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Virtualization as an approach in the development of IT system implementation process

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Abstract—**Virtual administration of IT system implementation processes is now possible in small and micro-companies, characterized by relative simplicity and marked recurrence of business processes. Popularity of such approach to implementation is largely due to the wide availability of IT solutions offering remote administration of authorized IT resources. Virtual form of implementation offers significant reduction of both cost and time, compared with traditional approach. Consequently, it seems reasonable to expect further development of this trend, addressing larger economic entities and servicing more complex IT systems.**

I. Introduction

COMPANIES competing on modern markets face increased dynamics of changes, fierce competition and the need of making fast decisions. To meet those challenges, it is necessary to make good use of the available Information Technology (IT) solutions. IT instruments open up new potential for company operation and are a driving force of transformation. By implementing modern technological solutions, companies re-organize their activities not only in the B&C context, but also in relation to other companies, through value-creation chain [1]. The potential offered in this respect by the Internet and networking is widely and readily employed for optimization of business processes, namely the minimization of process cost and maximization of profit. Processes conducted via information and communications technologies (most notably, the Internet), due to the nature of the medium, are subject to potential virtualization. Through virtualization, both the entrepreneurs and their customers can profit from delocalization of business processes, i.e. freeing them up from the geographic constraints and focusing on customer needs and key competences of process supervisors [2].

The potential of virtualization can be readily deduced from the etymology of the term. Virtualization is a word derived from Latin *virtus, virtuti* standing for proficiency, efficiency, courage, fortitude and *virtualis* – effective [3]. The aim of this paper is to offer an insight into potential of virtualization of business processes through the evaluation of the IT system implementation process. Determinants, possibilities and tools for virtualization of this process are analyzed. Definition of system implementation process virtualization is presented, together with benefits implied by the use of this method. Deliberations presented in this paper refer to the practice of IT system implementation, with main focus on the recent trend to virtualize the co-operation between the provider and the client and employ remote implementation procedures and processes based on large potential of modern IT solutions – a trend observed and not yet sufficiently addressed in professional literature.

II. Determinants of Virtualization of the IT System Implementation Process

At present, straight majority of companies, especially large and medium-sized, employ consolidated application suites to service the main areas of their business activities, mainly in the sphere of accounting, personnel and wages, and sales [4]. Due to good saturation of IT solutions in this area, software providers seek to extend their offer to cover the sector of small and micro-companies. This interest takes the form of adapting the IT solutions to the specificity and needs of this particular segment as well as development of trade-specific IT instruments, evident even on the part of the largest software providers. Moreover, IT providers offer a range of supplementary services (business consultancy, support in the acquisition of EU structural funds), and their applications, when properly implemented, warrant increased effectiveness of business processes. This trend is manifested in the increased interest of IT providers in commercialization of their knowledge and implementation expertise, by offering services that complement IT systems' functionality, such as best practices in organization of specialized business processes, process maps for trade-specific activities and supplying predefined sets of procedures for their IT systems. This range of services is particularly attractive for small companies seeking to improve their market standing by implementing IT solutions combined with extensive knowledge of best practices in their line of trade [4].

However, solutions tailored to the needs and requirements of small and micro-companies, from the viewpoint of IT providers, offer significantly lower per-unit profit. Financial resources available to small and micro-companies for IT system implementation (need analysis, product modification and configuration, training, assistance, etc.) are decidedly sub-par compared to those of larger companies. Moreover, their business processes are of significantly lower complexity, coupled with trade-specific large-scale recurrence of procedures. IT systems addressed to this sector are definitely cheaper. Consequently, for optimization of business activi-

ties in this sector to be profitable, the IT providers need to minimize the cost and maximize the number of recipients. Cost minimization requires, on the one hand, standardization and simplification of system functionality and, on the other hand, simplification and time-effectiveness of implementation procedures.

The search for cost-minimization of implementation procedures has led to the present market trend, observed in this sector. In general, the trend is manifested in virtualization of implementation procedures or their constituents. This approach allows for delocalization of implementation, regardless of geographic location of both parties – in practice, the whole implementation process can be accomplished remotely, with significant reduction of implementation time. In addition, the IT system provider can service a large group of clients in a relatively short time, and at marginal cost.

