PI World 2020 Lab

Successful PI System Adoption Through Staff Training

OSIsoft, LLC
1600 Alvarado Street
San Leandro, CA 94577 USA
Tel: (01) 510-297-5800
Web: http://www.osisoft.com

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1. Introduction

1.1 Overview of Lab

Welcome to “Successful PI System Adoption Through Staff Training”. This lab isn’t the typical hands-on, technical lab we usually host at our conferences. We’ll be looking at the PI System from a different perspective. We’ll be using an educational lens; focusing on how adults learn and what motivates them. We will also be recommending an appropriate learning path for you to present to your colleagues which can assist them on their journey to PI System proficiency. An integral part of this path are the training and support options available from OSIsoft.

Figure 1. Training company staff is an integral part of a “PI System Implementation” project workflow.

Overall, the **aim of the lab** is to help you improve the time to value when adopting the PI System and to successfully facilitate onboarding for people at your company.

At OSIsoft, we’ve been teaching workshop-style classes to our customers for a while now. These are generally 3-hour workshops covering the basics of using our products to accomplish a goal; for example: seeing an overview of an asset in a PI Vision dashboard, or logically mapping out your business operations in the Asset Framework. By the end of these workshops, attendees will have had hands-on, practical experience working in a virtual environment, or even on their own data.

This approach (called *experiential learning*) is a really effective way to learn how to use a new tool because you engage multiple mental and physical faculties and you minimize the distance between the learning environment and the actual environment in which the new skill is to be applied. This increases the possibility of successful memory recall.

 Tip	In this workbook, certain words or phrases are in *italic* when first encountered. This means that a definition of this term can be found in the “Glossary” section.

This is not a technical, hands-on lab, but you will be provided with opportunities to reflect on the format, the content and the structure of the learning process that is more appropriate for your company. This will allow you to then run your own internal workshops for members of your staff.

In this lab, you will:

- consider a sequence of learning events to better instruct your colleagues
- discuss how you might need to modify the material to make it more relevant for your circumstances

- reflect on important learning design considerations
- understand your own learning process and preferences

During this lab, we'll be making the following assumptions:

- your organization already has a PI System set up
- you're familiar with OSIsoft and its suite of products
- you're interested in training your colleagues and easing adoption of the PI System
- you're comfortable with speaking in front of small groups of people

It's okay if you're not a certified trainer or if you've never considered the PI System from a *pedagogical* point of view. The session will help you become familiar with the basic principles of instructional design and ensure that your learning resources are usable, accessible and have an impact on your colleagues.

1.2 Exercise – Meet Your Fellow Attendees

- **Objectives**

- Introduce yourself to the person next to you
- Let them know why you chose to attend this lab and how your company uses the PI System

- Problem Description

Some exercises in this lab will be collaborative. Introduce yourself and break the ice.

- Approach

If you and the person next to you work for the same company, ask them the following questions:

- What's the best presentation or lab you attended at the conference so far (or are excited to attend later)?
- What are you going to do with what you learn when you get back to work?

If you and the person next to you work for different companies, ask them the following questions

- What's your name, role and company?
- What industry are you in?
- Why did you choose to attend this lab?
- How does your company use the PI System?

2. How people learn

2.1 Introduction

We know that brain connectivity is dynamic and remains so even after it matures, with new synapses being formed and others disappearing. Therefore, **learning is a process that leads to change** and as such needs to be managed, since individuals are usually apprehensive of or resistant to change. This attitude usually stems from: i) concerns about ability (skill gap), ii) lack of clarification (rationale for change), or iii) unwillingness (motivational gap). Discussing change management is beyond the scope of this workbook, but for more information we recommend you look at Kotter's 8 stage process of transforming organizations.

 Tip	70% of change projects fail because they are treated as IT projects rather than people projects.

Organizations that are embracing a *growth mindset* are creating a culture of continuous improvement. However, it's important to understand that there isn't one approach to learning that's better than others. What's most important is **selecting an approach that's appropriate for your situation.**

In the following sections we will discuss some research-based and domain-independent principles which can be applied to any learning approach. Having a general idea of how learning works will help you in adapting your approach and ensuring that it's efficient.

2.2 Seven principles of learning

The principles presented here[1] provide instructors with an understanding of learning that can help them see why certain training approaches are or are not supporting learning. This is important in refining training strategies and improving learner retention.

The principles are:

- **prior knowledge** can help or hinder learning
    - identify and address misconceptions; build on existing knowledge and avoid repetition of familiar content
- how learners **organize knowledge** influences how they learn and apply what they know
    - recognize the difference between expert and novice knowledge structures and provide *concept maps* that will help learners develop their own

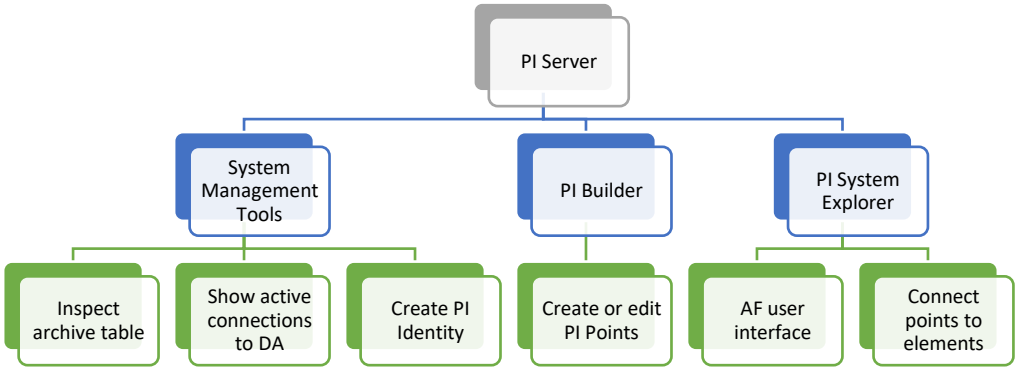


Figure 2. Example concept map of PI tools and features

- learners' **motivation** determines, directs and sustains what they do learn –
    - motivation influences the direction, intensity, persistence and quality of the learning behavior; we'll explore the aspects that drive motivation at a later section of this document
- to develop **mastery**, learners must acquire component skills, practice integrating them and know when to apply what they have learned
    - provide plenty of practice opportunities and assist learners with recognizing their learning gaps (i.e. what they don't know they don't know – unconscious incompetence)
- goal directed practice coupled with targeted **feedback** enhances the quality of learning
    - identify the appropriate level of challenge and highlight to learners how their performance is changing; link feedback to additional practice opportunities and be careful with the timing of the feedback (i.e. how soon, how often)
- learners' current level of development interacts with the **social, emotional, and intellectual climate** of the course to impact learning
    - the climate in the training room has implications for learning and performance; climate is determined by trainer - trainee interaction, tone of instructors, instances of stereotyping, audience demographics, trainee to trainee interaction and range of perspectives considered.
    - strategies for creating a climate conducive to learning include not asking individuals to speak for an entire group, using multiple and diverse examples, establishing ground rules for interaction, getting direct feedback on the climate
- to become **self-directed** learners, they must learn to monitor and adjust their approaches to learning
    - meta-cognition is the process of reflecting on and directing one's own learning; learners should learn to assess the demands of a task, evaluate their knowledge and skills, plan an approach, monitor progress, and adjust strategies as needed

- you can assist learners in being more self-directed by: giving more explicit instructions (e.g. step-by step, checklist), model instructor's metacognitive process (i.e. think out loud as you're working through a task), offer learners opportunities to reflect on their own work and the work of peers

In the following chapter, we'll see how these principles can be applied in practice to create a holistic training approach. Trainers must consider themselves designers and in the next pages we'll discuss what they need to know to design training effectively and how they can test and improve their designs.

