-wide or concrete partial. Metrics is a measurable indicator used for determination of quality, quantity and financial category; it is an indicator of quality in the light of set goals [24] [25] [26]. Objectively measured measures (hard measures) are characterized as objectively and easily measurable indicators. They monitor for example development of corporate goals and they are focused on the output of corporate processes, key activities, or they are focused directly on customer [25] [27]. Subjective measures (soft measures) cannot be measured directly objectively, but they lean on subjective evaluation for example in form of questionnaires.

Determination of set indicators is both a significant and a difficult task in each model creating process. It is a complex task – to find suitable indicators, monitor them and evaluate them. There are two aspects:

- Correct structure of indicators: it is vital to find as many indicators as possible and such indicators, so that their evaluation would have predicative ability – so that the evaluation would really quality or defectiveness of production.
- Objective and subjective indicators: the main question is when and to what extend is it suitable to use subjective indicators, or whether is it more suitable to focus on objective indicators.

## III. INITIAL SITUATION

Initial model situation was determined within an

organization. Authors stem from the model of a company which had own department covering development and testing of internal applications. In course of delimiting model situation, following situations are identified:

- Non-existing unified requirements register.
  - o Requirements were passed on by means of emails directly to individual development teams which provided given change in application.
  - o Members of teams were addressed directly by means of telephone or email; they could be allocated to another job, which would prevent them from performing the change within given time frame.
  - o Possibilities of sending similar or conflicting tasks by various workers.
  - o Considering passing the requirements directly to individual developers via emails, it was not possible to easily check the work performed by given team during certain time period..
- Required work was delivered based on level of utilization of teams processing the task.
- When a worker covering certain area leaves the job, the company loses the entire communication channel about individual changes by canceling his email account.
- Insufficient documentation of individual applications.
- Unpredictable time of processing and introducing required change.

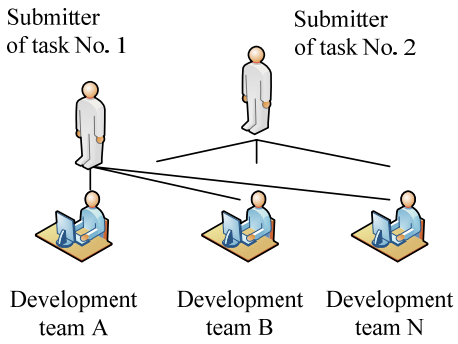


Fig. 2 model of communication between task submitters and solvers

In figure No. 2 a general scheme of initial communication between task submitters and individual development teams is illustrated. A contact point, which would eliminate redundancies and unite the communication, is missing.

Process of elaborating little changes is captured in picture No. 3, which generally illustrates life cycle of the task in initial situation.

Following practice was designed for process of change creation:

- Defining range and priorities of system changes: includes delimitation of range of system changes, description of roles (who identifies and evaluates the change) and also differentiation of importance of changes or in other word their prioritization.
- Defining roles: individual roles entering the process will be defined as a base for creating final process; a table with detailed role definition can be used as well as UML tools for capturing responsibilities of individual roles; process input can be captured by diagram with swim-lines.
- The design of process change: goal of process creation is to beware of identified flaws in current process and include roles in logical succession; we can use swim-lines diagram, RACI map compliant with ITIL methodology and table for comparing identified flaws in original process and their solution in new process.
- Determination of control mechanisms of the process: in order for process results to be measurable, it is necessary to set control mechanisms; as default we can use relatively simple metrics, which would be methods set for measuring results; a part of this chapter would also be design for determining SLA values.

