E-learning methodologies

A guide for designing and developing e-learning courses

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This guide was prepared in the context of the FAO Trust Fund Project GCP/GLO/279/GER entitled: "Improving the abilities of Regional Organizations to develop, implement and monitor food security training programmes". The project is funded by the Government of Germany and implemented by FAO.

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OVERVIEW

The purpose of this guide is to provide detailed guidance on designing and developing an e-learning course for trainers and instructional designers who are new to e-learning design. It also provides basic concepts and information on the processes and resources involved in e-learning development, which might be of interest to capacity-development managers.

The information in this guide is based on consolidated instructional design models and learning theories and incorporates FAO's experience in delivering e-learning courses in development contexts. While there are several definitions of e-learning which reflect different perspectives, e-learning in this document is defined as follows:

E-learning can be defined as the use of computer and Internet technologies to deliver a broad array of solutions to enable learning and improve performance.

This guide focuses on formal learning, specifically on structured courses designed to meet job-related training goals.[1] It does not address needs assessment or evaluation stages of a training project, but rather the design, development and delivery activities which are specific to e-learning. Its focus is on e-learning solutions suitable for development contexts characterized by technology constraints, such as limited hardware capabilities and low-bandwidth Internet connections.

Although much of what is covered in this document can be applied to e-learning in primary and secondary school education, these guidelines have been developed mainly for adult learners, i.e. learners who have completed their formal education, but who are still motivated to improve their job-related tasks and knowledge. Adult learners share some characteristics that are different from those of full-time students, which influence the design of learning programmes. In particular, adult learners:

- need to know the benefits of learning (why they have to learn something);
- like to learn experientially;
- approach learning as problem-solving;
- learn better where they can see the immediate value and application of content; and
- prefer to study at a time, place and pace convenient for them.

The guide is articulated into four main sections:

Part I: Introduction

Part I (chapters 1 and 2) provides an introduction to e-learning characteristics, benefits, activities and resources needed to develop an e-learning project. It mainly addresses training and capacity-development managers and those who are interested in starting an e-learning project or integrating e-learning components in their organization's training programmes.

Part II: Designing an e-learning course

Part II (chapters 3 and 4) provides guidance on how to design an e-learning course (from the needs, target and task/topic analysis to the definition of learning objectives, sequencing, choice of learning strategies and delivery formats). This mainly addresses trainers and instructional designers who aim to create learning projects that really match learners' needs.

[1] *However, e-learning is not limited to formal, well-defined courses. It also encompasses other forms of learning, such as learning at home or learning at work through e-mentoring and e-coaching, for example.*

Part III: Creating interactive content

Part III (chapters 5, 6 and 7) provides detailed guidance on creating interactive content (from the application of learning strategies and media to courseware development). This chapter addresses instructional designers and subject matter experts involved in content development as well as all those who want to know more about the methodology and tools used to create e-learning content.

Part IV: Managing and evaluating learning activities

Part IV (chapters 8 and 9) provides an overview of online collaborative learning, evaluation methods and learning platforms used to host online courses. This addresses training managers, facilitators and instructional designers who want to know how to conduct and evaluate an online course and how learning platforms can support course delivery and communication among participants.

The guide also includes a glossary, a bibliography, and a number of templates and tables.

TABLE OF CONTENTS

PART I — INTRODUCTION

THIS SECTION REVIEWS THE REASONS FOR DEVELOPING E-LEARNING AND PROVIDES AN OVERVIEW OF THOSE SITUATIONS IN WHICH E-LEARNING IS A GOOD SOLUTION. IT ALSO DISCUSSES THE STAGES OF DEVELOPING AN E-LEARNING COURSE, THE RESOURCES AND TECHNOLOGY REQUIRED, THE MAIN TYPES OF E-LEARNING AND E-LEARNING COMPONENTS AND SOME EXAMPLES OF E-LEARNING COURSES DEVELOPED BY FAO AND ITS PARTNERS.

1. GETTING STARTED

Salim is a senior manager in a non-governmental organization.

Among its activities, the organization provides training on food security to practitioners from several developing countries.

