

The web-based information system for small and medium enterprises of Tomsk region

P V Senchenko¹, O I Zhukovskiy¹, Yu B Gritsenko¹, A P Senchenko¹, L M Gritsenko², E V Kovaleva¹

¹ Tomsk State University of Control Systems and Radioelectronics (TUSUR), 40, Lenina Ave., Tomsk, 634050, Russia

² National Research Tomsk Polytechnic University, 30, Lenina Ave., Tomsk, 634050, Russia

E-mail: pvs@tusur.ru

Abstract. This paper presents the web enabled automated information data support system of small and medium-sized enterprises of Tomsk region. We define the purpose and application field of the system. In addition, we build a generic architecture and find system functions.

1. Introduction

Nowadays, small and medium enterprises in the Russian Federation (RF) deeply influence economic development, contributing to job growth and social problems accomplishment. Job creation favors the increase of tax revenues and growth of production of commodities, improvement of service quality and widens its range according to consumer needs.

Apparently, small and medium-sized entrepreneurs play the leading role in job creation and practically take the first place in different parameters: employment volume, volume of output and sold goods, provided services. Small and medium-sized enterprises (SME) in the RF is in the making and lacks support and work stimulation from the government. Government agencies, which are formed in territorial entities of the RF, aim their activity at SME support. The existing entrepreneurship support mechanism in the RF and Tomsk region, particularly, facilitates SME incorporation and development, effective coordination of small and medium-sized entrepreneurs with RF economic entities and foreign partners.

At the moment, the majority of functions for organizational support of the SME support process reduces to collecting and processing applications for government support (hereinafter referred to as applicant), presented in hard copy (from government support application on out to extracts from the Register of Companies and other accompanying documents). Lack of the automated process of collection and handling of documents along with issues connected with organization of interaction of interdepartmental information, leads to a prolonged consideration of government support application, numerous mistakes on both sides, the applicant's - when preparing the document - and the expert's one. When handling it, we have a great number of rejections, often for formal reasons.

Organization of support for small and medium-sized enterprises in Tomsk region

Utility programs of SME support in Tomsk region are assigned to Development Department of Entrepreneurship and real economy of Administration of Tomsk region (hereinafter referred to as



department), together with SME support fund. At present, the action plan is being developed, which gives financial aid to SME, providing the following mechanisms of the state support:

- backing costs because of adoption of energy-conservative technologies;
- subsidies for small and medium-sized entrepreneurs making exportable products, services and executing work aimed at realization of products outside Tomsk region;
- granting from the regional budget to local budgets of Tomsk region municipal structures for the purpose of support of municipal projects for SME development;
- granting partial cost recovery for SME under the leasing equipment agreement;
- granting partial cost recovery for SME which is retaining innovative companies realizing innovative projects;
- granting start-up innovative companies set up a claim to a grant;
- competitive selection of business projects of young entrepreneurs "Perspective";
- guarantee fund security;
- granting a part of the credit interest rate, leasing and franchising costs;
- granting partial costs for technological connection.

Each type of government support has special regulations for its receiving, time limits, and the procedure may vary notably.

Prerequisites to automation SME support

Considering the process of receiving government support by SME of Tomsk region, one can draw the following conclusions:

- SME government support is carried out in order to comply with laws and regulations of the Administration of Tomsk region;
- implementation of government support mechanisms is carried out upon an application of SME filed to civil authority of Tomsk region in the form approved by the relevant regulatory and legal act, and a listed package of documents, established by laws and regulations of the Administration of Tomsk region;
- an application and accompaniment of documents registered by an authorized authority within a day of their arrival;
- an authorized authority decides to grant government support within a time limit according to the law and regulation.

We can diagram the generic order of receiving government support in terms of functional modeling using IDEF0 [1, 2] (Figure 1).

The diagram shows that functional blocks A1-A3 actually describe the paper work both from the applicant's side and from the expert's one, starting from preparing a package of documents up to deciding on granting government support.

The conducted research on department's staff work experience in terms of realization of SME government support mechanisms identified a number of problems, such as:

- unawareness of small and medium-sized entrepreneurs of existing mechanisms of government support;
- problems of collection and processing of data of small and medium-sized entrepreneurs;
- big time expenditures when providing SME with a package of documents for government support;
- inability to provide and check electronic documents filed by an applicant;
- lack of feedback from an authorized executive authority at the stage of examining the application for government support.