2.3 Adult Learning

This section will focus on the concepts and theories of how adults learn. Also referred to as a*ndragogy*[5], this is the process of helping adults learn. You are perhaps more familiar with the term pedagogy. This refers to the process of teaching young children and mainly focuses on learning for the sake of learning. On the other hand, adult learning emphasizes learner motivation and connects new knowledge or skills to practical application.

Malcolm Knowles promoted the six principles of adult learning:

- **rationale**: adults need to know the reason they're being asked to learn by explicitly conveying to them the purpose and benefits
- **experience**: adults already have prior experience which can be utilized as the basis of learning activities
- **readiness**: adults are most interested in learning that can have an immediate impact on their professional or personal life
- **problem – centered**: adults learn best when training is problem-oriented rather than content-oriented; training should be focused on helping participants acquire specific knowledge or skills rather than generic content
- **self – directed:** adults like to have control over their own learning content and process; being presented with decisions and feeling included in the planning and evaluation of instruction increases their sense of ownership of the content and experience
- **community:** adults like being able to share their past experiences and insights and learn from the experiences of others

2.3.1 Rationale = Learning Objectives

Workshops, learning modules, resources etc. should provide clear learning objectives. Ideally, these should be structured with the SMART framework in mind: Specific, Measurable, Achievable, Realistic, Timebound.

- Specific – well defined and focused, define what success looks like
- Measurable - helps determine progress and success rate
- Achievable – small steps to achieve big things, self-awareness
- Relevant – part of a bigger picture, meaningful

- Timely – set a deadline for evaluating progress, milestones

Providing learning objectives allows learners to evaluate whether a training opportunity is appropriate for them, helps establish clear goals and assists learners in measuring their progress. *Bloom's Taxonomy* is a helpful tool for establishing comprehensive learning objectives. We will explore this in the "Instructional Design" chapter.

Offering specific examples can demonstrate how new skills will benefit learners and how new knowledge can serve as a foundational level on which to build upon. This can be motivating, ensuring the necessary effort will be made and time invested.

2.3.2 Experience = Know your audience

Learners have their own objectives for attending a workshop or seminar. By understanding what these are you can structure the learning material accordingly and align activities with expectations. In addition, this will help you recognize content that can be skipped, content that needs to be revisited and what content to present next in order to build upon existing knowledge. Understanding the different roles in your company and the required level of PI System knowledge, will help you customize your learning material accordingly.

2.3.3 Readiness = Performance support

Increasing your awareness of your audience's roles in the company, their learning preferences and professional challenges will help you in providing more targeted learning, which can be accessed at the point of need. This is also called *just-in-time* learning. In other words, performance support is content that can be accessed easily and consumed quickly, and which achieves a very specific learning outcome. Examples of this can be a short video or podcast, a one-page document, a checklist, an infographic and others.

2.3.4 Problem – Centered = Use case scenarios

Adults are interested in solving specific problems which they may have encountered already or are likely to encounter in the future. They are interested in the very practical nature of the knowledge being conveyed and are more focused on developing their competencies and being more productive in their profession. This is why use cases, that are stories grounded in relevant scenarios and authentic contexts allow learners to relate to a situation and makes learning memorable and meaningful.

2.3.5 Self - directed = Options and Decisions

Offering learners opportunities of choice, allows them to personalize the learning experience and gain a sense of ownership of the content and process. They begin to feel empowered and responsible for their progress. Customizable options could include navigation, the sequence of learning events, or the format of learning material.

Another dimension of this is offering learners the ability to monitor and adjust their approaches to learning. This could take the form of checklists, progress bars and even recommendations based on an analysis of the behavior of their peers (for example “after viewing this resource, most learners proceed with…”). Having a personal analytics dashboard could allow learners to reflect on their current behavior, modify learning strategies and facilitate change.

2.3.6 Community = Social media, Discussion forums

Providing plenty of communication and collaboration opportunities is essential for a complete learning experience. Social media and discussion forums can provide the necessary peer support and feedback avenues. By seeing others exchanging views, sharing challenges and discussing solutions, learners feel more motivated to participate themselves, with people having the tendency to view an activity as more worthwhile if others are doing it too[2].

In the *70-20-10 model* of learning and development[6], 20% of learning is ascribed to peer interaction. Encouragement and feedback are prime benefits, but these interactions could also enable learners to develop partnerships, mentoring and collaborations by increasing their awareness of other people’s roles and responsibilities in the organization. The 70-20-10 model is considered to be of greatest value as a general guideline for organizations seeking to maximize the effectiveness of their learning, and development programs.

2.4 Exercise – How people learn

Objectives

- Reflect on your own learning preferences

Problem Description

When participating in training we usually just focus on the material being taught. Let’s take some time to think critically about how that material is presented, the structure and pace of the session and the interactions with others.

Approach

Ask you fellow attendees:

1. How do you decide what you’d like to learn next?
2. What breaks your concentration during a learning experience?
3. What recent learning experience had a big impact on you? Why?

1.

2.

3.

3. Instructional Design

3.1 Introduction

The main components for learning to occur are an enabling environment and a motivated learner. An enabling environment is established through a process called *Instructional Design.* This is the process of structuring a fit for purpose learning experience by combining elements such as: resources, feedback, evaluation and others. It is important to understand that Learning (and Teaching) is a designed activity; it is not something which simply occurs. There are aspects to consider, challenges to overcome and objectives to meet. Moreover, instructional design is an iterative process since it uses the feedback gained from one implementation to improve upon the next.

On the other hand, motivation might be even more important than the environment itself. It has been said that "highly motivated learners will learn, regardless of the quality of the learning experience [2]". The key idea to motivating your audience is understanding who they are, why they are participating and what they hope to accomplish. Beyond that, aspects such as autonomy, mastery and purpose are also critical in structing activities that are engaging and meaningful. We explore motivation in more detail in Section 3.7.

The model presented below, will assist you in effectively designing and implementing your envisaged educational approach. This will enable your trainees to realize their full potential in achieving the intended learning objectives.

Other instructional design models do exist, but we are focusing on the ADDIE model here since it is the simplest and most foundational. These different model types vary based on properties such as organization type, workflow, team and content.

For example:

- For short deadlines, the SAM (successive approximation model) is more applicable.
- For a highly flexible team, the Rapid Prototyping model is recommended, and
- For a focus on behavioral outcomes, the Gradual Release model is more appropriate.

Applying an instructional design model makes learning and teaching design more efficient, since it's a process that can be controlled, evaluated and optimized. You save time by following specific steps that are organized and predictable. Moreover, it's a process that can be documented and reported on.

3.2 ADDIE Model

ADDIE is an acronym referring to the major processes that comprise the generic Instructional Systems Development (ISD) process: analysis, design, development, implementation and evaluation. These processes are considered to be sequential, but also iterative with overlapping boundaries[8]. It is intended to guide individuals

through the creation and evaluation of Instructional (Learning) Design[9]. It is a strategic plan for course design and may serve as a blueprint to design assignments and various other instructional activities[10].

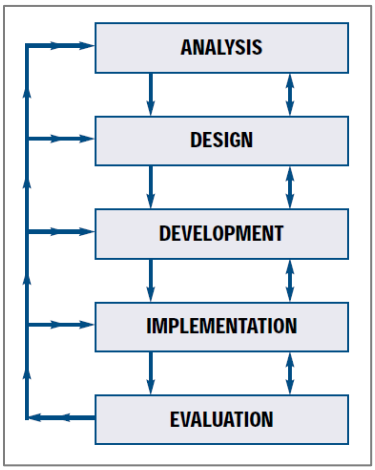


Figure 3. An ISD Model featuring the ADDIE Processes[11]

3.2.1 Analysis

In the Analysis phase, a needs assessment is conducted, and a problem/root cause is identified. The goals and objectives are established, and the learning environment and learner characteristics are determined. The instructor creates a concept map and builds performance measures for the tasks to be completed. Put simply, the instructional problem is identified along with learner characteristics[10].