Because of the increasing number of requests for training from different countries, Salim is considering the option of including e-learning in the organization's training plan.

He now would like to know if e-learning is a convenient option for the organization, and if it can ensure the same effectiveness as traditional training.

This chapter will introduce you to the following topics:

- The main reasons for developing e-learning;
- The basic types of e-learning courses and their components;
- How to combine e-learning with traditional face-to-face training; and
- Examples of e-learning courses developed by FAO.

1.1 WHY DEVELOP E-LEARNING?

Many organizations and institutions are using e-learning because it can be as effective as traditional training at a lower cost.

Developing e-learning is more expensive than preparing classroom materials and training the trainers, especially if multimedia or highly interactive methods are used. However, delivery costs for e-learning (including costs of web servers and technical support) are considerably lower than those for classroom facilities, instructor time, participants' travel and job time lost to attend classroom sessions.

Moreover, e-learning reaches a wider target audience by engaging learners who have difficulty attending conventional classroom training because they are:

- geographically dispersed with limited time and/or resources to travel;
- busy with work or family commitments which do not allow them to attend courses on specific dates with a fixed schedule;
- located in conflict and post-conflict areas and restricted in their mobility because of security reasons;
- limited from participating in classroom sessions because of cultural or religious beliefs;
- facing difficulties with real-time communication (e.g. foreign language learners or very shy learners).

E-learning can offer effective instructional methods, such as practising with associated feedback, combining collaboration activities with self-paced study, personalizing learning paths based on learners' needs and using simulation and games. Further, all learners receive the same quality of instruction because there is no dependence on a specific instructor.

CAN E-LEARNING BE USED TO DEVELOP ANY TYPE OF SKILL?

A training program may aim at developing different types of skills:

- **cognitive skills**, which can involve knowledge and comprehension (e.g. understanding scientific concepts), following instructions (procedural skills), as well as applying methods in new situations to solve problems (thinking or mental skills);
- **interpersonal skills** (e.g. skills involved in active listening, presenting, negotiating, etc.); as well as
- **psychomotor skills**, involving the acquisition of physical perceptions and movements (e.g. making sports or driving a car).

How can e-learning address these diverse domains?

Most e-learning courses are developed to build cognitive skills; the cognitive domain is the most suitable for e-learning. Within the cognitive domain, thinking skills may require more interactive e-learning activities because those skills are learned better "by doing".

Learning in the interpersonal domain can also be addressed in e-learning by using specific methods. For example, interactive role playing with appropriate feedback can be used to change attitudes and behaviours.

Some questions to ask when choosing among e- learning, face-to-face instruction or other types of informal or on-the-job learning include:

- What is the relative cost of each type of training?
- Is learning best delivered in one unit or spread out over time?
- Does it address a short-term or a long-term learning need?
- Do participants have access to needed computer and communications equipment?
- Are participants sufficiently self-motivated for e-learning or self-study modes of learning?
- Do target participants' time schedules and geographic locations enable classroom-based learning or other types of synchronous learning?

E-LEARNING IS A GOOD OPTION WHEN...

- there is a significant amount of content to be delivered to a large number of learners;
- learners come from geographically dispersed locations;
- learners have limited mobility;
- learners have limited daily time to devote to learning;
- learners do not have effective listening and reading skills;
- learners have at least basic computer and Internet skills;
- learners are required to develop homogeneous background knowledge on the topic;
- learners are highly motivated to learn and appreciate proceeding at their own pace;
- content must be reused for different learners' groups in the future;
- training aims to build cognitive skills rather than psychomotor skills;
- the course addresses long-term rather than short-term training needs[2];
- there is a need to collect and track data.

Since e-learning is not ideal for all purposes, it is unlikely that it will replace classroom training completely in an organization. The most cost-effective application of e-learning may be to complement conventional training in order to reach as many learners as possible.

1.2 E-LEARNING APPROACHES

There are two general approaches to e-learning: self-paced and facilitated/instructor-led.

Self-paced learners are alone and completely independent, while facilitated and instructor-led e-learning courses provide different levels of support from tutors and instructors and collaboration among learners.

Often, e-learning courses combine both approaches, but for simplicity it is easy to consider the two separately.

