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## **IT TOOLS IN THE VIRTUALIZATION OF THE SOFTWARE IMPLEMENTATION AND MAINTENANCE PROCESS**

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**Abstract:** By implementing modern technological solutions, companies re-organize their activities. The remote software implementation process and then the remote maintenance mean for companies a new approach to gaining competitive advantage. In practice, it gives the opportunity to reduce costs and hence the prices of services. These two processes become also independent of the geographical location of the client and the contractor, which can significantly reduce response time to reported problems and help ensure the higher quality of service. The IT support is needed to efficiently and quickly virtualize software implementation and maintenance process, so the aim of this paper is to present and characterize such IT tools.

**Key words:** virtualization, implementation, maintenance process.

### **1. Introduction**

Nowadays we are witnessing that the world has entered the information society era. The basic resources have become information and knowledge obtained from their processing. Digital products and services dominate the market. The availability of the transmission networks and sources of information has become more common and easier, while significantly reducing the costs of this access. Extensive use of IT tools in the economy, government, education and culture as well as in organization and management, has created new opportunities for all market participants and their environment [Steinmueller 2005, pp. 133–152].

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 the value-creation chain [Szpringer 2008, pp. 58–60]. The potential offered in this respect by the Internet and networking is widely and readily employed for the 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 the delocalization of business processes, i.e. freeing them up from geographic constraints and focusing on customer needs and key competences of process supervisors [Kisperska-Moroń 2008].

It should be noted that it is not only the newest information and communications technology solutions that have influenced the changes in the way people do business. Very important were also changes in the treatment of partners, competitors and customers. When the technology became obvious and relatively available on the market, reflections on a virtual enterprise focused on the areas of structures and strategies of companies. It can be concluded that a virtual enterprise need not be considered in terms of organization (structure), but instead often in terms of competitive strategy [Szpringer 2008, p. 10]. Such an approach has been adopted in the article. Companies do not change their fundamental structures, they must change their business models. They must change their current ways of organizing work, and in consequence also modify the organizational structure, but this is the effect of change in the way of cooperation with customers.

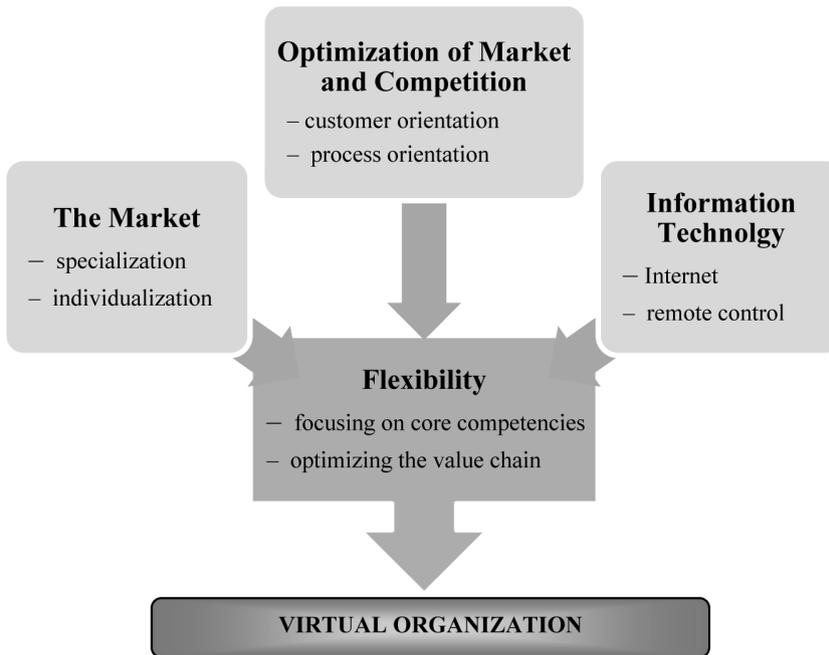
The remote software implementation process and then the remote maintenance mean for companies a new approach to gain competitive advantage. In practice this gives them the opportunity to reduce costs and hence prices of services. These two processes become also independent of the geographical location of the client and the contractor, which can significantly reduce response time to reported problems and help ensure a higher quality of service.

The aim of this paper is to present virtualization as a concept of e-business models improvement. The subject of improvement described in this article are the procedures of implementation and maintenance of the software that are carried out remotely. A definition of system implementation and maintenance process virtualization is presented, together with the benefits implied by the use of this method [Frączkowski 2003, s. 26]. Deliberations included in this paper refer to the practice of Protetic4You implementation, with the 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.