Key questions to ask in this section include:

- What are the aims and learning outcomes?
    - What are the prerequisites from the previous activity/module?
    - How do these learning outcomes lead into the next activity/module?
- Who is your audience and what do they need to learn?
    - What is the audience's prior knowledge? Is it accurate or inaccurate?
    - What are the delivery options and what will the instructional setting be?
- Consideration of context and environment
    - What is your timeline for module completion?
- How will the trainees' competency be measured?
    - Assessment, feedback, social interactions
- When should the training program be revised?

When establishing the learning objectives, a useful tool to consider is **Bloom's Taxonomy.**

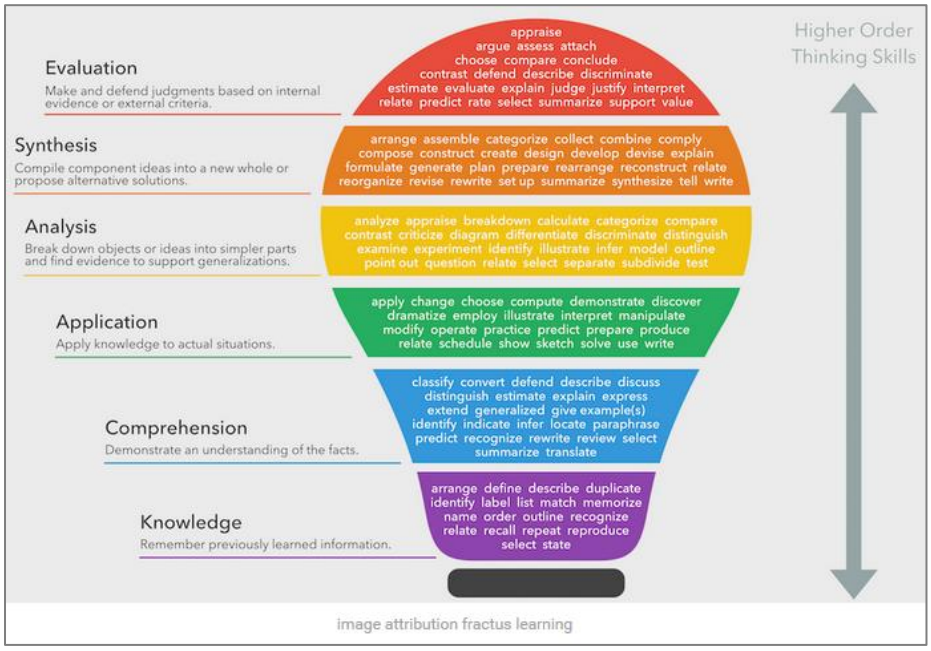


Figure 4. An overview of Bloom's Taxonomy for defining learning objectives

This model divides the cognitive domain (i.e. intellectual skills) into six categories:

- **Knowledge**: remembering, recognizing, recalling
- **Comprehension**: understanding, interpreting, exemplifying, classifying, summarizing, inferring, comparing, explaining
- **Application**: executing, implementing
- **Analysis**: differentiating, organizing, attributing
- **Evaluation**: checking, critiquing, debate, argumentation, critical thinking
- **Synthesis**: generating, planning, producing

Each category is associated with a set of verbs or cognitive processes that describe what learners should be capable of doing. You can then use these verbs to define your learning objectives and ensure you've covered all aspects of the learner journey.

Bloom's level	Key Verbs	Example Learning Objective
Knowledge	list, recite, outline, define, name, match, quote, recall, identify, label, recognize.	"**Identify** the main components of the PI System"
Comprehension	describe, explain, paraphrase, restate, give original examples of, summarize, contrast, interpret, discuss.	"**Describe** how data flows from the Data Source to the PI Visualization tools"

Application	calculate, predict, apply, solve, illustrate, use, demonstrate, determine, model, perform, present.	"**Calculate** Production Rate During an Event"
Analysis	classify, break down, categorize, analyze, diagram, illustrate, criticize, simplify, associate.	"**Analyze** your users' data requirements and examine the infrastructure required to meet those requirements."
Evaluation	choose, support, relate, determine, defend, judge, grade, compare, contrast, argue, justify, support, convince, select, evaluate.	"**Compare** Between Direct OLEDB Connections or Routing Through an External Database"
Synthesis	design, formulate, build, invent, create, compose, generate, derive, modify, develop.	"**Create** a notification based on an Event Frame."

Figure 5. Examples of Learning Objectives using Bloom's Taxonomy[12]

3.2.2 Design

In this phase, an outline of instructional strategies is created and/or learning activities and assessment are determined[10]. Using the information obtained in the Analysis phase:

- apply instructional strategies according to the content type
- develop principles of learning into plans for the learning materials, activities, information resources, and evaluation
- transfer the objectives, solutions, and descriptions of activities into storyboards
- create or collect needed resources (e.g. graphical assets)
- define assessment details: format (e.g. multiple-choice questions, open ended, activities), formative, summative

3.2.3 Development

The Development phase focuses on producing the learning material required to meet the aims and learning outcomes. It is a detailed plan that lists step-by-step procedures, time schedules, and deadlines, and addresses the tools and resources used to create the material.

During this phase you will:

- obtain necessary tools and required training
- create deliverables (e.g. course guides, handouts, presentations, performance support, websites, videos)
- develop activities and assessment
- put everything together

3.2.4 Implementation

In this phase, the designed assets are deployed and utilized. The learning environment is prepared and learning tools are activated. The learners are informed of the timescale, schedule and expected outcomes. The designed educational process is then applied. This means that a workshop, seminar etc. is delivered, feedback is collected and aspects such as accessibility, engagement and learner motivation are examined.

3.2.5 Evaluation

Evaluation is an ongoing process throughout all phases of the ADDIE model to determine the quality and effectiveness of the instructional design, with respect to trainee achievement. It is both the first and last step of the educational process, linking the sequence of iterations. Analyze the feedback you've received and consider changes to future implementations such as revisions to content or structure of the learning material.

The **Kirkpatrick model** is a useful tool for considering the different areas of the approach that you can receive feedback on. It is the most widely used model for measuring training. The four levels of the model are:

- **Reaction** - survey after the session, looking at the training experience from a learner perspective, helps improve training delivery
- **Learning** - measure knowledge, skills and attitudes through tests, simulations or assignments
- **Behavior** – examine whether the new skills were applied back on the job
- **Business results -** which program training goals were met

Other models you could look into include the Phillips ROI model and Brinkerhoff's Success Case method.

✓ Best Practice	By using models such as these you can work out the return on your investment and your training program will be much more likely to receive top-level support.

3.3 Exercice – ADDIE mini-course

Objectives

Try out the "Understanding ADDIE" mini-course to learn more about this instructional design model. Take the quiz at the end to test your knowledge.

Approach

1. Use a web browser to access: https://tinyurl.com/sfw5r83

3.4 Learning Activities

Adults prefer to play an active role in their own learning process, connecting new knowledge and skills to practical applications[5]. Being active when learning aids with both retention and motivation. The advantages of active learning include:

- **challenge** - passive learning learners aren't challenged
- **confirmation** – there is evidence of the knowledge, skills, or abilities that learners have gained
- **feedback** - feedback on performance that will reinforce what learners are doing well and help them improve

Laurillard[3] has identified 6 types of learning activities and associated technologies that can serve them.

- **acquisition** - learner is reading, hearing or watching an explanation of a concept. Examples include reading multimedia, websites, digital documents, listening to podcasts, watching animations or videos
- **inquiry** - learner is prompted to investigate texts, documents, resources using online advice or guidance, analyzing the ideas in a range of digital resources, using digital tools to collect and analyze data
- **practice** - learners are using their developing concepts to improve their actions. Examples here include simulations, micro-worlds, virtual labs, online role-play
- **production** - the way the instructor motivates the learner to consolidate what they have learned by articulating their current conceptual understanding. This includes producing and storing digital documents, animations, models, photos, videos, blogs, e-portfolios.
- **discussion** - learners generate ideas and questions by participating in online seminars, tutorials, discussion forums or using web conferencing tools
- **collaboration** - incorporates discussion, practice, production; learners modulate their actions but also generate a discussion of reasons for them. Tools here include wikis, chat rooms, or collaboration tools for building joint digital output.