Self-paced e-learning

Learners are offered e-learning courseware (also called Web-based training (WBT)), which can be complemented by supplemental resources and assessments.

Courseware is usually housed on a Web server, and learners can access it from an online learning platform or on CD-ROM.

Learners are free to learn at their own pace and to define personal learning paths based on their individual needs and interests. E-learning providers do not have to schedule, manage or track learners through a process.

E-learning content is developed according to a set of learning objectives and is delivered using different media elements, such as text, graphics, audio and video. It must provide as much learning support as possible (through explanations, examples, interactivity, feedback, glossaries, etc.), in order to make learners self-sufficient. However, some kind of support, such as e-mail-based technical support or e-tutoring, is normally offered to learners.

When self-paced e-learning is offered through an Internet connection, there is the potential to track learners' actions in a central database.

[2]Developing an e-learning programme requires more time than preparing a traditional training course. When instruction needs to be provided urgently, a series of training sessions might be the right solution.

Instructor-led and facilitated e-learning

In this model, a linear curriculum is developed that integrates several content elements and activities into a chronological course or syllabus.

The course is scheduled and led by an instructor and/or facilitator through an online learning platform.

E-learning content for individual study can be integrated with instructor's lectures, individual assignments and collaborative activities among learners.

Learners, facilitators and instructors can use communication tools such as e-mails, discussion forums, chats, polls, whiteboards, application sharing and audio and video conferencing to communicate and work together.

At the end, a final step typically includes an exercise or assessment to measure learning.

1.3 E-LEARNING COMPONENTS

As we have seen, e-learning approaches can combine different types of e-learning components, including:

(a) e-learning content;

(b) e-tutoring, e-coaching, e-mentoring;

(c) collaborative learning; and

(d) virtual classroom.

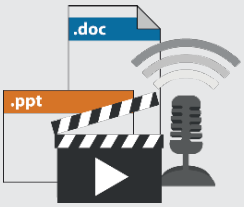
Let's have a quick look at these components.

(a) E-learning content

E-learning content can include:

- simple learning resources;
- interactive e-lessons;
- electronic simulations; and
- job aids.

Simple Learning Resources



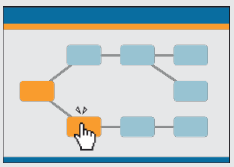
Simple learning resources are non-interactive resources such as documents, PowerPoint presentations, videos or audio files. These materials are non-interactive in the sense that learners can only read or watch content without performing any other action.

These resources can be quickly developed and, when they match defined learning objectives and are designed in a structured way, they can be a valuable learning resource even though they don't provide any interactivity.

Interactive e-lessons

The most common approach for self-paced e-learning is Web-based training consisting of a set of interactive e-lessons. An e-lesson is a linear sequence of screens which can include text, graphics, animations, audio, video and interactivity in the form of questions and feedback. E-lessons can also include recommended reading and links to online resources, as well as additional information on specific topics.

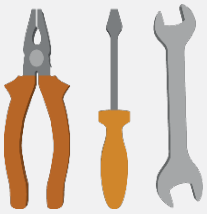
Electronic simulations



Simulations are highly interactive forms of e-learning.

The term "simulation" basically means creating a learning environment that "simulates" the real world, allowing the learner to learn by doing. Simulations are a specific form of Web-based training that immerse the learner in a real-world situation and respond in a dynamic way to his/her behaviour.

Job aids



Job aids provide just-in-time knowledge.

They can take several forms and be delivered on different platforms (e.g. computer, printed document, mobile phone). They usually provide immediate answers to specific questions, thus helping users accomplish job tasks. Technical glossaries and checklists are a few examples of simple job aids, but sophisticated expert systems can also be developed to assist workers in complex decision-making.

(b) E-tutoring, e-coaching, e-mentoring

Services which provide human and social dimensions can be offered to learners to support them through the learning experience.

E-tutoring, e-coaching, e-mentoring

E-tutoring, e-coaching and e-mentoring provide individual support and feedback to learners through online tools and facilitation techniques.