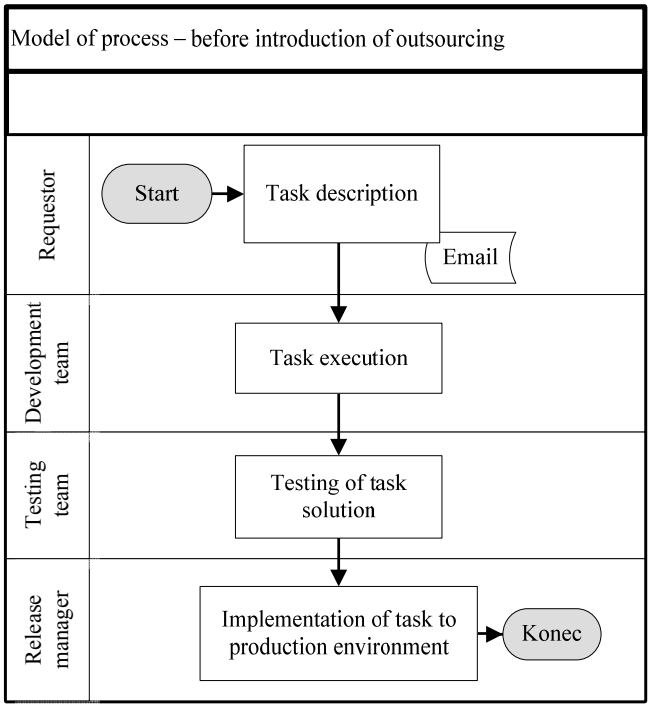


Fig. 3 model of little changes process – before introduction of outsourcing

## IV. Modeling of RFC

Primary and continuous documentation of the realization process of RFC is done from two points of view - from the point of view of a customer and the point of view of a vendor:

- Registration RFC sheet on the side of a customer's consists of these characteristics: request name, evidence request number, contracting authority name, priority, request description, request submission date, requested delivery date.
- Registration RFC sheet on the side of a vendor consists of these characteristics: request name, evidence request number, name of a responsible person, priority, solution

description, severity of a request, delivery date assumption according to demandingness, request status, date of request submission to customer.

### *A. RFC definition*

Default is the defining element of the RFC in terms of scope, priorities and other characteristics (see figure 4). The range of RFC can be estimated by time consumption, such as RFC can be characterized by a 50 man-days (MD), the project can be defined by the range of over 50 MD.

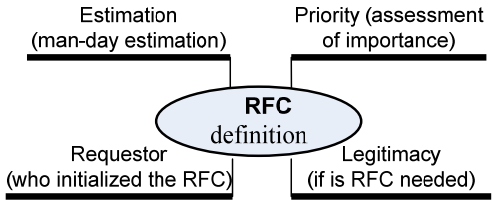


Fig. 4 characteristics of RFC definition

Defining priorities RFC can be categorized (see Table 1). It should be noted that whereas the extent of change is time consuming RFC, then the time of delivery does not correspond with the scope, respectively may raise based on defined priorities.

TABLE 1
DIVISION AND DEFINITION OF PRIORITIES

| Time of delivery (in man days) | (60; ∞) | (40; 60> | (20; 40> | (0; 20> |
|---|---|---|---|---|
| **Description** | • Realization is not needed / important for corporate welfare<br>• Simple changes without impact of users | • Realization is not needed / important for corporate welfare<br>• Simple changes with impact on majority part of users | • Realization is needed for corporate welfare<br>• The change has an impact of majority part of users. | • Realization is needed according the law or the corporate welfare is threatened.<br>• The change has an impact of majority part of users. |
| **Priority** | Low | Middle | High | Urgent |

Evaluation (if the implementation of system changes is needed) is performed by qualified staff according to set requirements and priorities of its description. If the change was evaluated as necessary, the staff submit it through agreed tool to vendor side, who makes man-day estimation of the request.

| **Role of requestor** | **RFC – Life cycle stages** | **Role of contractor** |
|---|---|---|
| Requestor | To define system change requirement<br>To log system change requirement into application<br>To secure corporate executive´s approval<br>To clarify system change requirement<br>To accept of delivery<br>Responsibility for payment | |
| System changes coordinator | To control of system change requirement<br>To hand over system change requirement to vendor side<br>To control of agreed term compliance | |
| Corporate executive | To approve system change requirement | |
| | To recieve system change requirement from customer side<br>To identify impacted the development team<br>To provide delivery of the request estimation from development team<br>To provide delivery of the request estimation from testing team<br>To send estimation of the request to customer side, the delivery time commitment<br>To secure correct delivery in agreed term<br>To provide an invoice to customer | Contractor´s coordinator |
| | To estimate system change requirement<br>To allocate development resources | Supervisor of development team |
| | To develop the system change requirement<br>To clarify system change requirement | Development specialist |
| | To estimate system change requirement<br>To allocate testing resources | Supervisor of testing team |
| | To test the delivery of the system change requirement<br>In case of inconsistences of delivery to send change recommendation to development team | Testing specialist |
| Release manager | To provide release of delivery into production environment | |

Fig. 5 model of RFC life cycle

*B. Defining the roles of responsibilities for the outsourcing environment in accordance with the RFC life cycle*

First, it is recommended to establish the roles that are related to particular stages of the life cycle of system change. The role is necessary to define both the customer and the vendor, because in terms of outsourcing, both sides cooperate, respectively are logically connected (see figure 5).