Virtualization of IT system implementation process can be defined as remote realization of individual implementation procedures using modern telecommunications and IT solutions as well as the Internet potential (detailed analysis below). Thus, the need of personal contact between IT provider and the customer is effectively eliminated. The consultant, using a set of IT instruments and the Internet connection, communicates in real time with the customer. Both parties not only communicate with each other, but are also linked with the same physical machine, sharing the desktop view on their respective monitors and working hand in hand. It must be noted that this particular form of cooperation is made possible by the user-friendly, intuitive applications tailored to the requirements of virtual IT system implementation. Those instruments typically do not require specialized IT knowledge; the only requirement is the efficiency of communication via the Internet.

It should be noted that virtualization of IT system implementation processes is available and applicable mainly to small companies operating within a standard set of business activities or those that seek to modify their operation in accordance with best practices of the trade. IT systems dedicated to this sector are characterized by simple, straightforward functionality, intuitive and user-friendly interface and a range of predefined, typically trade-specific standard business processes. End users of such systems, for the majority of tasks, adapt their processes to the knowledge and expertise provided within the system, rather than vice versa. This is in clear opposition to the practice of system implementations in medium and large companies, where IT systems are often adapted to particular requirements of the user, resulting in costly modifications.

The interest in virtualization of implementation processes on the part of small and micro-companies stems from their need to minimize the cost involved. In this respect, both customers and system providers are motivated by similar aims. Moreover, the typically low cost of such projects allow the client to take the risk of virtualization and accept the lack of direct contact with the provider. Such constraints would be considered unacceptable in the case of large projects.

It must be noted that virtualization, among other things, is aimed at building the implementation process on the particular needs of the client. In addition, the client is an active participant of the process, taking part in realization of individual implementation tasks. Consequently, virtualization of IT system implementation processes obliges the provider to offer a suitable level of security and work comfort to the client. This should be reflected in proper organization of implementation tasks and – most of all – a reliable hot-line service offering fast and effective solutions for most of the client's problems and inquiries. In virtual context, this is a substitute for direct contact between clients and consultants.

It must also be remembered that virtualization of implementation processes for standard IT products dedicated to small and micro-companies carries a large potential for development, since the procedures and methodologies developed in the course of system implementation may help streamline future implementation processes targeted to medium and large companies.

III. Potential for Virtualization of IT System Implementations

As already mentioned above, the owners of small and micro-companies typically purchase trade-specific or highly standardized IT solutions. Such decisions result from the lack of funds to carry out pre-implementation analyses, offering detailed evaluation of organizational needs, information needs of individual user groups and elaborate design of business processes. In such cases, the implementation becomes a key stage in the system life-cycle. In the sector of small and micro-companies, the awareness of the need to implement IT solutions is a first step in the implementation process. Identification of user needs is carried out from "within' the organization itself – typically through involving company employees and owners in identification and evaluation of operational areas that may benefit from IT support.

The self-induced awareness typically leads the potential users to independently penetrate the market of trade-specific IT products. Users seek products that are not only adequate to their needs, but – most of all – products that place within the reasonable price range. After initial selection, the potential clients contact individual IT system developers or distributors. Nowadays, such contact is accomplished via predefined, interactive contact forms made available on IT providers' web sites. This contact constitutes the first stage of remote client-provider communication. More often than not, the interactive forms include questions that offer initial verification of the client's expectations towards the system's functionality.

The classic approach to implementation process identifies the following sequence of activities [5]:

- preparatory proceedings – involving analysis and preparing the way for the organization to adopt the system, preparation of the system itself and ensuring proper technical infrastructure for future use of the system,

- testing the system – involving trial runs and elimination of errors,
- system exploitation.

In traditional approach, preparatory proceedings required frequent on-site visits, with consultants preparing specifications of user requirements in terms of system functionality [6]. In modern approach, the initial evaluation of user requirements is verified via specific questions included in the interactive contact form. Hence, virtualization of this stage of system implementation process, in the case of small and micro-companies, may limit the number of direct contacts to only one pre-implementation meeting, to clarify user expectations and settle the financial conditions of the contract. In the case of small and micro-companies, preparing the organization for adopting the system is typically reduced to appointing the client representative to supervise the implementation procedures and remotely co-operate with the consultant representing the IT system provider.