(c) Collaborative learning

Collaborative activities range from discussions and knowledge-sharing to working together on a common project. Social software, such as chats, discussion forums and blogs, are used for online collaboration among learners.

Online discussions

Synchronous and asynchronous online discussions are designed to facilitate communication and knowledge-sharing among learners. Learners can comment and exchange ideas about course activities or contribute to group learning by sharing their knowledge.

Collaboration

Collaborative project work implies collaboration among learners to perform a task. Collaborative activities can include project work and scenario-based assignments.

(d) Virtual classroom

A virtual classroom is the instructional method most similar to traditional classroom training, as it is led completely by an instructor.

Virtual classroom

A virtual classroom is an e- learning event where an instructor teaches remotely and in real time to a group of learners using a combination of materials (e.g. PowerPoint slides, audio or video materials). It is also called synchronous learning.

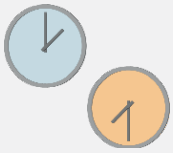
This method requires the least amount of effort to convert materials (but instructors still have to prepare them). Appropriate technology must be in place for both the learners and providers (e.g. software for the virtual classroom and good connectivity).

1.4 SYNCHRONOUS AND ASYNCHRONOUS E-LEARNING

E-learning activities can be synchronous or asynchronous.

Synchronous

Synchronous events take place in real time. Synchronous communication between two people requires them to both be present at a given time. Examples of synchronous activities are chat conversations and audio/video conferencing.



Asynchronous

Asynchronous events are time-independent. A self-paced course is an example of asynchronous e-learning because online learning takes place at any time. E-mail or discussion forums are examples of asynchronous communication tools.

Synchronous	Asynchronous
> Chat and IM	> E-mail
> Video and audio conference	> Discussion forum
> Live webcasting	> Wiki
> Application sharing	> Blog
> Whiteboard	> Webcasting
> Polling	

The flexibility of Internet technology creates gray areas around the concepts of synchronous and asynchronous.

For example, video and audio sessions can be recorded and made available for learners who cannot attend a live event.

1.5 QUALITY OF E-LEARNING

The quality of an e-learning course is enhanced by:

- **learner-centred content:** E-learning curricula should be relevant and specific to learners' needs, roles and responsibilities in professional life. Skills, knowledge and information should be provided to this end.
- **granularity:** E-learning content should be segmented to facilitate assimilation of new knowledge and to allow flexible scheduling of time for learning.
- **engaging content:** Instructional methods and techniques should be used creatively to develop an engaging and motivating learning experience.
- **interactivity:** Frequent learner interaction is needed to sustain attention and promote learning.
- **personalization:** Self-paced courses should be customizable to reflect learners' interests and needs; in instructor-led courses, tutors and facilitators should be able to follow the learners' progress and performance individually.

ASSESSING THE QUALITY OF E-LEARNING PROGRAMMES

In 2010, an international quality standard for e-learning programmes – "Open ECBCheck" – was officially released. ECBCheck is an accreditation and quality improvement scheme for e-learning programmes which supports organizations in measuring the success of their programmes and allows for continuous improvement though peer collaboration. It was developed through an innovative and participative process involving more than 40 international, regional and national capacity-development organizations.

ECBCheck provides a set of quality criteria to assess e-learning programme design, development, management, delivery and evaluation, as well as the quality of learning materials, methodology, media, technology and e-tutoring.