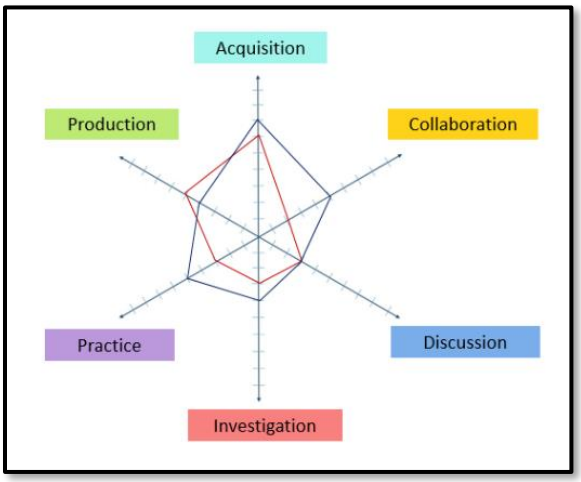


Figure 6. Balancing a variety of learning activity types

So, there are many possibilities here for keeping the learners engaged and for presenting content in a diverse set of formats. To evaluate the diversity of approaches employed in your training offering you could utilize a diagram like the one above. A more symmetrical shape is usually better.

3.5 Exercise – Learning Activities

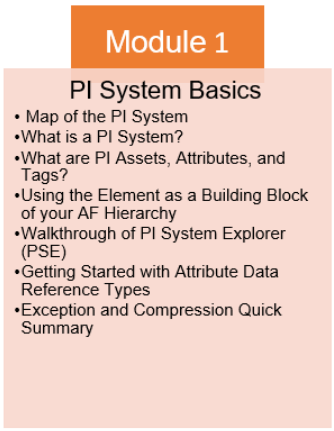
Objectives

- Look at the module contents provided below. Come up with one or two activities which could be used to engage learners. Look back at the previous section of the workbook to remind yourself of the type of activities you could implement.

Problem Description

- Training that focuses on just one or two types of activities (e.g. a presentation and a quiz) can feel stale and unengaging. Try to combine different types of activities such as practice, collaboration and discussion to spice things up.

Approach



3.6 Content Presentation

The type of tools and activities, presented in the previous section, are very important. However, equally important is the approach in presenting this content in an engaging and interesting way, avoiding confusing or overwhelming the learner. In these sections we'll look at four aspects of presenting content and discuss best practices.

3.6.1 Orientation

It is likely your educational content will be hosted somewhere online. This could be a database, a video hosting platform or a *learning management system* (also known as virtual learning environment). It's helpful for learners to be assisted in their familiarization with this environment. This can be achieved through a clear design, appropriately named sections and even a quick overview video by the instructor showcasing the features of this digital space.

In addition, when learners return to the learning environment it's helpful to remind them of their place in the sequence of activities, resources or events with something like a progress bar, so they can resume from where they stopped. Moreover, to avoid having learners shift through all the content in fear of missing any changes or new resources, it is important to communicate these updates effectively through a discussion forum or email notification.

The learning environment should be graphically appealing, including images and color in moderate amount. When selecting graphical elements to use, instructors should foremost consider their educational value and decide against using something simply because it "looks good".

Finally, to assist learners with familiarization with the learning environment, a degree of **consistency** should be maintained across the elements used in terms of design and operation. For example, sections could be organized into similar subsections, the color and appearance of hyperlinks should be exclusively used for them and clicking on a resource should consistently open it in a similar way (i.e. same or new window).

In summary

- ✓Clear navigation
- ✓Easy to find resources
- ✓Assistance with familiarization
- ✓Timely updates on any changes
- ✓Consistency in look and operation

3.6.2 Support

Learners will often be challenged, become stuck, require assistance or would simply like to ask a question. It is important to provide and highlight the possible avenues of communication with the instructor (e.g. contact details, availability etc.), the organization or even their learning peers.

Creating appropriate discussion forums and FAQ documents ensures they don't get lost or feel isolated. In addition, this allows learners to help themselves or for other learners to respond in the place of the instructor. This saves time and effort and is particularly useful and effective with large audiences.

3.6.3 Content

To avoid overwhelming, confusing or demotivating leaners, content should be organized and labelled into smaller sections. This is called **chunking** and is used to expose learners to smaller pieces of information that are easier to manage and comprehend. This is also useful in gradually revealing the bigger idea by bringing all these different chunks together and seeing how they connect in a coherent way. A basic example of chunking is using chapters, subchapters and paragraphs in a document.

Chunking can be structural, as in the example above, but also **temporal**. This means that new information is presented gradually over time, allowing learners to review and practice. Research tells us that recall is increased by spacing learning over time[13].

Also, presenting content in a **variety of ways**, utilizing different types of media and incorporating alternative approaches will increase the accessibility of the material and cater for a number of trainee learning preferences. This variety of resources and activities should include opportunities for collaboration, communication, choice, community building, production, ownership of content and feedback.

An important aspect of presenting content to learners is managing their **expectations**. This can be achieved by providing adequate descriptions, revealing learning goals and providing estimates on the time required for engagement.

Finally, when different types of media are used, **accessibility** issues should be considered. All files should be uploaded in standard and popular formats with videos and audio accompanied by subtitles and transcripts. For more information on accessibility, search online for "*universal design principles for learning*".

In the end, bringing this all together effectively means that the **content flows** logically, naturally and is interlinked.

In summary

- ✓Chunking
- ✓Variety of presentation methods
- ✓Expectation management
- ✓Logical and natural flow of content
- ✓Accessibility considerations
- ✓Opportunities for collaboration, communication, choice, community building
- ✓Reveal content gradually

3.7 Learner Motivation

Motivation refers to the personal investment that an individual has in reaching a desired state or outcome. Motivation will be highest if a goal is valued, and expectancies for success are positive, and the environment is perceived to be supportive[1].

In his book Drive[4], Dan Pink reveals that people are most motivated by:

- **Autonomy** - opportunities to be self-directed
- **Mastery** - the opportunity to get better
- **Purpose** - contribute to something meaningful

There is a variety of ways to actualize these aspects in the digital learning environment.

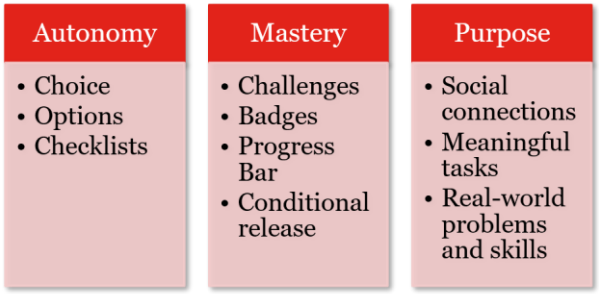


Figure 7. How motivational aspects can be technologically facilitated

3.7.1 Autonomy

Offering learners opportunities of **choice**, allows them to personalize the learning experience and gain a sense of ownership of the content and process. They begin to feel empowered and responsible for their progress. Moreover, by utilizing **checklists**, the instructor can communicate task details and goals and ensure that learners stay on track. This way, learners are provided a path for completing a complex task, they understand what is required of them and are in control and accountable for their own performance.

3.7.2 Mastery

Learners enjoy making progress, meeting challenges and completing goals. Instructors can utilize this by setting tasks such as problem sets or quizzes that are right on the edge of the learners' knowledge and skills. Moreover, learners like sharing their successes and competing or comparing their performance with others.