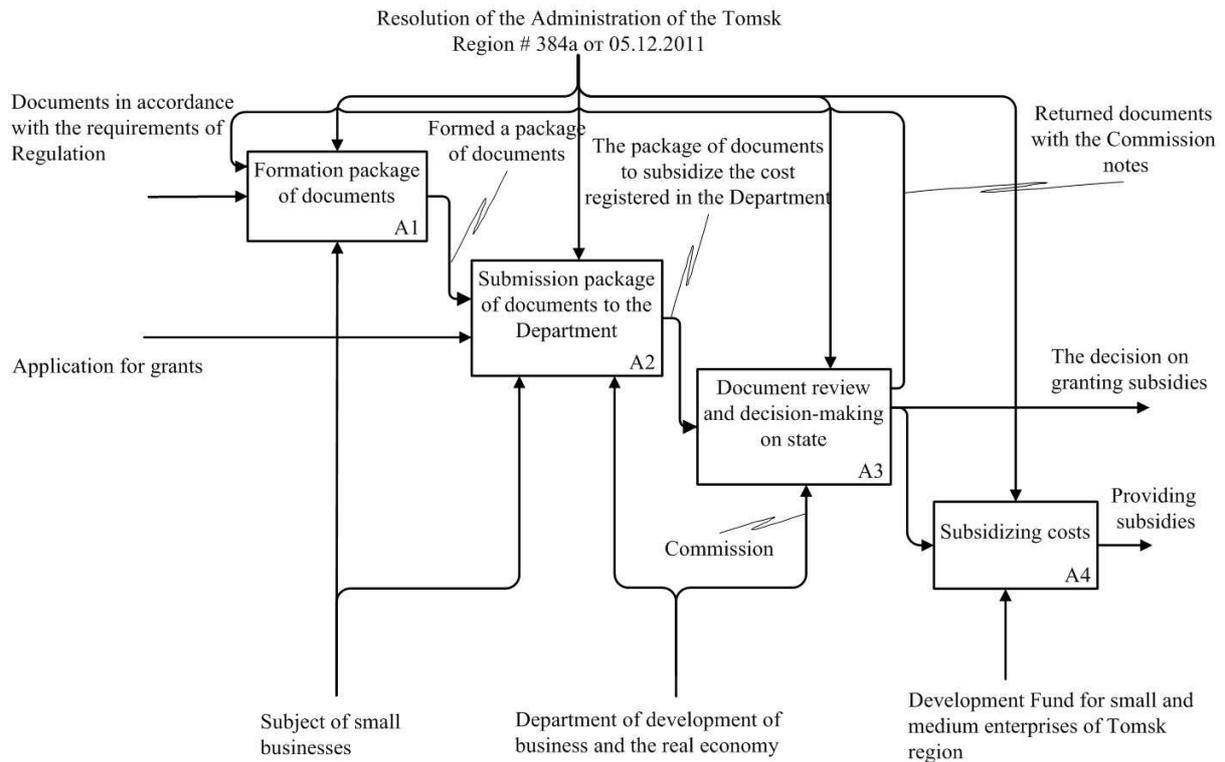


Figure 1. The generic functional model of providing government support.

The designated problems can be solved by developing and deploying the IT system (hereinafter referred to as system), which can automate processes intended to provide government support for SME. Such a system should contain mechanisms providing automated collection and processing of applicant's information along with a feedback technology offering a possibility to interact with applicants, the pension fund and the Tax Administration via the Internet. Realization of such interaction is based on requirements of the Federal Law of the Russian Federation dated 27 July, 2010. № 210-FZ, according to which, authorities providing central and local government services must "...provide a possibility for an applicant to receive central and local government services by electronic means..."

Automation of the support providing process for SME

Talking about automation, the activity focused on supporting SME nowadays mainly reduces to developing websites, which contain a list of support options, granting procedures, recommendations for documents preparation and some useful services, which, nevertheless, cannot provide any automation of gaining the government support.

According to the results of domain analysis, we developed a number of solution algorithms for automation of the government support process for SME in Tomsk region. For example, in figure 2 we see the generic automated algorithm for collection and processing applicant's raw data needed for receiving a grant. The given algorithm was developed by means of UML (Unified Modeling Language) [3] using the activity diagram.