For more information: **http://www.qualityfoundation.org/openecbcheck/**

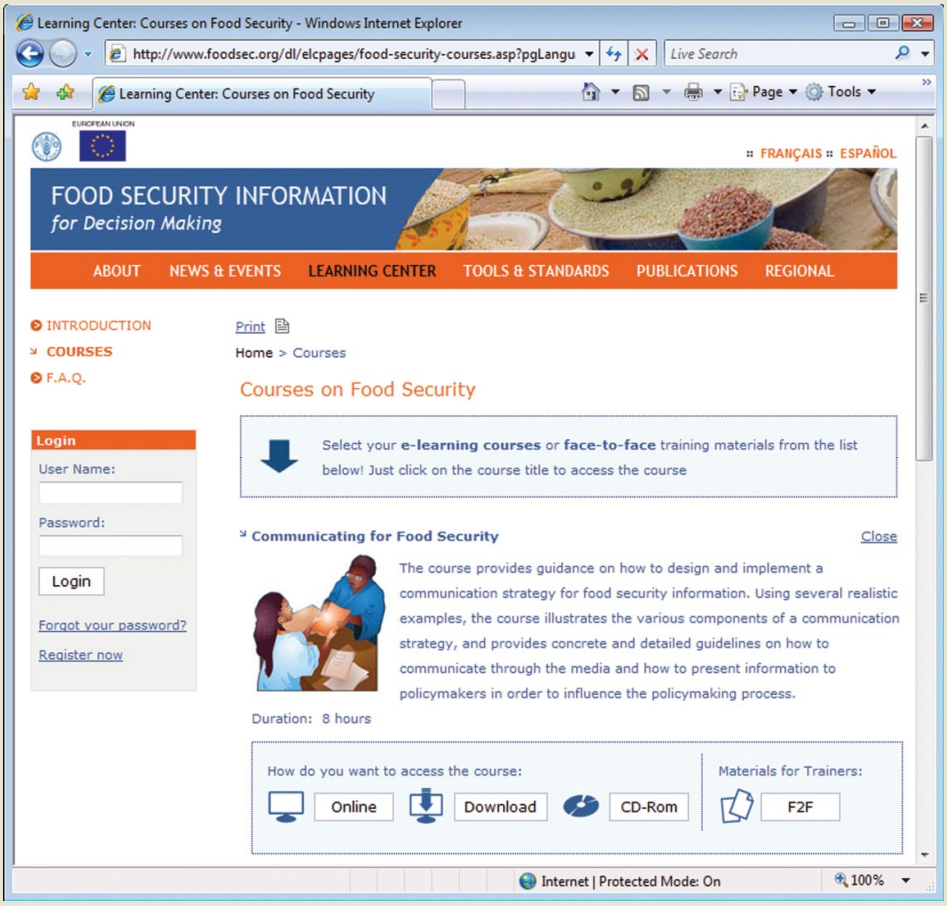
1.6 EXAMPLES OF FAO E-LEARNING COURSES

The following e-learning solutions were designed to incorporate low bandwidth and technical PC requirements.