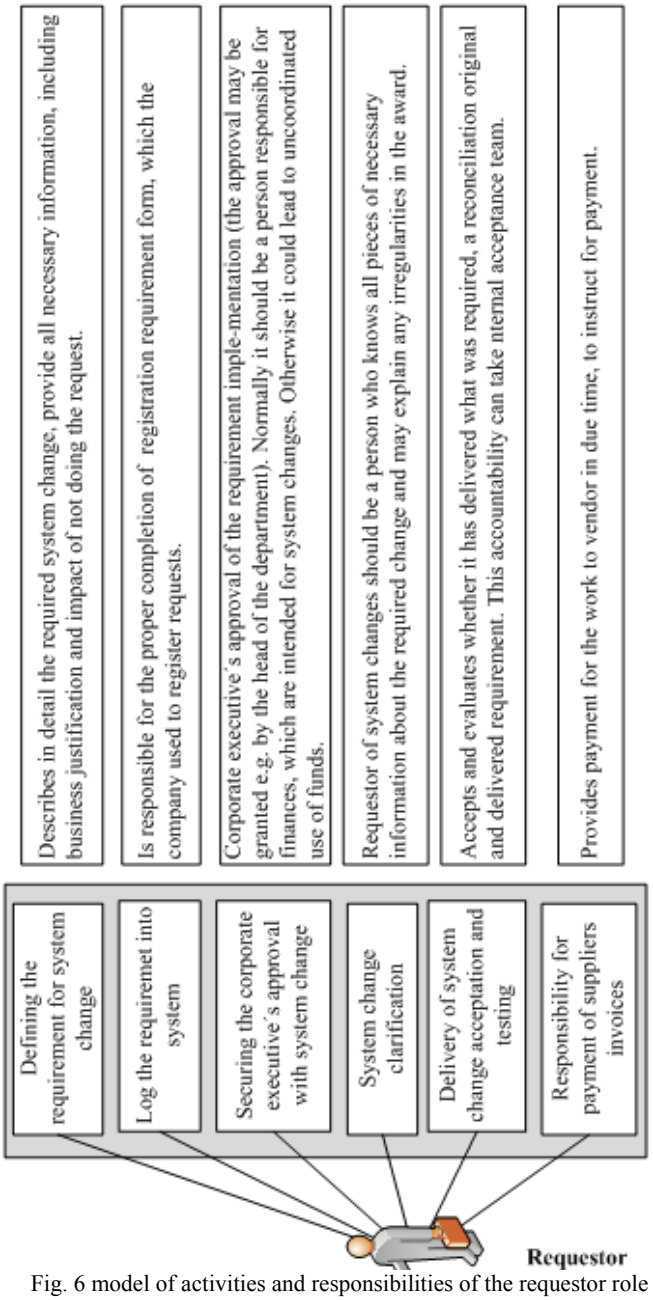


Fig. 6 model of activities and responsibilities of the requestor role

For each role is then to be precisely defined responsibilities / activities. The following example (see figure 6) is directed to the first role of the contracting authority, it shows the activities and responsibilities of the role of „Requestor“. Thus they are gradually identified activities and responsibilities of all roles RFC process. Defined characteristics are used to the overall role of transparency in the process and also serve as the way-out for creating process maps. The model should be especially clear and well understood, so that each requestor is able to identify his role with this model.

TABLE 2
RACI MAP (PART I)

| Role / Part of process | Requestor | Corporate executive | System changes coordinator | Vendor´s coordinator | Supervisor of development team | Development specialist | Supervisor of testing team | Testing specialist | Release manager |
|---|---|---|---|---|---|---|---|---|---|
| 1. Defining and submitting of requirement | A R | | I | | | | | | |
| 2 Is the requirement acceptable? | | | A R | | | | | | |
| 2.1 Cancellation | I | | A R | | | | | | |
| 3 Hand over the requirement to vendor side | | | | A R | I | | I | | |
| 3.1 Estimation of requirement development | | | | I | A R | C | | | |
| 3.2 Estimation of requirement testing | | | | | | | A R | C | |
| 4 Consolidation of estimate of workload | | | | A R | | | | | |
| 5 Is task estimation less than 50 MD? | I | | | A R | | | | | |
| 5.1 Solving the task as a project | A R | | | | | | | | |
| 5.2 Ensuring approval of realization of the task | A R | I | | | | | | | |
| 6 Is it possible to accept the task? | I | A R | | | | | | | |
| 7 Approval of the task by supplier | I | A R | | I | | | | | |