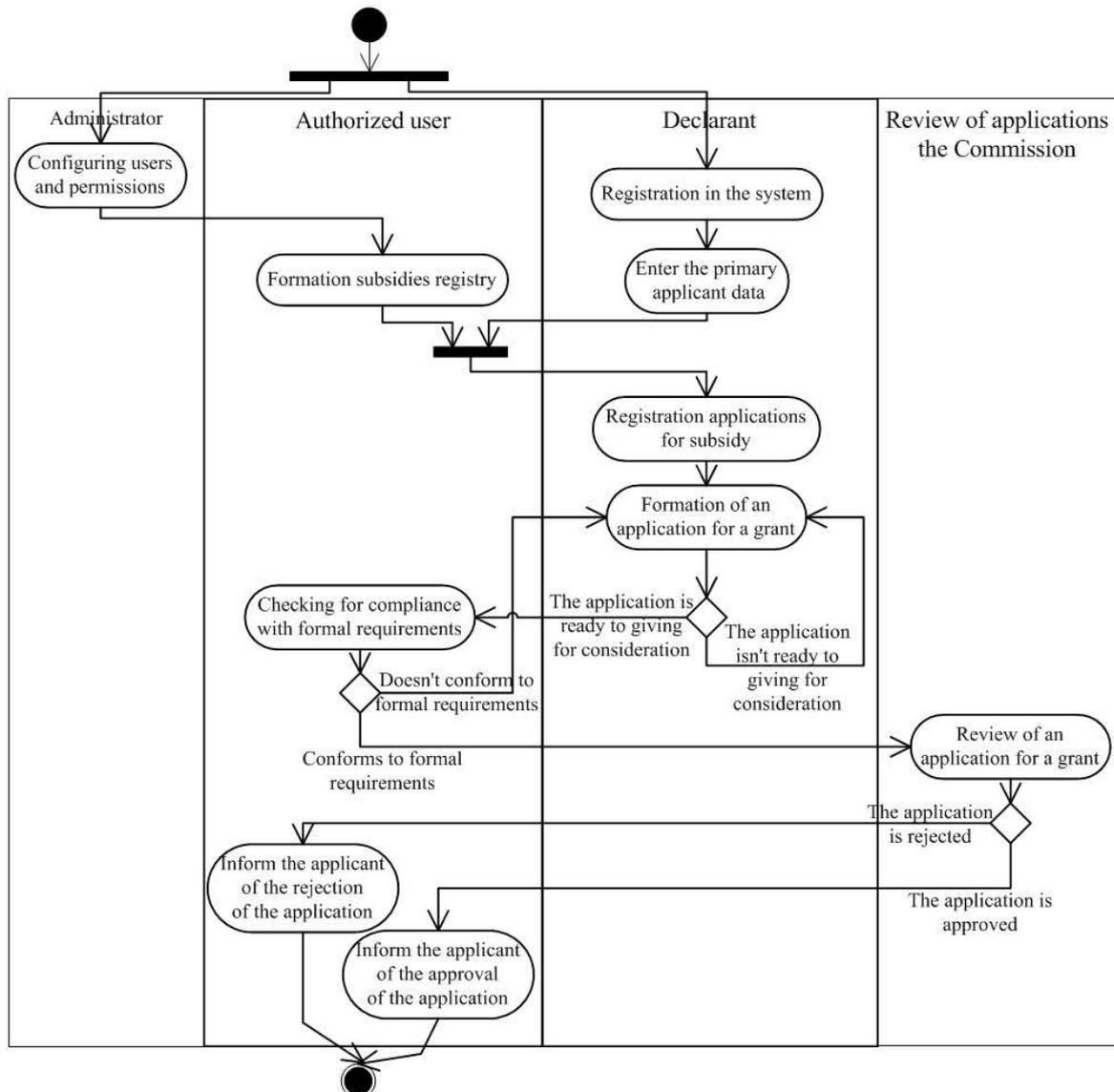


Figure 2. The generic solution algorithm of automation of the support providing process for SME.

In accordance with the developed algorithms, we can distinguish major functional tasks that the system can solve:

1. Setting up and administrating applicant's raw data in a database (DB).
2. Organization of role-based restricted access to data [4, 5] in the system, according to the regulatory documents, which define the order of filing necessary documents for receiving government support;
3. Input of full text electronic documents to the system (with their subsequent database storage), necessary for different types of granting suitable for informing the department's staff (or other authorized person), responsible for paper work, concerning filing of a full set of necessary documents.
4. Documents storage on DB, created by the department's staff (or other authorized persons).
5. Review of documents and raw data of an applicant by a staff member of a department (or other authorized person).
6. Input of information about results of the paper work with the applicant's documents.