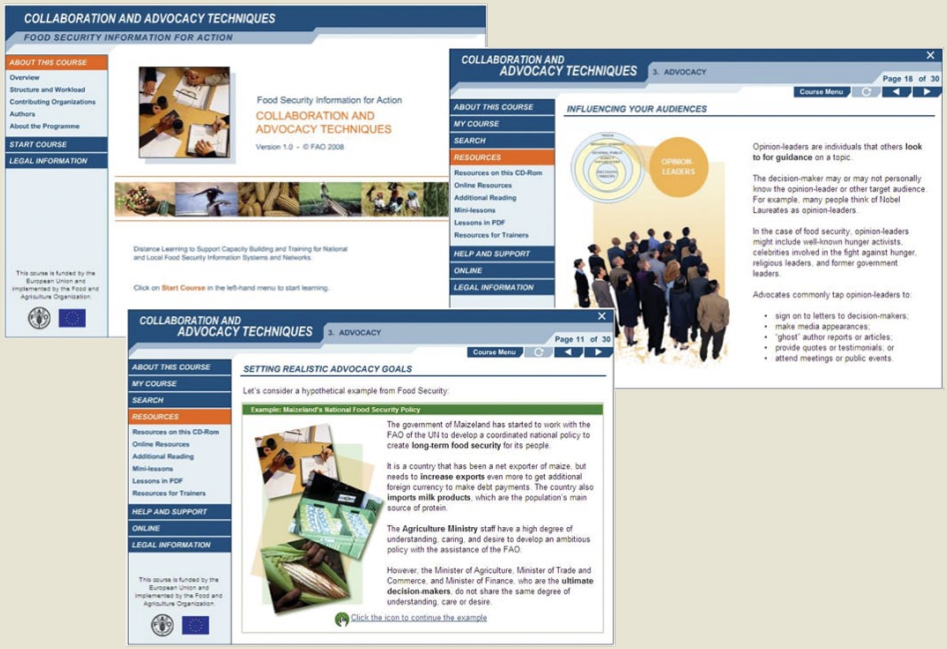
1 - Self-paced courses on food security

An e-learning curriculum on food security, developed by international experts to support capacity development, is part of the "EC/FAO Programme on Linking Information and Decision-making to Improve Food Security". It is led by FAO and funded by the European Union's Food Security Thematic Programme (FSTP). The media (e.g. images and small animations) can be viewed by low-performing computers. The curriculum is comprised of a set of courses[3] in English, French and Spanish, and is available free of charge from the programme Web site (**http://www.foodsec.org**).

[3]*The following courses are available as of August 2011: Food Security Information Systems and Networks; Reporting Food Security Information; Availability Assessment and Analysis; Baseline Food Security Assessments; Food Security Concepts and Frameworks; Collaboration and Advocacy Techniques; Livelihoods Assessment and Analysis; Markets Assessment and Analysis; Nutritional Status Assessment and Analysis; Food Security Policies - Formulation and Implementation; Targeting; Vulnerability Assessment and Analysis; Communicating for Food Security.*



Learners need to register in order to take the courses and can choose between studying online, downloading the course on their computers or ordering a CD-ROM.



Courses consist of interactive lessons including text, images, animations and interactions.

Different instructional techniques are used, such as storytelling, case studies, examples, questions and practice with reinforcement feedback.

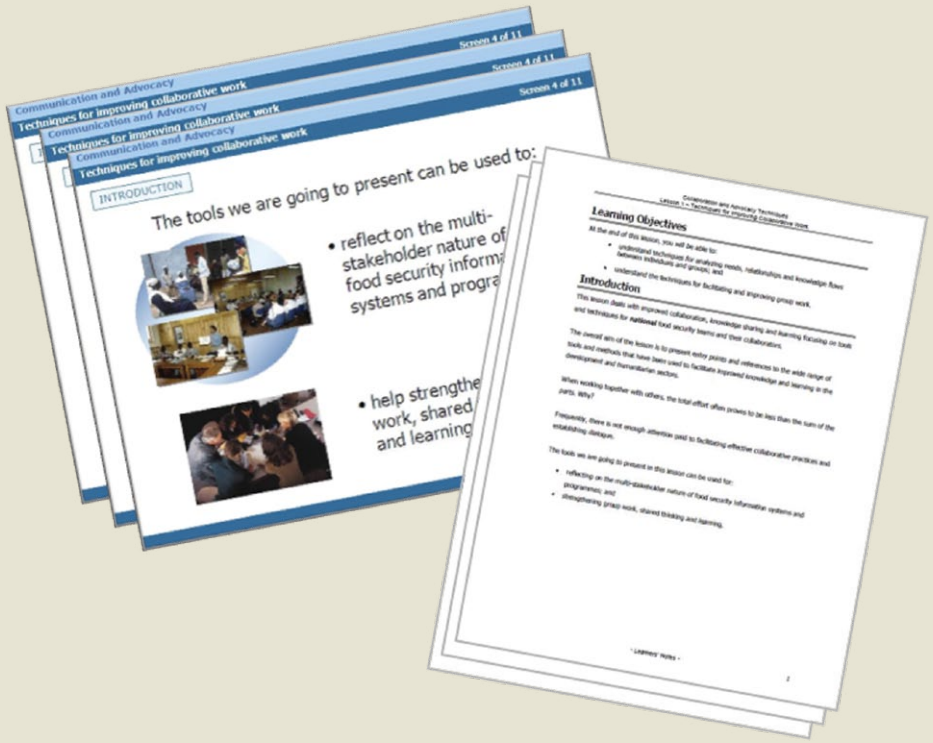
Additional resources include links to online resources, recommended reading, job aids and a glossary.

Minimum technical requirements are:

- Software: Windows 98 or above, Acrobat PDF reader version 4.0, Mozilla Firefox 1.0 or later, Netscape version 4.0 or later, or Internet Explorer version 4.0 or later
- Hardware: Pentium-class processor, 64 MB RAM, 800x600 screen resolution with 16-bit colour depth

Software required to display the course is provided as part of the CD-ROM resources.