Design-wise you can facilitate this by implementing **badges** and associating them with activities, outcomes and desired behaviors. Digital badges are validated indicators of an "accomplishment, skill, quality, or interest that can be earned in many learning environments. Recent evidence[17] suggests growing acceptance among employers of badges as a means to evaluate potential employees.

According to Antin and Churchill[14], badges serve a number of different purposes, contributing to maintaining learner motivation:

- **Goal setting**
    - badges challenge users to meet the mark that is set
    - "conceptual consumption" - individuals sometimes "consume" goals and the experience of striving for them
- **Instruction** - learners gain an understanding of what activities are available, valued and expected
- **Reputation**
    - a summary of interests and engagement level
    - information about expertise, skills, preferences
    - an essential tool for determining reliability
- **Status / affirmation**
    - can be used as status symbols, bragging rights
    - serve as reminders of past achievements, milestones
- **Group ID**
    - Indicates shared experience, solidarity
    - stimulates increased collaboration and group identification

Badges also offer a fun, competing factor which assists in the *gamification* of the learning process; learners who are having fun and are engaged in the learning process will have better retention and recall of content.

Goal setting is most effective when users can see their progress; since people often escalate their efforts when they know they are near their goal. Therefore, a **progress bar** is also a handy tool; learners get a sense of their completion rate and are assisted in managing their time, effort, and workload.

Conditional release is the practice of restricting learner access to certain resources or activities until specific conditions are met. For example: a learner cannot access the content of "Section 2", before receiving a passing grade on a quiz in "Section 1". This allows instructors to monitor trainee progress and ensure that learners proceed to more advanced content only when they are ready to do so.

Off-the-shelf Learning Management Systems (LMS) usually include badges, progress bars and conditional release capabilities as standard features of the software. To take advantage of these, an LMS solution is recommended for hosting and presenting educational content.

3.7.3 Purpose

A sense of purpose arises when learners understand the connection between what they are learning and how it applies to their personal or professional lives. This includes engaging in meaningful tasks, connecting to other people, building groups and communities, celebrating the mastery of content, sharing successes and failures, collectively overcoming challenges and reflecting on real world problems.

3.8 Exercise – Universal Principles of Design

Objectives

- Choose 3 of the design principles listed below and do a little internet research to learn more about them. We'll discuss your insights and findings in a few minutes.

Problem Description

- This a just a sample of the principles that are critical to successful design[18]— no matter what the context. Anyone who creates, designs, engineers, or illustrates will learn invaluable lessons that can take their work to the next level.

Approach

Choose two principles that you are least familiar with and find out more about them. How can you apply this principle in designing a better learning experience / environment?

- Desire lines (tip: search for "desire lines in web design")
- Hick's Law
- IKEA effect
- Scaling fallacy (tip: search for "scaling fallacy in web design")
- Five hat racks
- Flow (tip: search for "flow learning theory")

3.9 Performance Support

One of the main challenges of training is assisting learners in transferring what they have learned to performance in their own work environment. Performance support (also known as job-aid) options cover the missing link between training and effective on-the-job performance[15].

Performance support needs to be an easily accessible resource, used for troubleshooting or when employees are knowledgeable about a task and just need a little help applying that knowledge. Different forms of performance support include checklists, job aids, reference guides and short how-to videos.

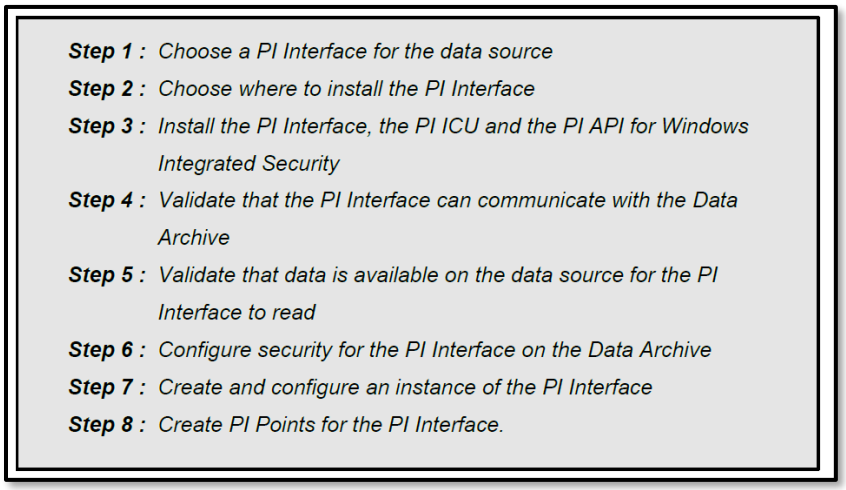


Figure 8. A PI Interface installation checklist

Deciding when to offer comprehensive training versus performance support can be challenging. In general, we propose that the decision is based on elements such as: the scope, complexity, time required, and criticality of the required task. Usually, training is more appropriate when individuals are leaning something for the first time, are seeking an update to existing knowledge or require support with a complicated set of tasks. On the other hand, a job-aid can be used for troubleshooting, following a step-by-step process, making a decision or as a walkthrough of a simple task.

As another example, we provide here a **quality assurance checklist** which you can use to ensure that you have included all the elements which will assist learners in engaging with the learning resources, participating in activities and communicating or collaborating with their peers through the digital education space.

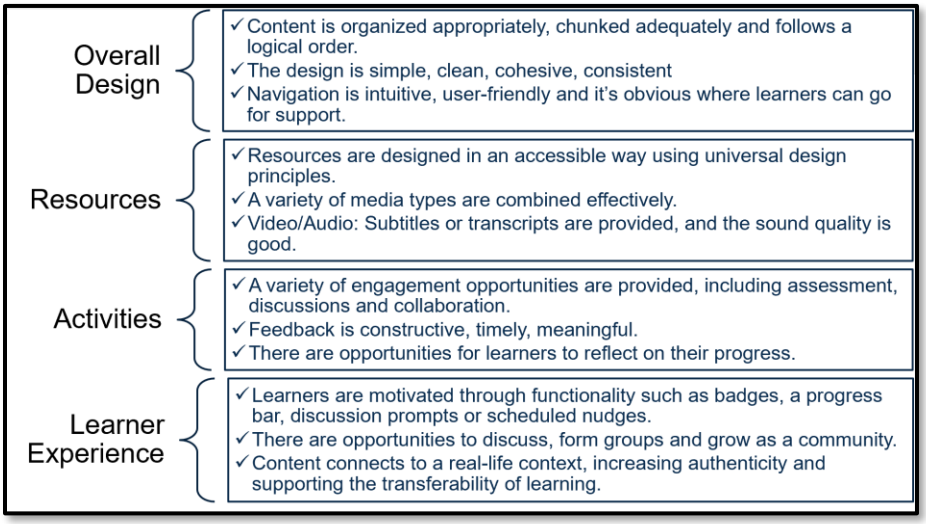


Figure 9. A quality assurance checklist for educational modules

Alternative approaches to quality assurance can be found by searching online for:

- **Blackboard Exemplary Course Rubric** - The Blackboard Exemplary Course Program (ECP) recognizes course creators whose courses demonstrate best practices in four major areas: Course Design, Interaction & Collaboration, Assessment and Learner Support.
- **Pearson Learning Design Principles -** These principles offer solid reference points for targeted aspects of how people learn. Each has been vetted by stakeholders across Pearson—and in some cases outside experts. Each is tailored for direct application in product and feature development work by teams: data analytics, metadata, content architecture, user experience, and learning services.