## **2. Virtualization as a concept of e-business models improvement**

In the area of management science, the concept of a virtual organization is known as a strategic response to the increasing complexity, uncertainty and interdependence of processes in the business environment. Virtualization can take many forms and ranges. It may involve internal business processes and those on-line businesses – the customer. But now we can talk about a new paradigm of management, rather than about a new kind of organization.

The process of virtualization has many sources of inspiration and direct interactions. Figure 1 presents the main “forces” shaping the virtualization of the organization.



**Figure 1.** The forces shaping the virtual organizations

Source: own research based on [Ulrich 2001, p. 45].

The factors presented in Figure 1 inspire virtualization of an organization or of selected business processes. Focusing on the needs of the market, the need for an individual approach to customers combined with a focus on core competencies and the newest achievements in information technology create a new framework for the functioning of modern organizations. The concepts of virtualization, combined with the latest information and communication solutions, lead to new business models. Due to the fact that they mostly use the Internet, we can talk about e-business models [Fuehrer, Ashkansy 2001; Rond 2003, pp. 24–27].

One of these new models is the concept of organization which pursues in a remote way its key processes associated with implementing and maintaining software at the customer. The search for cost-minimization of implementation and maintenance procedures has led to the present market trend. In general, the trend is manifested in the virtualization of the implementation and maintenance procedures or their constituents. This approach allows for the delocalization of implementation, regardless of the geographic location of both parties – in practice, the whole implementation and maintenance process can be accomplished remotely, with a 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 [Kisielnicki 2008, pp. 351–368].

The virtualization of IT system implementation and maintenance process can be defined as the remote realization of individual implementation and maintenance procedures using modern telecommunications and IT solutions as well as the Internet potential (detailed analysis below). Thus, the need for personal contact between the 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 and maintenance 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, an 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 the particular requirements of the user, resulting in costly modifications.

It must be noted that virtualization, among other things, is aimed at building the implementation and maintenance process to the particular needs of the client. In addition, the client is an active participant of the process, taking part in the realization of individual implementation tasks. Consequently, the virtualization of IT system implementation and maintenance processes obliges the provider to offer a suitable level of security and work comfort to the client. This should be reflected in the proper organization of implementation and maintenance 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.

### **3. Selected IT tools supporting virtualization of software implementation and maintenance process**

The virtual accomplishment of the aforementioned stages of IT system implementation and maintenance 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 the remote administration of shared computers. These 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 and supporting 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 a 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 and maintenance are presented in 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 and maintenance

Type of license	Software
Freeware	<ul style="list-style-type: none"> <li>• TeamViewer*</li> <li>• CrossLoop</li> <li>• TightVNC</li> <li>• Remote Desktop Connection</li> </ul>
Commercial	<ul style="list-style-type: none"> <li>• pcAnywhere</li> <li>• NetOp Remote Control</li> <li>• Radmin</li> <li>• Atelier Web Remote Commander</li> <li>• YuuGuu</li> </ul>

\*It is free only for non-commercial use.

Source: own research based on vendors' websites.

TeamViewer offers facilitated connectivity without the need for installing client/server applications on the remote machine. The provider needs access to the full version of the 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 the generation of customized client modules, with the provider's logo and welcome message, thus offering the optimal presentation of contact details. In the case of non-commercial use Team Viewer is free [<http://www.teamviewer.com>]. An example of software (Protetic4You) implemented and supported by TeamViewer is described in the last part of this article.

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 an unrestricted view of the remote desktop with mouse and keyboard functionality. The CrossLoop 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 a more complex functionality [<http://www.crossloop.com>].

TightVNC is another free remote control package based on the VNC software. It allows the user to take over remote desktop functionality. Compared with RealVNC (based on a 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 a 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 allows to manage servers and workstations from local computer and does not require installing any software on the remote machine. This makes the software particularly useful for accessing a 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 a 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 the major communication platforms such as Yahoo, MSN, AIM, GTalk and more. It also does not require downloading and installing anything, which should save lots of time [<http://www.yuuguu.com/home>].

