Design, Implementation, and Deployment of On-the-Job Training Systems in Large Scale Organizations*

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Abstract: *In this paper we summarize the best practices in design, implementation and deployment of the efficient on-the-job training system in the modern organization. Later the ADONIS on-the-job training system developed in our organization is presented. Although it was initially targeted at the simultaneous use by many small and medium size enterprises the ADONIS system with its distributed and scalable architecture is robust enough to be applicable in the large-scale organizations as well.*

***Keywords*:** *on-the-job training, on-the-job training systems, e-learning solutions, on-the-job training blueprints, knowledge management.*

Introduction

In order to be competitive, modern organizations have to leverage the enormous quantity of information about new technologies, markets and competitors. That is why the managers require staff to be able to learn new methods, procedures, and technologies and to develop their skills on-the-fly. As the traditional learning methods are not flexible enough to cover the increasing gaps of the required and available knowledge and skills of the employees, modern organizations emphasize on web-based solutions to gain additional productivity and efficiency. These IT solutions become a foundation of the On-the-Job Training (OJT) systems deployed throughout the organization. With the help of the OJT system the organization gains the following advantages: collecting and saving the existing knowledge resources in more accessible, convenient, and learning oriented format; quick distribution and efficient reuse of information and knowledge; the organization is always in touch with the constant changes.

On-the-job training is one of the best training methods that is planned, organized, and conducted at the employee's work site, by which a person receives "hands-on"

job training [7]. This training is important because it grounded in real-life practice and will generally be the primary method used for broadening employee skills and increasing productivity. It is particularly appropriate for developing proficiency skills unique to an employee's job – especially jobs that are relatively easy to learn and require locally-owned equipment and facilities. Morale, productivity, and professionalism will normally be high in those organizations that successfully develop, implement, and deploy a sound OJT system.

The underlying OJT information system provides tools and utilities based on contemporary information technologies [6]. They give opportunities to the course authors, tutors, instructors, and trainees (learners) to be more efficient in authoring, maintenance, presentation and usage of the e-learning content. Some software systems that can be used to support OJT training in the organization are the following:

• TATS (The Task Analytic Training System) model is a performance-based, hands-on approach to developing, implementing, and evaluating a structured OJT program that can be applied to a variety of manufacturing settings [12].

• TrainingFolks [13] provides just-in-time training solutions to premier organizations around the world that require seasoned training and development professionals on demand.

• NetSpeed leadership [14] is training system of supervisory and management training, which helps managers grasp and apply proven management techniques immediately.

• Customer training for-profit solution suite [15] – it helps to increase revenues and maximize profits with scalable e-learning (allows to create training storefront, to manage courseware and customers, and analyze the learning results on a daily basis).

• Testcraft system is web-based testing system [16]. It provides simplistic solutions to meet the specific assessment needs of Business, Academic, Government, and Non-profit organizations of any size.

• Ariadne [8] is representative on the Course Support Systems (CSS). It allows the learning materials and professional knowledge and experience to be used repeatedly and simultaneously ("share and reuse").

• TopClass [9] is one of the first attempts for CSS. It follows the idea for a "virtual class room".

• WebCT (Web Course Tools) is a system [10], which supports the creating of environment for WWW based learning.

• TeleTop [11] is web-based system, which contains large number of courses.

The basic features of OJT systems are [4]:

• The location in which the learning takes place is a work place and the nature of the learning process is largely similar to the working environment;

• The trainees produce regular working products and services;

• The activities include "hands-on" experience;

• The training is highly similar to the current or future everyday tasks.

Using modern information and network technologies as a foundation of its OJT system the organization obtains the following facilities [5]:

• Mobile learning environment;

• Helpful in time-pressed situations;

• Good for self-motivated employees;

• Eager to master skills on own-terms;

• Supplement for traditional instructor-led training.