4. Overview of OSIsoft learning options

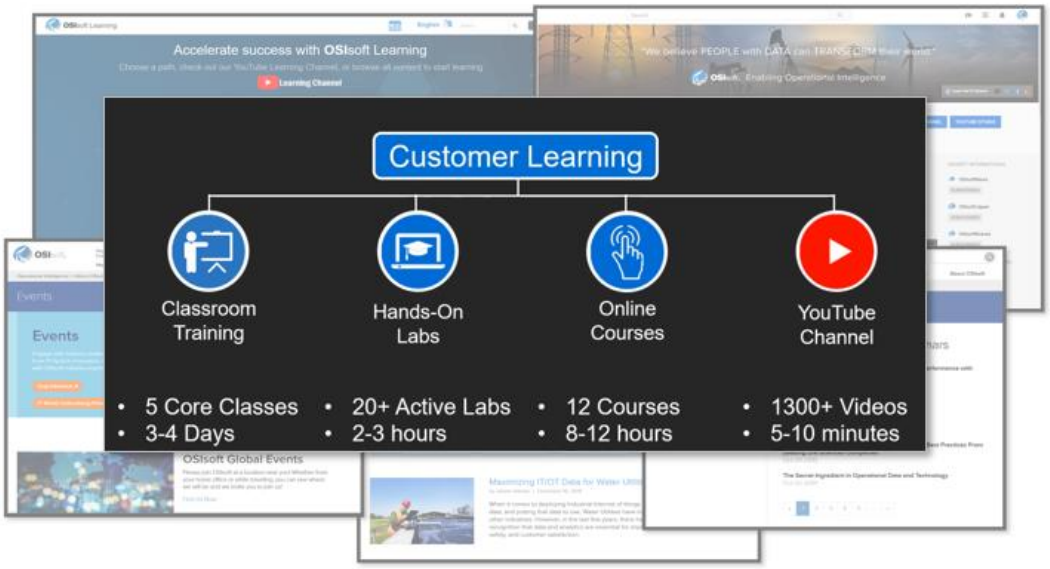


Figure 10. Our extensive range of learning options

At OSIsoft our customer is the most important asset. That is why we are focused on developing a variety of learning offerings to help customers achieve the best possible results with our products and accelerate their path to value.

4.1 learning.osisoft.com

Visit our award-winning[16] Virtual Learning Environment to sign up for our online or classroom classes (https://learning.osisoft.com). There are **12 online courses**, with more than 50 hours of content, to choose from. The content is organized in learning paths appropriate for specific user roles: administrators, users, developers, and power users.

You can also register for any of our **6 instructor led training sessions**, conducted in one of our 14 OSIsoft learning centers around the world. For our new customers we recommend: i) PI System Administration for IT Professionals, ii) Building PI System Assets and Analytics with PI AF, iii) PI System Architecture, Planning, & Implementation, and iv) Visualizing PI System date with PI Vision. See Figure 11 for details.

The workbooks from all our courses are available for free download and use at your facility. Moreover, any course video content can be audited for free on our YouTube learning channel.

4.2 YouTube learning channel

Join the more than 12000 subscribers of our OSIsoft Learning channel on YouTube and access more than 1000 videos including our range of online courses, individual walkthroughs, troubleshooting and new features videos.

Among other things our playlists include “Visualizing Data with PI Client Tools” where you can learn more about PI Vision, PI ProcessBook and PI DataLink; “Administering the PI System” with videos on PI System basics, installation walkthroughs and PI Server Security; and “Asset Framework” with information on analytics, event frames and notifications.

Title	Level	Online	Product Group
Building Asset Hierarchies with PI AF	Beginner	✓	AF / Analytics
PI System architecture, planning and implementation	Beginner	–	AF / Analytics
Building PI System Assets and Analytics with AF	Intermediate	–	AF / Analytics
Configuring Analytics with PI AF	Intermediate	✓	AF / Analytics
Enabling Condition Based Maintenance (CBM)	Intermediate	✓	AF / Analytics
Developing Applications with PI AF SDK	Beginner	✓	Data Access
Programming in PI Web API	Beginner	✓	Data Access
Exposing PI Data with the PI SQL Framework	Beginner	✓	Data Access
Analyzing PI System Data	Intermediate	–	Data Access
PI System Administration	Beginner	–	Data Archive
Configuring a Simple PI System	Beginner	✓	Data Archive
Implementing PI System High Availability	Beginner	✓	Data Archive
Configuring PI Data Archive Security	Beginner	✓	Data Archive
Visualizing PI System Data with PI Vision	Beginner	✓	Visualization
Visualizing PI System Data (Clients)	Beginner	–	Visualization
Creating Basic Reports with PI DataLink	Beginner	✓	Visualization
Building Displays with PI ProcessBook	Intermediate	✓	Visualization
RtReports Administration	Advanced	–	Visualization

Figure 11. Our current full offering of courses on learning.osisoft.com

4.3 Events, blogs, webinars

At OSIsoft events attendees have the chance to understand how to get more from the PI system, hear about the latest industry trends and meet with OSIsoft engineers to get deeper insight into OSIsoft's product offerings.

Explore our events page (https://tinyurl.com/txtc3kp) to find upcoming OSIsoft events in your area or watch recordings of keynotes and presentations from previous events. Regularly visit our blog (https://tinyurl.com/ua87lxa), to keep up to date on information about our products, customer stories and related topics. Finally, register to attend one of our upcoming webinars or watch previous webinars on-demand (https://tinyurl.com/unn32kh).

4.4 AF Example Kits

The AF Example Kits demonstrate how to address simple, industry-specific business problems with the Asset Framework (AF) and other asset-based PI tools. Each example kit is a ZIP file that contains the AF database definitions and related files. This allows you to install and explore in your own AF Server common use cases such as: downtime tracking, condition-based maintenance and others. Visit the example kit page here: https://tinyurl.com/rkf2b38.

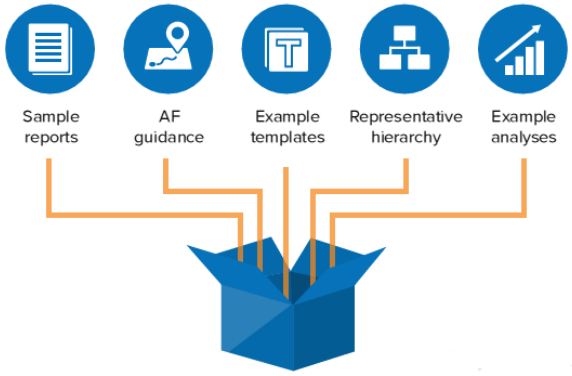


Figure 12. AF Example Kits help you practice on common use cases

5. Recommended approach

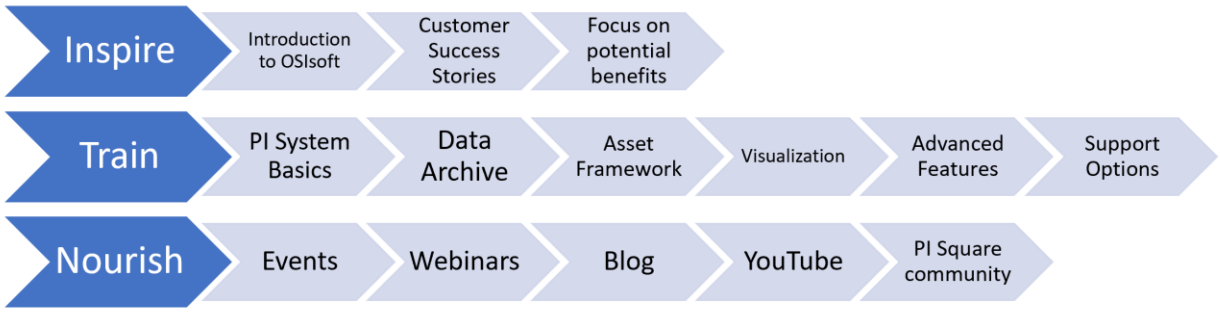


Figure 13. Stages of introducing the PI System to your colleagues

5.1 Inspire

Getting everyone interested in what you have to say and being enthusiastic about what is to come is incredibly important. Some points to focus on include:

- Introduce OSIsoft and the PI System but keep it short. The 2 minute video on "OSIsoft: What we do" will keep the audience engaged and inform them about the fundamentals: https://youtu.be/C5S3ogZ_0oM
- Concentrate on the "why" for now, rather than the "how" or the "what". Make the content interesting and relevant by briefly presenting some Customer Success Stories related to your own industry. You can search our customer stories here: https://tinyurl.com/sdotbpk
- Also concentrate on the "why" at the personal level: impact on skills, benefits to process etc. Use specific examples for scenarios from your workplace that fit the PI System well. Give only a brief overview of features and functions.
- Ask your attendees questions and have them express how they can see themselves using the PI System. Organize activities or online spaces, for them to share their thoughts.
- Rather than simply showing slides, present the final product of a workshop; for example, a PI Vision display.