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

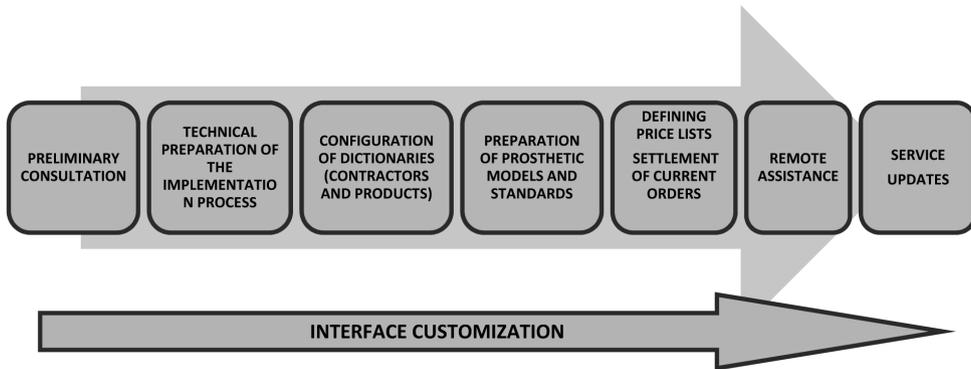
#### **4. Practical implementation of 'Protetic4You' software suite**

The Protetic4You software suite, designed by the 4-Tune IT company in Wrocław, is a comprehensive IT tool for prosthetic laboratories, offering support for the whole range of business processes in the profession: managing orders, registering individual production stages, as well as internal (employees) and external (dental surgeries) settlements, product shipment and potential iterative corrections of the product. It is implemented and supported by TeamViewer – one of the tools for remote operation which was previously described.

The implementation of Protetic4You software suite is, to a large extent, a virtual process. At this stage of 4-Tune IT company development, individual contact with clients can be maintained only at specialized conferences and professional fairs. For a small company, customer acquisition is a process based on references from current users, virtual presentations and remote contacts. The implementation methodology utilized in Protetic4You is built around the idea of leading user (users) taking an active part in the implementation process along with the 4-Tune IT consultant, participating in software configuration and initial training. The Protetic4You software implementation process involves the following stages:

- Preliminary consultation – précising the needs,
- Technical preparation,
- Configuration of dictionaries (contractors and products),

- Preparation of prosthetic models and standards,
- Defining price lists,
- Remote assistance,
- Interface customization,
- Software service and updates.



**Figure 2.** Diagram of Protetic4You software implementation process

Source: own research.

The fundamental tools used by 4-Tune IT in implementation and the subsequent servicing of the Protetic4You suite include: TeamViewer (TV) software and telephone and/or Skype communication software. TV is an instrument for virtual contacts with end users via the Internet. As advertised by the TV supplier on their web page, *With TeamViewer you can remotely control any computer as if you were sitting right in front of it*. TeamViewer requires full installation and licensing rights only on the part of the supplying company, while customers can use TV in “run” mode, without prior installation of the software on their computers. The product is user-friendly, and as such, it seems an ideal solution for the Protetic4You implementation process, since it does not burden the end user with additional advanced IT knowledge [see: <http://www.teamviewer.com>].

The first stage of Protetic4You implementation is the **preliminary consultation**, focusing on identification of end user needs and requirements as well as suggestions for best practices in the profession. At this stage, the supplier evaluates the range of implementation, number of workstation licenses and networking/hardware requirements. The end user is also provided with detailed information on implementation methodology and subsequent stages of the process. The stage culminates with establishing the implementation schedule i.e. details of subsequent remote sessions for the configuration of the software and training of the leading end-users. After concluding the preliminary consultation, the customer is often provided with a list of hardware purchases needed, since the implementation methodology also covers comprehensive servicing of the laboratory at implementation.

The next step is the **technical preparation of the implementation**. This stage is in part realized during the initial virtual presentation of the software suite, when potential customers get acquainted with the remote functionality and basic operations of the TV tool. If the customer has no suitable networking infrastructure for the purpose, 4-Tune IT provides the laboratory with hardware purchased and configured to the needs of the process. If suitable networking capabilities are available, the installation of necessary software components is done remotely. The technical preparation of the implementation process, apart from the installation of the Protetic4You suite, involves the following components:

- Net Framework 3.5 SP1 and 4.0,
- IIS (Internet Information Services),
- MS SQL Server 2008 R2 Express.

It is worth noting that in large prosthetic laboratories, the technical preparation of the process may require on-site visits of the 4-Tune IT consultant, due to the necessary configuration of multi-user networking and hardware structure.

The actual work with software suite requires **configuration of basic dictionaries**: of contractors and products. In the case of contractor, this typically involves defining details of dental surgeries and dentists cooperating with the prosthetic lab. During training, end users are acquainted with detailed functionality of contractor and product sheets, which then need to be supplemented by the end user to include new contractors and products.