*C. RACI map*

As a part of process map, it is necessary to create a RACI map. Generally RACI map (in compliance with ITIL) is a model used for self explanatory expression of roles and responsibilities in process, based on teams or organization [4]. RACI is acronym, which expresses roles in defined process:

- R: Responsible – someone, who performs/deliver the result of the activity
- A: Accountable – is responsible for the activity/area
- C: Consulted – the topic is consulted with this person
- I: Informed – someone, who is informed only

There is only a part of the RACI map shown because of its vastness, so that the illustration express start and the end step of the process (see table 2 and table 3). For lucidity, there is a

colour difference between role of requestor (white colour background) and role of vendor (gray colour background).

TABLE 3
RACI MAP (PART II)

| Role / Part of process | Requestor | Corporate executive | System changes coordinator | Vendor's coordinator | Supervisor of development team | Development specialist | Supervisor of testing team | Testing specialist | Release manager |
|---|---|---|---|---|---|---|---|---|---|
| 8 Allocation of sources of development and testing team | | | | A R | I | | I | | |
| 9 Allocation of work to developer | | | | | A | R | | | |
| 10 Is it necessary to clear out the task with the submitter? | | | | | | A R | | | |
| 10.1 Clearing out details of change of application | R | | I | I | | A | | | |
| 10.2 Own development (or solution) of the task | | | | | A | R | | | |
| 11 Allocation of work to tester | | | | | | | A | R | |
| 12 Testing of task solution | | | | | | | A | R | |
| 13 Was the task solved in compliance with submission? | | | | | | | | A R | |
| 13.1 Testing of supply from users viewpoint | A R | | I | | | | | | |
| 14 Was the change performed according to the task? | A R | | I | | | | | | |
| 14.1 Ensure the implementation date | I | | A R | | | | | | |
| 15 Implementation | | | | | | | | | C I |
| 16 Provide payment for work to vendor | A R | I | | | | | | | A R |

*D. RFC process map*

Process map of system changes express activities and competences connected with analysis and definition of requirement including the decision, whether the requirement is in category RFC (less than 50 MD) or the requirement is solved using project (more than 50 MD). Process map is shown in figure 7. Process map is expressed by notation BPMN diagram with swim lanes. For better orientation, there is a colour difference between requestor's lanes (white colour of background) and vendor's lanes (gray background). It is recommended, to use more colours for better orientation. Gray shades were used for printing purposes of this article.

TABLE 4
PROPOSAL OF PROCESS CONTROL INDICATOR

| Indicators | Time to deliver estimates of workload (A) | Time to deliver RFC from vendor to customer (K) | Fulfilment of agreed deadlines and priorities (M,N,O,P) | Control of errors (F) |
|---|---|---|---|---|
| Measure-ment for one RFC | A=b-a | K=z-k | M=z-k; M ∈ (60;∞)<br>N=z-k; ∈ (40;60><br>O=z-k; ∈ (20;40><br>P=z-k; ∈ (0;20> | F=f |
| Average time to deliver estimates of workload | B=($\Sigma A_n$/n)*100<br>n= number of required RFC in observed period | K=($\Sigma K_n$/n)*100<br>n= number of required RFC in observed period | M=($\Sigma M_n$/n)*100<br>N=($\Sigma N_n$/n)*100<br>O=($\Sigma O_n$/n)*100<br>P=($\Sigma P_n$/n)*100 | F=($\Sigma F_n$/n)*100<br>n= number of required RFC in observed period |
| Limit of accep-tability of SLA | 90% delivered estimates of workloads in agreed time (respecting SLA) | 90% delivered RFC in agreed time (respecting SLA) | 90% delivered RFC in agreed time (respecting SLA) | 5% errors in RFC in agreed time (respecting SLA) |