Since the IT market at present offers a large number of IT solutions for remote automation of the installation process, the prospective user may chose to open the technical resources of the company to the IT provider and have the system installed remotely. The IT instruments also offer trial run assistance as well as verification of data structure and correctness of implemented algorithms. The functionality of selected IT instruments offering virtualization of system implementation process is presented in the next section of this paper.

One of the key stages of IT system implementation is employee training. This area can also benefit from remote cooperation between system provider and end user. Modern software is typically equipped with elaborate help modules and detailed user manuals with detailed presentation of system functionality features. The increased focus on user self-improvement during standard system operation effectively reduces the time needed to familiarize the user with the system. The end users (employees) effectively take over parts of the implementation procedures but, at the same time, are made responsible for the progress [7]. By limiting or eliminating the number of training sessions supervised by IT provider, the company can largely reduce the cost of system implementation.

Moreover, virtualization of IT system implementation offers the prospect of remote assistance. Since the end user cannot benefit from direct contact with the IT consultant, the latter is often equipped with remote desktop instruments to better support the user during the initial trial runs and help eliminate errors and problems. The on-line consultants can also remotely address any errors found in data structure or business algorithms implemented in the system.

IV. Selected IT Tools Offering Virtualization of Implementation Process

Virtual accomplishment of the aforementioned stages of IT system implementation is made possible by the dynamic development of information and communications technologies. At present, the market of IT products features a large number of solutions for remote administration of shared computers. Those applications vary in terms of operating system support, functionality features, ease of use, built-in security level and licensing fees.

Companies intent on using virtual approach in implementing new software need only satisfy the requirement of leased line Internet connection, with bandwidth playing a major part in the efficiency and facility of remote cooperation. The Internet in this process is perceived as global channel, providing real-time information exchange between the parties [Jurga 2010, pp. 49-53]. There are also dedicated IT solutions for remote administration via LAN and WAN (local and wide area networks), but – since software providers are outside the reach of such networks, the Internet remains a fundamental communication medium.

The most popular applications used for the purpose of virtual implementation are presented in the table 1. They were divided into two groups, depending on the type of license: freeware and commercial software. Many of them are available for use at no cost or for an optional fee. All of the commercial solutions have also trial versions, which can be used for free for a predetermined time.

Table 1.
The most popular software used by IT providers for the purpose of virtual implementation

Type of license	Software
Freeware	• TeamViewer[1] • CrossLoop • TightVNC • Remote Desktop Connection
Commercial	• pcAnywhere • NetOp Remote Control • Radmin • Atelier Web Remote Commander • YuuGuu

TeamViewer offers facilitated connectivity without the need of installing client/server applications on the remote machine. The provider needs access to full version of Team Viewer application, but the customer needs only to install a Team Viewer QuickSupport module. The client-side module is user-friendly and does not require advanced skills nor knowledge. Moreover, TeamViewer allows for generation of customized client modules, with provider's logo and welcome message, thus offering optimal presentation of contact details. In the case of non-commercial use Team Viewer is free [http://www.teamviewer.com].

Another example of remote administration software based on the Internet connection is CrossLoop. The package offers access and/or administration of remote computers, with the administrator having unrestrained view of the remote desktop with mouse and keyboard functionality. The CrossLoop

[1] It is free only for non-commercial use

package is an ideal tool for specialized technical assistance services during system implementation. It is available for free, but requires a certain degree of IT knowledge to operate. There is also CrossLoop Pro – the commercial version of this application with more complex functionality [http://www.crossloop.com].

TightVNC is an anather free remote control package based on the VNC software. It allows the user to take over remote desktop functionality. Compared with RealVNC (based on similar code), TightVNC offers improved image compression, which helps perform standard operations on remote systems with low-bandwidth connection. Similarly to RealVNC, the package includes two modules: Server (image generation and transfer) and Viewer (image reception) [http://www.tightvnc.com].

Remote Desktop Connection, a client software for remote administration offered by Microsoft, is less popular due to limited functionality, such as the lack of shared control (mouse, keyboard, desktop) and OS restrictions (the software offers connectivity with systems working in Windows Server 2003 or Windows XP Professional environment).