7. Editing (changing) documents by an applicant when receiving a notification from a member of a department on the need for editing (changing) the content of the documents.
8. Input of information about results of proceedings in an application for government support.
9. Requesting data samples and general reports using a number of different filters.
10. Implementing the automated control of document execution: document monitoring; setting up the reminders and warning letters about a necessity of drawing up documents in time; extension of executing time and the control process of the document coming out.
11. Conducting the technology of electronic communication between an applicant and the Departments, such as Pension Fund of Russia (PFR), Federal Tax Service (FTS) and Social Insurance Fund (SIF), on a basis of electronic interagency communication [6].
12. Communication between documents of different execution levels.

Since it is preferable to use a remote access to the system for a main stream of applicants, one of the variants of technical implementation of the system architecture is development as a web-based application in ideology of client-server systems using "thin client" [7, 8]. The generic system architecture is illustrated in figure. 3.

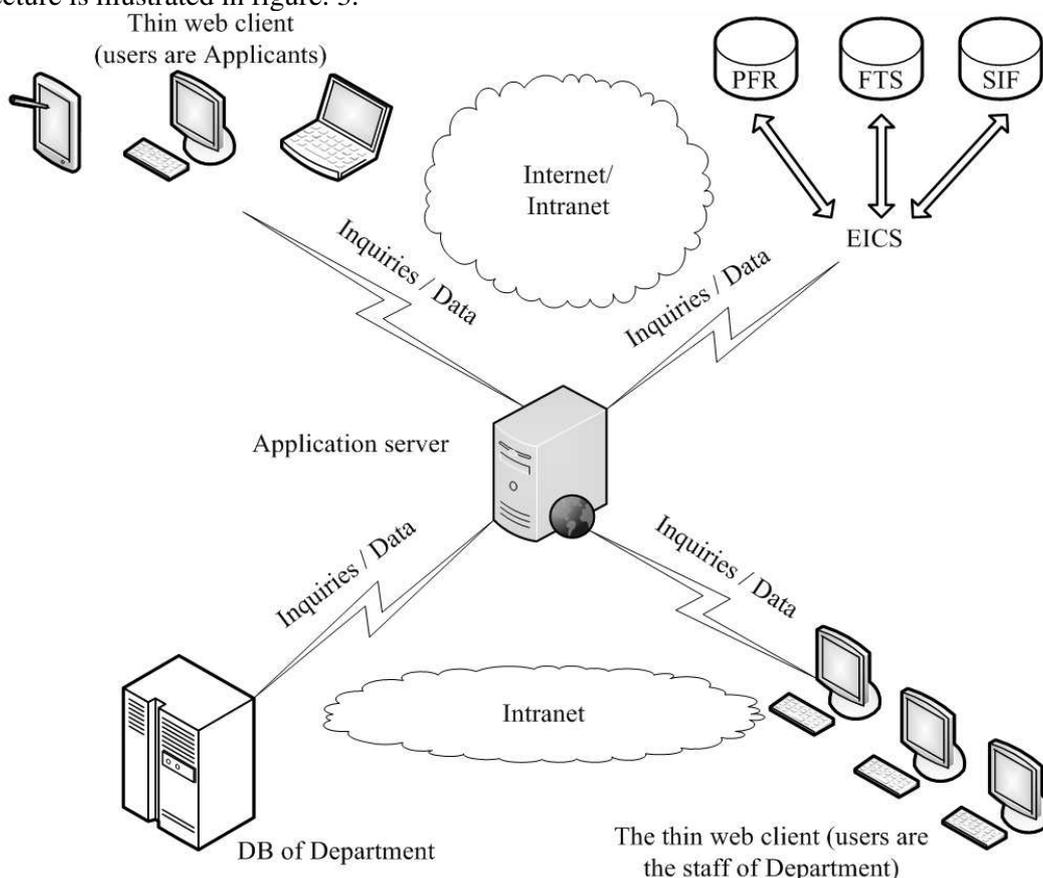


Figure 3. The generic system architecture.