The next stage of the process is **preparation of prosthetic models and standards**. This task involves definition of typical stages of manufacture process as used in the lab (for example, porcelain crown on metal is realized in two stages: preparation of metal form and porcelain baking) as well as specifying divisions responsible for each such stage, if applicable (in this case: Metals Division and Porcelain Division). This allows for the automation of the labor division at the initial stage of order placement. The models stored in the database may be further modified at will or used as templates for new models. This stage of the implementation process helps the end user get acquainted with the functionality of model definition, using templates, storing and modifying the models, etc. At this stage, only a few selected models are prepared and stored in the database, with further additions and modifications made by end users during the regular utilization of the suite. In practice, this stage involves the input of current orders only, coupled with the definition of the applicable standards. All configured elements of the suite are stored on the applicable order sheet. At implementation, the end user is acquainted with the basic functionality of the order sheet after prior definition of prosthetic standards. This stage may also involve defining the contractor (surgery), patient details, stages of prosthetic work and individual employers responsible for each stage of the order.

The next step is the **definition of price lists**. Price lists can be configured to cover internal settlements (employees) and external settlements (surgeries, dentists, or patients). Once defined, price lists are used to generate **test run settlement** of

current orders, combined with functionality of the order sheets. Culmination of the stage takes the form of a comparison between manual and automatic settlement of current orders – if the test results are positive, the end user may proceed with the regular utilization of the software suite. In the initial period, settled individually and related to the implementation range, the prosthetic lab is under the increased guidance of a 4-Tune IT consultant, remotely providing real-time assistance and solving potential problems found during the regular utilization of the suite. After this period, a protocol for the finalization of the implementation process is signed, and the provider enters the servicing mode.

It must be emphasized that on each consecutive stage of the implementation process the 4-Tune IT consultant is actively involved in **customization of the interface** to the needs and requirements of the end user, as well as providing applicable knowledge of how to perform this task using the Administration panel tools of the suite.

The software maintenance process is the customer services delivered after the end of the Protetic4You implementation. The (IEEE 1219) software standards document – Software Engineering – Software Life Cycle Processes – Maintenance or (ISO/IEC 14764) defines software maintenance as: *the modification of a software product after delivery to correct faults, to improve performance or other attributes, or to adapt the product to a modified environment*. The software maintenance process in 4-Tune IT includes **software service and updates**. The software service consists of assistance for software users and correction of software errors. The software updates are changes in software according to the current needs of its users.

The software service especially includes:

- the removal of previously undetected errors and shortcomings of the software,
- the removal of errors connecting with improper use of the software,
- hot-line and advice on solving current user problems,
- solving current problems with software configuration,
- starting-up new software functionality,
- remote training and assistance.

The software updates are initiated by: the new needs of its users and changes in the law. The feasibility study and also the functional and technical designs are always made before implementation of the new functionality in the software. Then the changes can be made in the software, but some users have to pay for them and others get them for free because they pay a monthly service fee. This depends on the individual agreement with each software user. When users have to pay for the changes in the software they get the information about the price of the programming work and have to accept it before the development of the software gets started. When the programming work ends the tests get started. The tests includes: internal tests made by employees of the 4-Tune IT company and acceptance tests made by users of the software. After the tests have ended, the changes in the software are implemented in software used by the real users in real everyday work with the program. During

the internal tests the documentation of the software change for users is made. The functional and technical designs made at the beginning of the update process are the basis for the documentation created at this stage of the process. The users get this documentation during the training of the introduced software functionality.

## 5. Conclusions

The virtualization of business processes represents an effective use of information technologies as one of the key determinants of success and a strategic resource of a modern company. Information technologies open up new potential for operation and transform both the means and methods of economic activities [Brzozowski 2010, pp. 89–91]. The use of virtualization potential in the process of IT system implementation and maintenance offers ways of 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 the 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.

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## NARZĘDZIA INFORMATYCZNE WYKORZYSTYWANE W PROCESIE WIRTUALIZACJI WDRAŻANIA I UTRZYMANIA OPROGRAMOWANIA

**Streszczenie:** Wdrażanie nowoczesnych rozwiązań technologicznych pozwala firmom reorganizować ich działalność. Zdalna obsługa procesu wdrażania oprogramowania oraz jego utrzymania oznacza dla firm informatycznych nowe podejście do uzyskiwania przewagi konkurencyjnej. W praktyce bowiem daje to możliwość obniżenia kosztów, a tym samym cen usług. Ponadto procesy stają się niezależne od położenia geograficznego klienta i kontrahenta, co pozwala na znaczne skrócenie czasu reakcji na zgłaszane problemy i pomaga w zapewnieniu wyższej jakości usług. Aby sprawnie i szybko realizować wirtualne procesy wdrażania i utrzymania, należy korzystać ze wsparcia odpowiednich narzędzi IT. Celami artykułu są ich zaprezentowanie oraz charakterystyka.

**Słowa kluczowe:** wirtualizacja, wdrażanie IT, utrzymanie oprogramowania.