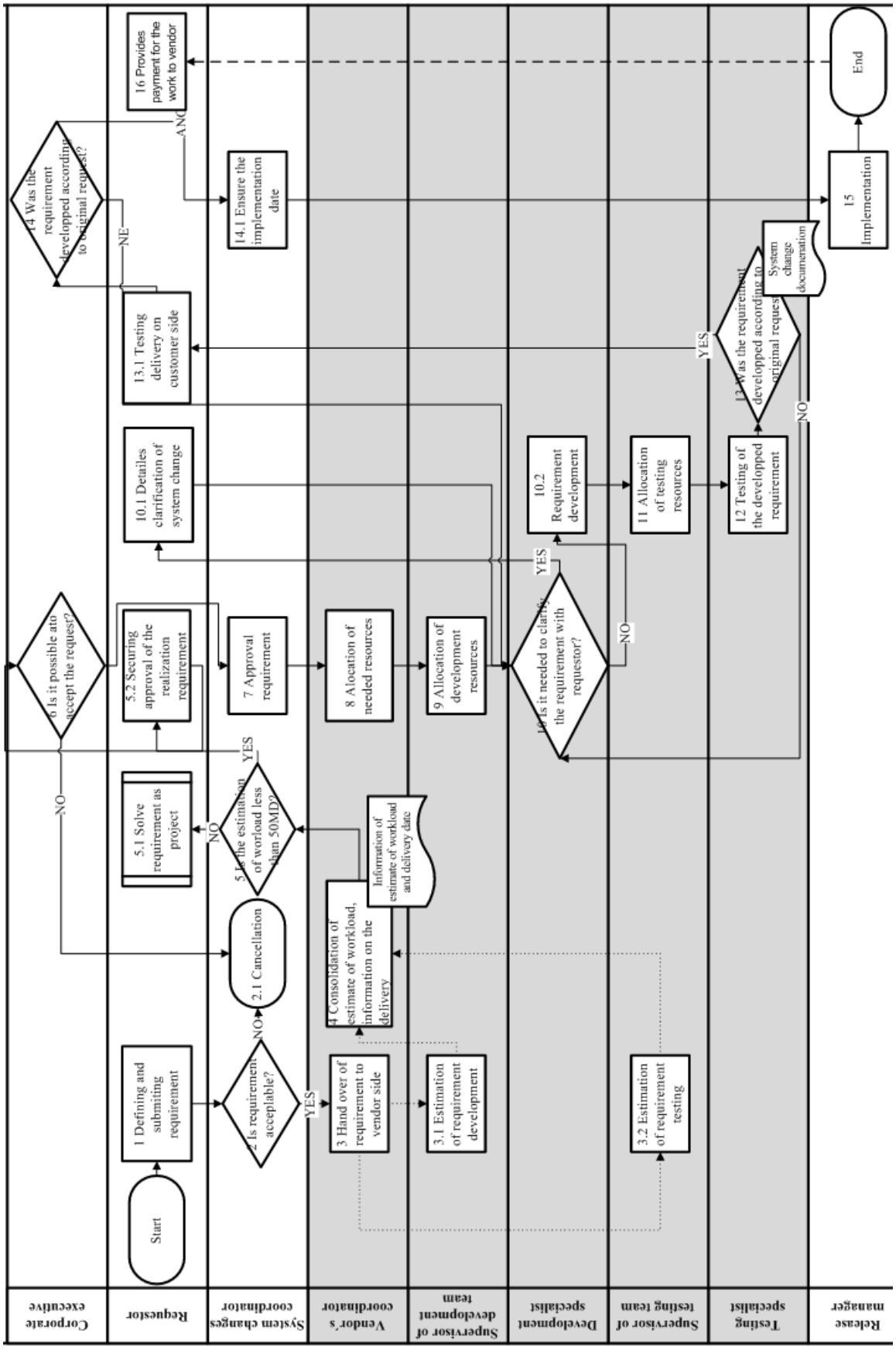


Fig. 7 process of system changes in outsourcing environment

### *E. Control mechanism*

Control mechanism should be set to check that all activities have been done in the way, how they were agreed in the contract. Generally, quality of the process and meeting its requirements can be controlled using following indicators:

- Time to deliver estimate of workload
- Time to deliver RFC from vendor to customer
- Fulfilment of agreed (proposed) deadlines
- Error checking (quality control)

Proposed indicators used for quality evaluation can be found in table 3. In left column, there is information about observed factors linked to each indicator. Calculation written below, is linked to each RFC, next one is summarized calculation for all RFCs for observed time period. Last row represents proposal of possible SLA for each indicator. If all indicators are fulfilled, we can talk about ensured process in required quality. Regarding collected information, it is not recommended to set the target to 100 %, but e.g. in range of 80 to 90 % (table 4). If the SLA was set to 100 %, and vendor was not able to meet the deadline in first indicator, it would probably lose the motivation to deliver other measured data.