As we can see from the architecture, the system can operate both as a web-based application (for users that are applicants) and as an intranet application, when users are the members of the department. In both cases, a web browser plays a client role. In addition, we realize the mechanism of technical interaction with the third party databases through the electronic interagency communication system (EICS) [9, 10] at the level of exchanging with structured information between the databases. As an input data for the system software, we use the electronic documents, filed in various formats (doc, docx, pdf, rtf), in accordance with the current regulations for filing documents by applicants depending on types of required support. Actually, it is possible to save to the system documents with

any content and suggested format. The electronic documents, created in the system of pdf format and as a report in xls format are used as an input data for the system software.

Communication service with EICS operates in an asynchronous mode. EICS user experience in terms of granting central and local government services in other regions allows for the conclusion, that the given mode is the most preferable. In the first place, it is caused by difficulty of initiating the interaction at a service level in the on-line mode and sometimes even impossible in the absence of instrumental and software capabilities that stakeholders have in hand. For instance, the following types of messages take part in the interaction of the system with the system provider of Pension Fund when requesting the information about absence/presence of debts of insurance contributions and other payments:

- a primary request for getting information;
- a response to a query, containing query ID;
- a repeated request for getting information on a received query ID;
- a response to a repeated query, containing feedback information or the query processing code.

Execution of such queries will run with a delay, but it, nevertheless, will not influence the promptitude and reduce the relevance of the given information. From the physical standpoint, we realized the ability of non-redundant data storage in a database; there is no need to keep full text extracts from organizations, connected to EICS: we considered the ability to receive only necessary information from the relevant databases.

Conclusion

We define the main goal of the developing system as raising of efficiency of providing the government support by means of automation of the process of collection and handling of applicants' raw data for receiving grants and other types of governmental support, and providing paperless document circulation when considering applications. The priority tasks of the system are:

1. Development of an infrastructure of enterprise support.
2. Arrangement of favorable conditions and elimination of barriers to business development (business environment in financial, personnel, judicial and informational support of SME activity, development of trans-regional and international collaboration).
3. Creation of the favorable image of an enterprise.
4. Involving young people in an enterprise.

The presented System is developed by the members of TUSUR Data Processing Automation Department and implemented in the Department of Entrepreneurship Development and Real Economy of the Administration of Tomsk region.

References

- [1] ICAM Architecture Part II-Volume IV – Function Modeling Manual (IDEF0), AFWAL-TR-81-4023, Materials Laboratory, Air Force Wright Aeronautical Laboratories, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio 45433, June 1981
- [2] Marca D A 2013 SADT/IDEF0 for Augmenting UML, Agile and Usability Engineering Methods *Communications in Computer and Information Science* **303** 38-55
- [3] *Unified Modeling Language User Guide, The (2 ed.)* 2005 Addison-Wesley p. 496
- [4] Gritsenko Y B , Milikhin M M, Senchenko, P V and Zhukovsky O I 2015 Model of role-based access to spatial data of electronic master plan *9th International Conference on Application of Information and Communication Technologies, AICT* pp 196-200
- [5] Li H, Li J, and Zhu H. 2005 Access control of secure operating system for electronic government application *Shanghai Jiaotong Daxue Xuebao/Journal of Shanghai Jiaotong University*, **39** (8) 1292-1295, 1299
- [6] Sidorov A A, Senchenko P V and Tarasenko V F 2015 Monitoring the social and economic development of municipalities in the life-cycle of information processing (In Russian), *Tomsk*

- State University Journal of control And Computer Science* **4 (33)** 54-61
- [7] Sojat, Z, and K. Skala 2016 Views on the Role and Importance of Dew Computing in the Service and Control Technology *39th International Convention on Information and Communication Technology, Electronics and Microelectronics* pp. 164-168
- [8] Oral A, Tekinerdogan B 2015 Supporting performance isolation in software as a service systems with rich clients *Proceedings - 2015 IEEE International Congress on Big Data, BigData Congress* pp. 297-304
- [9] Lönn C, Juell-Skielse G and Päivärinta T 2016 Modes of collaboration for realizing e-government benefits *Annual Hawaii International Conference on System Sciences* pp. 3031-3040
- [10] Buchanan W, Fan L, Lawson A, Schafer B, Scott R, Thuemmler C and Uthmani O 2010 Interagency data exchange protocols as computational data protection law *Frontiers in Artificial Intelligence and Applications* **223** 143-146