Symantec's pcAnywhere package is the market leader of remote administration software. By using efficient data encryption and authentication mechanisms, the software offers a high degree of security during remote access sessions. The most recent version of pcAnywhere offers improved directory search capabilities and AutoTransfer for automated batch transfers of files [http://www.symantec.com/business/pcanywhere].

NetOp is a family of software products for remote computer administration, with cross-platform capabilities, i.e. the potential to administer computers working under different operating systems. From the remote location, the provider can control workstations and servers, with remote desktop access, keyboard and mouse control, chat functionality (both text and audio), bi-directional file transfer, session recording, etc. NetOp Remote Control offers administration of any remote corporate network, with support for over 20 various operating systems at minimal system resource load. This is the only remote administration package with a centralized security system. This means that the user can control not only access authorization, but also set individual authorization rights for any remote operation – all from a single location. The package includes two basic modules: Host – for sharing computer resources; and Guest – for remote connectivity. Similarly to Time Viewer QuickSupport, the Guest module is easy to install and very user-friendly [http://www.netop.pl].

Other packages offering fast, reliable and secure administration of remote systems include Radmin, Atelier Web Remote Commander and YuuGuu.

Radmin is one of the safest, fastest and most popular remote access software solutions designed for Windows. A remote computer screen can be viewed on a local monitor in either a window or a full-screen display. All mouse movements and keystrokes are transferred directly to the remote computer. Files can be transferred to and from the remote computer, and communication with the remote computer's user is possible by either Text Chat or Voice Chat [http://www.radmin.com/products/radmin].

Atelier Web Remote Commander lets manage servers and workstations from local computer and does not require to install any software on the remote machine. This turns the software particularly useful for accessing remote computer without any previous preparation. This application provides lots of powerful tools for remote management and audit [http://www.atelierweb.com/rcomm/index.htm].

YuuGuu is the simple to use service for screen sharing, remote support and collaboration. It is a little different than the options outlined above, because it allows to share screen via instant messenger. It also supports all of the major communication platforms such as Yahoo, MSN, AIM, GTalk and more. It also doesn't require to download and install anything, which should save lots of time [http://www.yuuguu.com/home].

Regardless of the IT solution chosen for the purpose of remote implementation of systems, both parties can also communicate via standard channels used in traditional implementation processes, such as e-mail, instant messengers, sets of frequently asked questions and answers (FAQ), helpdesk and hotline. Direct forms of contact in virtual implementation sessions are typically limited to minimum.

V. CONCLUSIONS

Virtualization of business processes represents an effective use of information technologies, as one of the key determinants of success and a strategic resource of modern company. Information technologies open up new potential for operation and transform both means and methods of economic activities [3]. The use of virtualization potential in the process of IT system implementation offers ways for improving the operational capabilities of software providers and profitability of services addressed to small and micro-companies. In this respect, the IT providers, despite certain financial restrictions of their potential customers, can offer efficient implementation of IT solutions which would prove unprofitable for both parties if they were to employ traditional implementation methodology based on direct contact and carried out on-site. Through remote accessibility, the customer can benefit from consultant services, and the IT provider can carry out the implementation at the lowest possible cost. Another benefit of virtualization lies in the fact that the consultants can fully focus on using their key competences to address and satisfy the needs of the customer.

For obvious reasons, virtual implementation is typically limited to simple systems with low complexity and a range of predefined standard business processes. However, the skill and expertise resulting from such virtual implementations, coupled with best practices and methodologies developed in the course of servicing the small and micro-companies sector can bring profits in the foreseeable future, when

the IT providers decide to carry the virtual approach over to more advanced projects targeted to larger companies. Standardization of internal procedures on the part of IT providers, resulting from financial constraints and virtualization of services rendered to small companies, may effectively lead to optimization of procedures that take effect regardless of the scope of implementation processes and the targeted sectors. This approach, in effect, can bring about general reduction of implementation cost as well as considerable time savings. In this respect, the trend to virtualize IT system implementations seems a good direction, offering high potential for development on the part of IT providers as well as improvement and facilitation of the process from the viewpoint of future customers.

Case study of the virtualization of the IT system implementation process will be published in the AITM 2011 proceedings.

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