A sound OJT system in the organization introduces the following advantages for different groups of people:

- For employers:

− instructors (supervisors) and managers are able to utilize available resources to train, qualify, and develop their employees skills;

− economic reasons for employers to improve the skills of all their workers – more flexibility and improvements in productivity.

- For employees:

− less "downtime" for employees as they do not have to travel, the learning can be delivered around their shift if needed and can be shown to be directly relevant to their job;

− the training in the workplace enables trainees to learn an occupational skill and earn a paycheck at the same time, and offers the chance to improve their skills in an environment with which they are familiar and feel secure;

− for self-motivated employees this is a possibility to improve their skills and to raise their opportunities for a higher position.

- For lower skilled people:

− for lower skilled people this is a good chance, because they tend to have a negative experience in formal learning situation;

− a social and economic reason to raise people's skills - makes them more employable and more confident of their lives.

Implementing of OJT System in the organization

The foundation of the OJT system in the organization is specifically crafted e-learning system that has to implement the following subsystems:

Content objects	The courseware content is usually modularized, split to multiple "learning objects" that are presented to the trainee according to her/his current performance on the test results. Thus the learning process is adaptive to trainee skills, abilities, and knowledge.
Groups of interests	Online groups of learners, comprising people with similar interests, skills, needs, etc.
Online monitoring and advices	Provide feedback to trainees, tutors, instructors, and authors, sharing ideas, comments, collaborative activities.
Multimedia and Hypermedia	Rich content of the presentation and "eye-candy" effects are significant incentive for the trainees to broaden they knowledge, skills, activities, participation.
Groupware and teamwork	Software for online conferencing in the geographically distributed and heterogeneous environment.

For long term competitiveness, a total approach to OJT is needed. It means looking at the business, organizational and individual needs of all levels of staff in the

organization. This approach begins with long-term needs analysis that examines business imperatives to determine work processes and jobs that are critical for sustaining competitiveness. Also a plan for developing, implementing, evaluating and monitoring OJT has to be developed in advance. Organizations have to put in place four main stages [2]:

1. *OJT Needs Analysis* − examining business imperatives, determining work processes and jobs that are critical for sustaining competitiveness and identifying staff requiring OJT.

2. *OJT Blueprint Development* − development and review of the OJT blueprints[1] for the critical work processes and jobs identified.

3. *OJT Implementation* – allocation of the resources and implementation of the OJT for the critical work processes and jobs identified.

4. *OJT Evaluation* − evaluation and improvement of the effectiveness of the OJT in achieving the strategic business objectives.

Fig.1 shows the stages needed for successful development and deployment of the OJT system in the organization.
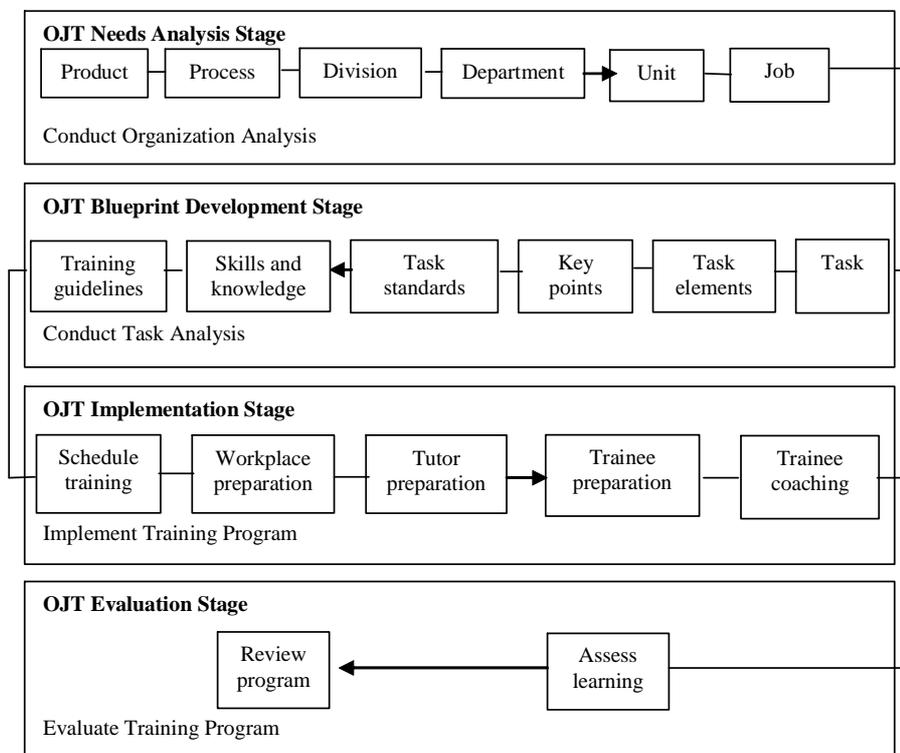