Trainers can easily adapt a set of provided resources to design and deliver classroom sessions using high-quality content which was developed and reviewed by international experts.



Material developed for the e-learning course has been used to create:

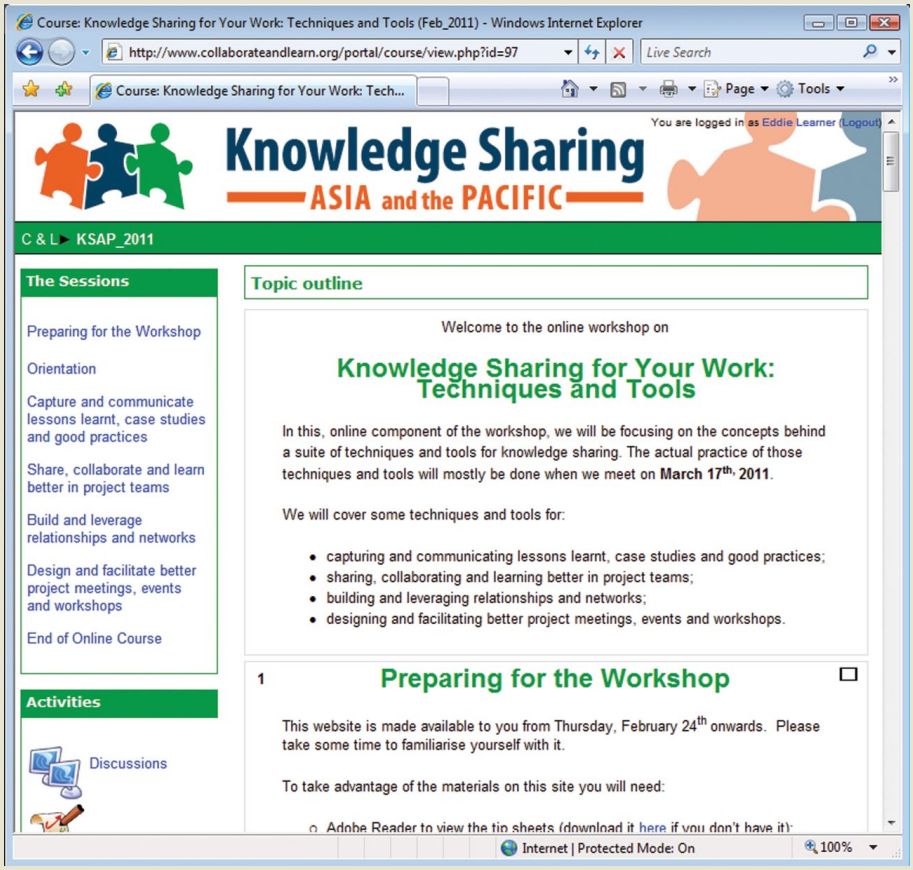
- a set of slide presentations that trainers can use;
- a printable document with the complete e-lesson content that trainers can distribute to participants after the training session.

Course lessons also can be integrated in facilitated courses on different e-learning platforms.

2 - Online facilitated course about knowledge sharing

The online course, "Knowledge Sharing for Your Work: Techniques and Tools," focuses on the concepts behind a suite of techniques and tools for knowledge sharing. The course adopts a facilitated and collaborative approach, using a combination of learning materials and asynchronous collaboration tools. The course is delivered through the Modular Object-Oriented Dynamic Learning Environment (Moodle), an open-source web-based learning platform.

Learners have weekly deadlines to accomplish activities and assignments, but they are free to schedule study sessions anytime during that week. The course uses a variety of tools, including learners' profiles; discussion forums; wiki spaces; glossaries; class bulletins; chats (using Skype); podcasts; videos; short e-lessons; and support materials (e.g. getting started, editing the profile, using discussion forums, and a course syllabus).



From the left-hand menu, learners can access sessions, activities (e.g. for discussions or to share reflections) and resources.

The main section, in the middle of the page, shows learning activities in chronological order.