5.2 Train

In the final steps of a PI System implementation, you'll need to train your users. There are a few options here, including online and classroom-based training. This could be a selection of courses from our leaning.osisoft.com offerings (Figure 11), an OSIsoft training session at your facilities or a customized workshop you've setup yourself.

Arguably, the most effective method is to run a workshop-style class, where the attendees use the solution you've built, work on actual data with use cases that are

meaningful to them and start to realize how to apply it on the job. This greatly assists participants in the transferability of learning from the classroom to the workplace.

Any advanced or specialized training will depend greatly on the user's role within the organization. In the most basic case however, it is recommended that users complete the training in one of the two sequences presented below.

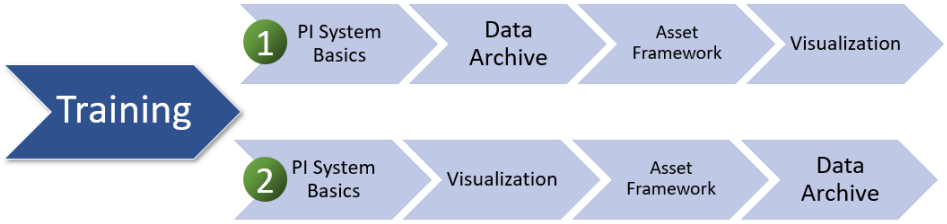


Figure 14. Suggested pathways to learning the PI System

In path 1 we're following the data as it's stored in the Data Archive, organized and contextualized in the Asset Framework and then presented in one of the visualization tools. Path 2 is the reverse of this. Sometimes, it's more engaging to impress the audience by showing the data displayed visually in a dashboard and then work backwards to trace the origin of the data and how it's structured internally.

Regardless of which path you prefer, if you're structuring your own learning courses, the table in Figure 15 should be helpful in identifying key areas to focus your *curriculum design*.

Module	Content
PI System Basics	• Introduction to OSIsoft • Components of a simple PI System • PI Time • PI System Architectures and planning • Installing and configuring a PI Interface
Data Archive	• PI Points and viewing data in the Data Archive • Managing the Data Archive • Assets, Attributes and Templates • Backups and Buffering • Data Archive Security (Identities, Mappings, Trusts)
Asset Framework	• Connecting to a Data Archive • AF Modelling, Templates • Asset Analytics and Formulas • Event Frames • AF Security • Notifications and Contacts • Condition-based Maintenance

Visualization	• PI Vision
	  • Building basic displays in PI Vision
	  • Graphics, collections, navigation links, multi-states
	  • Analyze event frames
	  • Manage and share displays
	• PI DataLink
	  • Search for PI Tags and PI AF attributes
	  • Compressed Data, Sampled Data and Calculated Data
	• PI ProcessBook
	  • Displays: Element Relative, Status, Linked
	  • XY Plots, Client-side Calculations, SQC Charts

Figure 15. Primary areas of the PI System learning material

During training, make sure to advise you colleagues on who they should contact regarding questions and technical issues. This applies to both OSIsoft services and your internal support structure. OSIsoft offers unparalleled support in 12 languages, garnering a rating of 4.7 out of 5 for customer satisfaction. Customers can ask an engineer from Tech Support, submit a question to the community on PI Square or search the online documentation. Through the myOSIsoft Customer Portal you can request Field Service engineers to provide onsite or remote installations, upgrades or trainings. Alternatively, the Live Library (https://tinyurl.com/uk5stdp) includes online documentation and the most up to date information on all our tools and products.

You will need to design an internal support structure before pushing software to your users. This should be well documented and should be included in the user training program you setup. The most common structures we seen in our customers resemble the following (simplified) diagram:

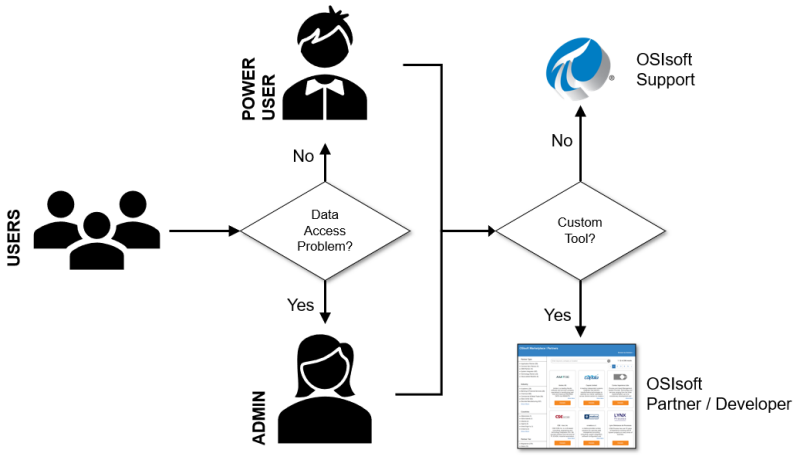


*Figure 16.*Common internal support structure

Your administrators act as front-line support for data access problems (most likely connectivity or security issues), while your power users help with non-data access type problems (usually user error or solution-related). Your front-line support contacts OSIsoft support or the developer of the application they're having the problem with; depending on who owns the application.

5.3 Nourish

While using the PI System and facilitating the digital transformation of your assets, it's important to stay current with everything that's new and under discussion at OSIsoft and in our community of partners, developers and end users, and in the media at large.

Maintain this relationship with OSIsoft by attending our **events**, regularly visiting our **blog page** and participating in our **webinars**. Subscribe to our **YouTube learning channel** to receive updates on new releases, technical walkthroughs and training modules. Thousands of high-quality PI System training videos are available free of charge. Self-paced and delivered by our expert and experienced Field Service Engineers, these videos cover everything from simple trends to complex calculations.

Engage with the community by connecting, sharing and collaborating through PI System discussions with OSIsoft insiders and experts, and fellow users, developers and partners on **PI Square**: https://pisquare.osisoft.com

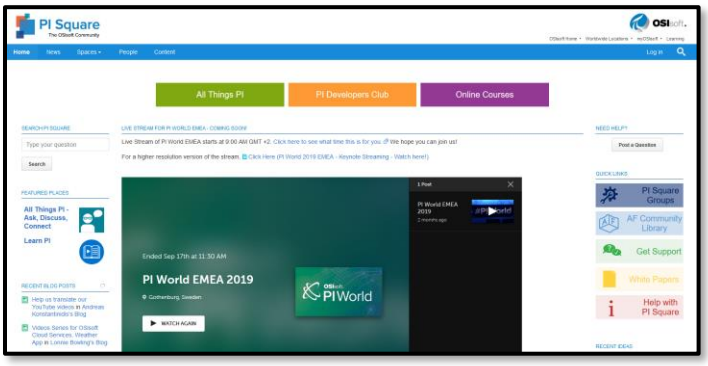


Figure 17. The OSIsoft community gathers in the PI Square website

Finally, don't hesitate to share with us your ideas and feedback on any OSIsoft products or services at https://feedback.osisoft.com/. Here you can also view, discuss and vote on the ideas of others, organized by category such as: Asset Framework, Installation, System Management etc.