Fig. 1. OJT system development and deployment stages in the organization

In the process of OJT system deployment, the organization has to take into account the following best business practices:

[1] OJT blueprints assure quality and consistency in the delivery of OJT. With blueprints, organizations can quickly train up their staff to meet established standards of performance.

- *OJT needs analysis stage:*

− This stage is conducted organization-wide annually;

− It identifies work processes and jobs critical for business success;

− The needs analysis determines the OJT required as well as the off-the-job training component needed to support it;

− It identifies staff that needs OJT;

− Instructors are involved immediate in identifying the OJT needs of their staff;

− It provides a schedule for training staff in the critical work processes;

− This stage establishes the OJT blueprints that need to be developed;

− It identifies staff responsible for developing specific blueprints;

− It determines the financial resources and staff required for implementing OJT;

− Deployment of a controlling (monitoring) system for regularly reviewing the needs analysis to ensure responsiveness to changing business requirements.

- *OJT blueprint development stage:*

− For all the critical work processes and jobs identified by the OJT needs analysis are developed OJT blueprints;

− Deployment of a system for monitoring and testing development of OJT blueprints;

− OJT blueprints are organized by main tasks, which are self-contained components of the critical work processes identified;

− OJT blueprints contain task elements for stipulating detailed steps for performing the main tasks;

− By all OJT blueprints are provided key points for ensuring error-free qualify work;

− By all OJT blueprints are stipulated task standards specifying the performance required by staff;

− Deployment of a system for continuously reviewing the OJT blueprints to ensure their relevance.

- *OJT implementation stage:*

− Deployment of a system for allocating financial resources and staff for implementing OJT;

− Deployment of a system for finalizing the OJT schedule;

− In finalizing the OJT schedule are involved instructors, tutors and trainees;

− Deployment of a system for preparing the workplace for conducting OJT, including the provision of training equipment and materials;

− Deployment of a system for preparing tutors for the conduct of OJT (tutors are provided coaching skills for conducting OJT);

− Deployment of a system for preparing trainees for OJT (tutors use five steps approach for coaching trainees in OJT-Demonstration, Guided Instruction, Skills Practice, Independent Learning and Follow-up);

− Information technology is utilized in the conduct of OJT;

− Assessing the performance of trainees to establish the achievement of the task standards set by OJT blueprints;

− Deployment of a system for monitoring and reviewing the implementation of OJT.

• *OJT evaluation stage:*

– Deployment of a system for regularly evaluating the impact of OJT on achieving business objectives;

– The first stage (*OJT Needs Analysis*) has to be evaluated to assess its responsiveness to changing business requirements;

– The second stage (*OJT Blueprint Development*) has to be evaluated to assess its capability for the timely production of relevant OJT blueprints;

– The content of OJT blueprints has to be evaluated to assess its effectiveness in helping staff acquires the necessary critical skills and knowledge;

– The scheduling of OJT has to be evaluated to assess the timely provision of critical skills and knowledge;

– The preparation of the workplace for OJT has to be evaluated to assess the adequacy of training facilities, equipment and materials;

– The preparation of tutors has to be evaluated to assess the adequacy of their skills for delivering OJT;

– The preparation of trainees for OJT has to be evaluated to assess their readiness for training;

– The coaching of trainees has to be evaluated to assess the effectiveness of tutors in facilitating learning through OJT;

– The information obtained by the evaluation stage is used to review and continuously improve OJT in the organization.