The designed control mechanisms are in this case simple, but sufficient. They do not have to be complex indicators, but it is vital that course of RFC is measured and evaluated so that it is possible to evaluate and improve quality of the RFC process.

These metrics for error rate verification can be further used by methods for observing and evaluating quality of process output and product (we can mention for example Six Sigma method among others). It is, therefore, possible to monitor and evaluate quality of a process, which addresses change of business process.

## V. Conclusion

Companies work with various information resources during their business activities. It is always data files necessary for support of business activity (whether it is production sphere or public administration organization). It can also be a data source the organization provides to other users, which means that the organization is in this case guarantor / administrator and consequently provider of these data (for example public administration organization can be guarantor for providing layout data within GIS applications). Currently companies utilize outsourcing of IT applications in constantly rising amount.

Outsourcing of IT applications enables companies fully focus on core business activities, but it also requires specific rules and processes mainly when the change of the system is necessary. Change is driven by improvement of the process, when the company reflects internal and external influences and regulations. Changes in processes create requirements on data and operations with the data, so that the IT environment will fully support the future state.

Examples of frequently changing systems are data in systems GIS. Spatially oriented data are changing frequently, thus users requests on these data (on this kind of information system) are changing very often. Frequency of changes is more frequent than changes of 'classical' transactional information systems. Non-spatial alphanumeric data in transactional information systems are stabilized to a certain extent and formats of these data do not change often. But demands for spatial data are subject to frequent change. It is caused by multiple factors - technologies, which manage and provide spatial data, have been changing and developing nowadays; territories are changing, thus registers of territories are subject to frequent changes; the group of users, which need spatial data, has been expanding because of it. Geographical information systems with spatial data have the same purpose as transactional systems (i. e. management of certain data) and apply the same standards and principles. Although it is necessary to take into account that demands on data are subject to frequent change. Therefore demands on system changes are also frequent.

Projects support a big change of systems. Though small changes are more often, they are also crucial for the business. Unexpected and urgent changes cannot be processed by normal projects, because of their difficult and long-term planning. Company could not react fast enough and would not be as competitive as it would be necessary. Requirements for change – RFC – are unique but it is also repeating activities in term of analysis and realization rules.

These activities are processed by requestor / customer and supplier (we talk about specific conditions of outsourcing). They are instances of RFC analysis and realization, so called individual/unique RFCs are 'repeating' instances of change process. Change process can be built-up using tools for process modeling. It can be done in following steps – specify RFC, define roles and responsibilities, create process maps and control mechanisms. To create a model one by one, it is useful using appropriate modeling tools, which shall be mainly self explanatory to all stakeholders.

In specific environment of outsourcing, process model covers activities and responsibilities of two parties; change process is than flowing from one company to another one. The need of model existence explaining the change process RFC is useful for measuring the quality of activities in compliance with agreed SLA and also for avoiding overlaps in requirements or mistakes not covering necessary activities. Changes in IT applications processed in compliance with modeled process RFC are creating conditions for flexible reactions on process change in the knowledge environment. It also ensures data and system operations, which will fully support high productivity of the business.

It is convenient to design control mechanisms for modeled process of change (process of business process change). The designed control mechanisms are in this case simple, but sufficient. They do not have to be complex indicators, but it is vital that course of RFC is measured and evaluated so that it is possible to evaluate and improve quality of the RFC process. These metrics for error rate verification can be further used by

methods for observing and evaluating quality of process output and product. It is, therefore, possible to monitor and evaluate quality of a process, which addresses change of business process.

Development inside and outside the organization causes business processes to change constantly. That results in changes, which are necessary to be performed within data sources and IT applications. System changes, or changes in information systems, are repeatable. That is why the system changes can be considered instances of change process. If we consider system changes as a process (with repeatable instances), we can apply tools and processes of process modeling for analysis of system changes.

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