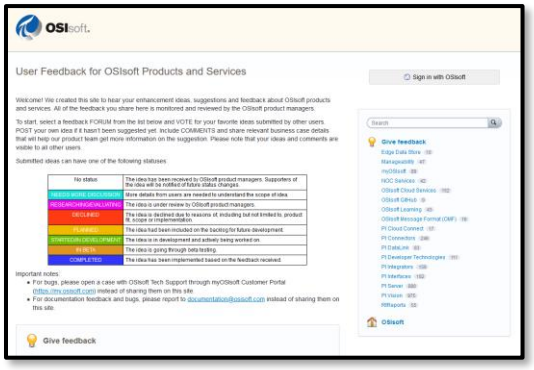


Figure 18. The OSIsoft product and service Feedback Page

6. Your Approach

6.1 Introduction

Putting together a list of comprehensive modules, or even a single workshop requires a degree of preparation. Think back to the Analysis phase of the ADDIE model (Section 3.2) and ask yourself:

- What are you're learning objectives?
- What is the subject and scope of the training?
- What are your technical requirements?
- What are your time limitations?
- Who is your audience and what are their needs?

6.2 Exercise – Workshop Requirements

Objectives

- List the things you'll need to do before running a workshop at your office or site.

Problem Description

There are a lot of things you need to think about before running a workshop at your company. Some things true of most companies are listed next.

- A room to present in, containing:
  - ✓ A projector
  - ✓ One PC or laptop per attendee with access to necessary software and data
  - ✓ A network path to your PI System server
- Security access for you and your attendees to your organization's server
- A completed workbook printed or published to PDF for each attendee– ensure you print or publish the document without markup or remove the instructor comments before printing for your attendees
- Pre-prepare AF models, dashboards, use cases
- (optional, but recommended) attach a PI Tag naming convention document to the end of the workbook, if you have one in your organization
- Practice leading other sections of the workbook, and make sure you know the content

Approach

List out anything you can think of that isn't covered above. What else would you need to do before you run this at your company?

6.3 Exercise – Evaluating the Workshop

Objectives

- Think of ways you would evaluate the impact of this workshop for your specific workplace (think back to the **Kirkpatrick model** presented in Section 3.2.5).
- Share your ideas with the class.

Problem Description

Workshops are not "one size fits all". Everyone uses the PI System differently. Your organization may use PI Vision in a completely different way than we assumed when we put together our learning modules. That's great! Let us know how you'd change this framework to fit your organization, and why. Your instructor will lead a discussion with the class.

Approach

Answer the following questions:

- It is a good idea to create a handout with your tag naming convention and other details for your attendees. What information would this handout contain for your PI System?
- Look at the quality assurance checklist (Figure 9) in Section 3.9. What would you add, remove, change to fit your own organization's needs?

How would you measure the effectiveness of a workshop you run?

7. Continue Learning about Instructional Design

If instructional design is a subject that you're interested in exploring further, you should find the resources provided below helpful.

7.1 MOOCs (Massive Open Online Courses)

https://www.coursera.org	• Get Interactive: Practical Teaching with Technology • Learning How to Learn: Powerful mental tools to help you master tough subjects
https://www.lynda.com	• Learning Path: Become an Instructional Designer • Brain-based eLearning design • Universal principles of design
https://www.futurelearn.com	• Learning Online: Learning and Collaborating • The Science of Learning

7.2 Books & Documents

How Learning Works – 7 Research based principles for smart teaching – Susan A. Ambrose, Michael W. Bridges, Michele DiPietro, Marsha C. Lovett, Marie K. Norman
Design for how people learn – Julie Dirksen
Teaching as a design science – Building pedagogical patterns for learning and technology – Diana Laurillard
Drive: The Surprising Truth About What Motivates Us – Dan Pink
eLearning by Design – William Horton
Badges: 7 Things you should know - Educause, https://tinyurl.com/ujsqstm

8. Glossary

- **70-20-10 model –** this learning model holds that individuals obtain 70% of their knowledge from job-related experiences, 20% from interactions with others, and 10% from formal educational events[6].
- **Andragogy** – the art and science of adult learning (key person: Malcolm Shepherd Knowles)
- **Concept map** - graphical tool for organizing and representing knowledge (concepts and relationships)
- **Curriculum design** - finding the appropriate sequence of concepts and skills
- **Experiential Learning** – learning through experience; this includes making decisions, solving problems and contemplating progress (key person: David A. Kolb)
- **Flow** – being concentrated and totally involved in a task; achieved through a balance of ability and challenge (key person: Mihaly Csikszentmihalyi)
- **Gamification -** the process of using game elements, game mechanics, and game thinking to engage people, motivate action, promote learning, or solve problems
- **Growth mindset** – the idea that intelligence can be developed (key person: Carol Dweck)
- **Instructional design** – design of an environment, process, activities and resources which will help learning
- **Just-in-time learning –** learning resources that are readily available exactly when and how they are needed by the learner
- **Learning Management System -** a software application for the administration, documentation, tracking, reporting, and delivery of educational courses
- **MOOC –** Massive Open Online Courses; these courses are provided free online, are open to everyone and cover a wide range of specialized subjects. Some MOOC platforms are: Coursera, Udacity, EdX, FutureLearn.
- **Pedagogical** – instructional, related to learning and education
- **Universal design principles for learning -** research-based set of principles to guide the design of learning environments that are accessible and effective for all

9. References

1. How Learning Works – 7 Research based principles for smart teaching – Susan A. Ambrose, Michael W. Bridges, Michele DiPietro, Marsha C. Lovett, Marie K. Norman
2. Design for how people learn – Julie Dirksen
3. Teaching as a design science – Building pedagogical patterns for learning and technology – Diana Laurillard
4. Drive: The Surprising Truth About What Motivates Us – Dan Pink
5. Lynda.com: Instructional Design Essentials: Adult Learners: Jeff Toister
6. The 70-20-10 Model for Learning and Development - https://tinyurl.com/y7nzxg4v
7. Learning how to Learn (MOOC) - https://tinyurl.com/ow6fcm7
8. Molenda, M. “In Search of the Elusive ADDIE Model” - http://tinyurl.com/DFE01
9. Marshall, M. “The ADDIE Instructional Design Process”, http://tinyurl.com/nsap98l
10. Davis, A. L. “Using instructional design principles to develop effective information literacy instruction: The ADDIE model”, http://tinyurl.com/p6s23k8
11. Grafinger, D.J. (1988). Basics of instructional systems development. INFO-LINE Issue 8803. Alexandria: American Society for Training and Development.
12. Using Bloom’s Taxonomy to write effective learning objectives, https://tinyurl.com/y934fndc
13. Lynda.com: Brain-based eLearning design, https://tinyurl.com/u6m5ebu
14. Judd Antin, Elizabeth F. Churchill (2011) Badges in Social Media: A Social Psychological Perspective. CHI 2011, May 7– 12, 2011, Vancouver, BC, Canada. ACM 978-1-4503-0268 - 5/11/05.
15. Performance support architecture represents the missing link between training and effective on-the-job performance. Conrad Gottfredson, Bob Mosher, https://tinyurl.com/u2aa4l9
16. Skilljar Recognizes Top Customer Education Programs with Annual Golden Skillet Awards, https://tinyurl.com/sz7wkdx
17. Digital Badges: 7 things you should know, Educause, https://tinyurl.com/ujsqstm
18. Lynda.com: Universal Principles of Design: https://tinyurl.com/yyxgmjeh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Save the Date!

OSIsoft PI World Users Conference in Amsterdam; October 26-29, 2020.

Register your interest now to receive updates and notification of early bird registration opening.

https://pages.osisoft.com/UC-EMEA-2020-Q4-10-26-PI-World-AMS-Register-Your-Interest_Register-Your-Interest.html

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