Assessment of a learning process is critical for determining the effectiveness of an OJT program. To determine whether workers are equipped with the requisite competencies, organizations have to evaluate the skills and knowledge of their employees acquired through OJT. Thus OJT is an organization-wide learning system involving systematic coaching of workers by instructors or skilled staff using structured training documents known as OJT blueprints.
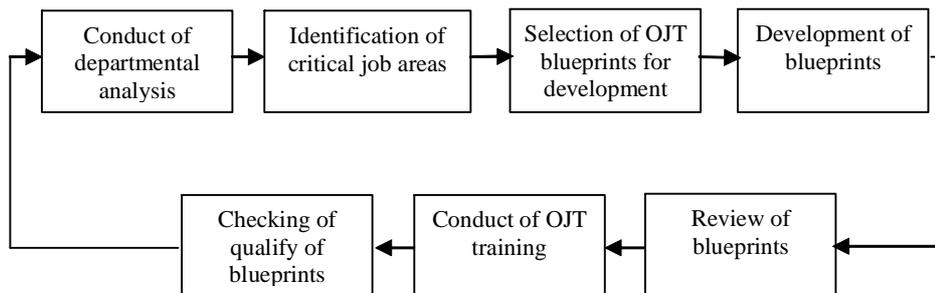

Fig. 2. OJT Blueprint development and implementation stages

Some OJT systems use cases

If the organization aims to be competitive in the long run it should think about how to align business with learning objectives. Some organizations develop custom courses to fit organization's unique business needs [3]. Some of the OTJ approaches that align business with learning objectives are:

- *OTJ solutions focused on application training*

Each start of a new application or business process requires a great deal of time, money, and resources. In this case, the OTJ system improve the efficiency of the business process changes, with consistent, on-demand, and end-user application training that offers faster time-to-competency, more flexibility, greater reach and scalability. Some application training issues and their feasible solutions are shown in Table 1.

Table 1

	Application Training Issues	Feasible Solution
❑	New applications or business processes that require significant changes:	– Deploying consistent, on-demand training as new business processes and best practices
❑	Increasing reliance on software applications as critical enablers of business processes:	– Rapid proficiency with new systems and business processes across all job levels and functions accelerates organizational productivity and efficiencies
❑	The same applications are used in different ways by different employees:	– Hands-on training that adapts to profiles and specific job functions; – pre- and post-assessments are customized to ensure training relevancy and efficiency
❑	Providing a 'safe' environment for hands-on practice with new applications:	– Interactive e-learning features complex, realistic simulations where trainees use the actual application to practice job-specific functions, from within the safety of the e-learning environment
❑	Geographically dispersed and multiple application end-users:	– Cost-effective method for global application training; – Consistent approach to training for all audiences; – Online training accessible anywhere, anytime
❑	Increased requirements for on-boarding new employees at all levels:	– Developing application fluency among newly acquired or temporary workers by cost-effective training model
❑	Scaling application training cost-effectively:	– *Build once, deploy many* e-learning model scales easily to 1000/10 000/100 000 end-users – automatically

- *OJT solutions focused on customer training*

This solution is used when the organization needs ways to increase revenues and maximize profits with scalable training. Some customer training issues and their feasible solutions are shown in Table 2:

Table 2

	Customer Training Issues	Feasible Solution
❑	Constantly changing training needs:	– Easy-to-update courses keep pace with product life cycles; – Customers always have access to the latest version of training
❑	Fluctuating demand for training:	– Lowers fixed-costs associated with instructor-led training; – No change in people or infrastructure required to scale business up or down; – Eliminates scheduling hassles and lost revenue
❑	Geographically dispersed customers:	– Customers can access training from anywhere in the world; – Self-paced courses allow customers to take training when it's convenient for them, including when disconnected from the Internet; – Eliminates the need for customer travel
❑	Scaling cost-effectively:	– Build once, deploy many model. – Scalable to 1 000/10 000/100 000 customers – automatically; – No additional IT or infrastructure investment

ADONIS on-the-job training system [4]

The ADONIS on-the-job training system was developed as part of the Leonardo da Vinci project HU/01/B/F/PP-136029. It is a common framework focused on:

•Covering the profiles and specific needs of the user target groups for working in the e-economy.

•Orienting the learning technologies to specific requirements of the on-the-job-training life cycle.

•Providing learning content oriented towards virtual enterprise activities.

•Simplistic solutions to meet the specific assessment needs of business, academic, government, and non-profit organizations of any size, distributed anywhere in the world.

Fig. 3 shows the overall architecture of the ADONIS OTJ system. It consists of the following software components:

1. Courseware management engine – multilayered ASP.NET application hosted on the web farm;

2. Distributed repository – database cluster (currently SQL Server 2000);

3. exercise servers infrastructure (a cluster of the Windows 2000 Terminal Servers);

4. User nodes – members, learners, authors, instructors, administrators;

5. Users nodes – members, learners, authors, instructors, administrators;

6. Additional housekeeping and support systems (email servers, back-up servers, firewalls, etc) that are not shown on the diagram.
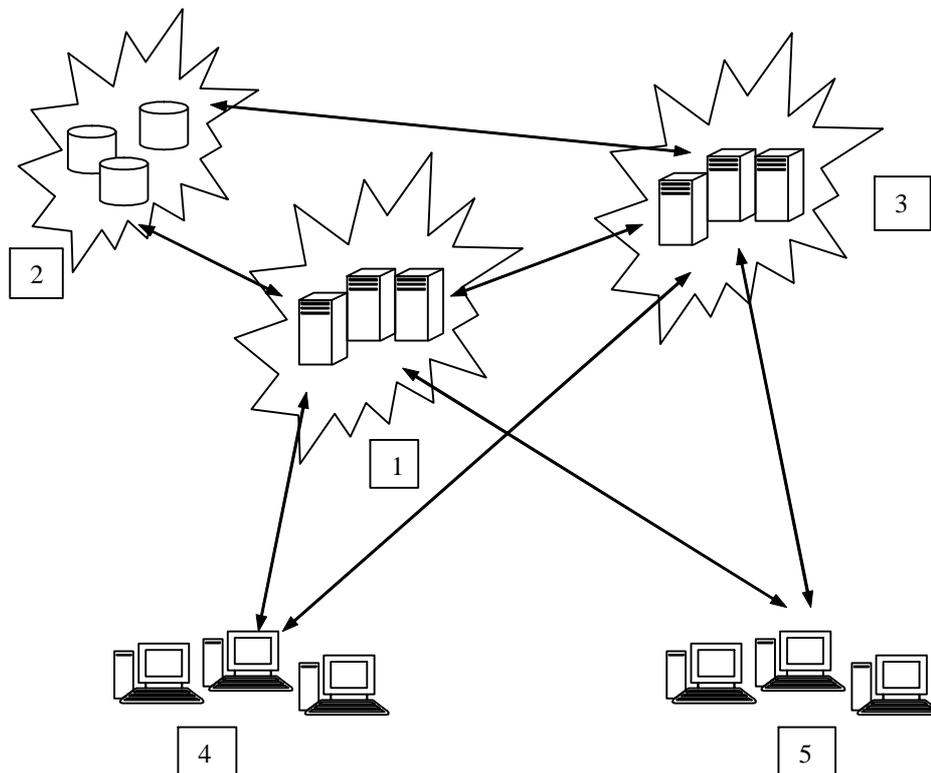

Fig. 3. The architecture of the ADONIS OTJ system

This architecture allows the ADONIS system to scale up and down according to the needs of the organization by just adding (removing) additional servers. As the system is web based, the users can use it from anywhere provided that internet connection is available. More complex exercises that require more than just a web browser are performed (with the help of Microsoft Remote Desktop Connection software) on the exercise servers in the restricted environment – the users are provided only with the software that they need for a certain task.

Upon is creation the system has distributed repository for innovative multimedia courseware in the field of information technologies and e-business with re-usability of the available educational resources and flexible approach to the development of new educational materials. The repository contains training materials (in English and several other European languages) and metadata descriptions according to the educational metadata standards. The validation of the repository functionality has been performed to ensure high quality management of the multimedia data base, re-usability of educational resources and fast-reactivity of the courseware production.

ADONIS can be used to develop custom courses to fit organization's unique business needs: from highly structured content to discovery-based exploration, from information presentation to immersive 3D simulation training – all within an online learning environment. The system has flexible and scalable on-demand e-learning delivery. This ensures consistent learning regardless of organization structure, locations, and audience. It allows organizations to measure knowledge, understanding, and compliance amongst their employees, collaborators, and customers.

Finally we will itemize the scenarios in which the ADONIS OJT system can be applied with the help of specifically tailored extensions:
- Assess product and service knowledge of sales and support staff;
- Assess skills and knowledge;
- Academic assessments (exams, tests, quizzes);
- Measure the effects of training;
- Certification and licensing exams;
- Compliance testing (e.g., regulatory issues);
- Product/service development surveys;
- Pre- and post-training testing;
- Product and service knowledge assessment (sales and support);
- Reinforce learning;
- Academic standardized testing;
- Deliver tests/surveys to measure distance learning;
- Test-prep and practice tests (beta tests);
- Measure employee attitudes;
- Measure customer satisfaction;
- Assess risk (protect against litigation);
- Employee recruitment (pre-employment screening);
- Job role assessment;
- Employee orientation;
- Placement testing;
- Course and assessment evaluations;
- Surveys (client, student/parent, faculty, employee);
- Needs assessment.

Conclusions

To maximize organization and staff efficiencies, enterprising managers have to invest in web-based collaborative solutions to optimize the business processes in the organization. These solutions include a set of applications and procedures, which facilitate access to the information, improve communications, collaboration and learning. The main goal is building a stable web-based foundation, which offers a high level of self-training opportunities. All of these are possible by an integrated, safe, scalable, and network-enabled solution by which the organization can more efficiently train and keep its staff on work.

The main incentives for large-scale use (deployment) of OJT Systems in the organization are:

- Learning process automation;
- Hypermedia courseware content;
- Tools for easy course/module updates, multiple usages and content reuse;
- Saving time and money by screening applicants for potential employees;
- Flexible learning process: depending on the learning goal, the trainee (learner) has numerous opportunities about the different features of the learning process (time, mode, place, learning content, etc.). That allows the trainees to progress according to their abilities; based on their preferences to choose the supplying type and organization of the content; to compose modules that fit to their personalized needs;
- The trainees can get access to valuable content from anywhere, provided that Internet access is available. Thus unlimited content delivery is possible and response times are not dependent on time zone differences;
- Opportunity for joint learning, that allows exchange and sharing of knowledge and content;
- Giving support to the instructors during the training period;
- Organizations can lower or eliminate travel expense for training; eliminate fees on classrooms, reduce time which their experts are spending out of their office and their duties;
- Helping to resolve issues that influence employee performance and productivity.

Finally, it is well known that in the modern organizations staff productivity is strongly related to information accessibility – not depending on whether that information is an organizational information (save staff working time) or, it is a market information (improve relations with the customers). Web-based information systems provide staff with dynamic information they need to make better and timely decisions.

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