1.7 BLENDED LEARNING

Blended learning combines different training media (e.g. technologies, activities and events) to create an optimum training programme for a specific audience. The term "blended" means that traditional instructor-led training is being supplemented with electronic formats.[4]

Bersin (2004) identifies two main models of blended learning:

- **Programme flow model:** Learning activities are organized in a linear, sequential order and learners have deadlines to accomplish the various assignments; this is similar to traditional training, but some of the activities are conducted online.
- **Core-and-spoke model:** A major course (e-learning or F2F) is provided and a set of supplemental materials are available to reinforce the main course; these materials are optional and not scheduled.

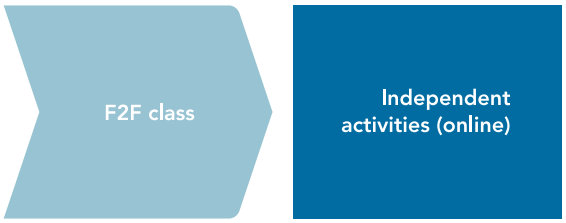
[4] *Bersin J. (2004). The Blended Learning Book. San Francisco: Pfeiffer.*

The programme flow model is more suited for observable outcomes and assessment purposes (including certification), since it enables formal tracking of learners' progress. Each step can be easily monitored by instructors and facilitators. Programmes can be designed using one of several approaches:

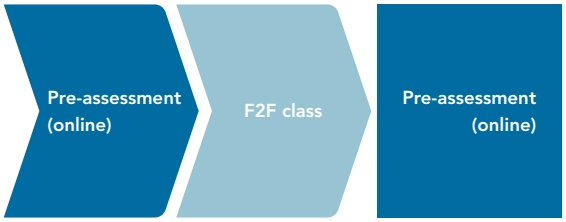
An online pre-class event can be used to bring learners with different levels of knowledge and skill to the same level before the F2F class begins.

The online event can be an assignment. The instructor can review the results of the pre-class assignment for each learner and adjust the programme for the F2F class by focusing on knowledge and skills gaps.

This approach has several advantages over a traditional F2F approach: it forces learners to come prepared to the classroom; allows the design of more efficient classroom activities which are tailored to the specific needs or interests of the participants; and reduces the total time in classroom, which reduces costs.



Another approach consists of starting with a core classroom event, followed by online independent experiences which can include, for example, interaction with online resources or e-mentoring services for continuous reinforcement. This approach could be used to develop communities of learners or to engage in further discussions on advanced topics of individual interest.



Online events can also be used to introduce and conclude a blended learning programme.

For example, they could be used to assess participants' knowledge prior to and after a course.

To optimize the efforts to design and produce e-learning courses, the materials designed for e-learning can be adapted and reused by trainers in classroom sessions and training workshops. Media elements, such as illustrations and diagrams, as well as textual content, can be reused to create presentations for trainers and materials for learners.

An FAO blended learning programme for country teams and food security working group members

A blended learning programme was designed to provide members of national food security teams with the knowledge and skills required to design and implement country agriculture and food security investment plans[5].

The programme includes the following components:

- **Pre-workshop preparation:** A questionnaire is submitted to participants a few days before the online phase. Participants are asked to describe their role in the national food security system and their areas of expertise. The questionnaire helps facilitators tailor the activities to participants' profiles and allows participants to understand each other's roles and responsibilities.
- **Online workshop (core component):** The workshop includes individual study with interactive e-lessons on food security topics and online activities supported by facilitators and subject matter experts. Both synchronous and asynchronous communication are used for online discussions and group work. The main outcome of the online component is an individual work plan that will help participants reflect on their country situation and will serve as a supporting resource for F2F workshop activities.
- **Bridge period:** This is a period between the two core components of the course. Online support is provided to participants to complete their preparation prior to the F2F workshop.
- **Face-to-face workshop (core component):** The F2F workshop consists of classroom events where participants can present and discuss their previous work, practise communication principles and techniques and further develop their work plan with the assistance of a subject matter expert.
- **E-mentoring service and online resources:** After completion of the course, a question-and-answer service and additional online resources are available to facilitate the transfer of knowledge to the job setting.

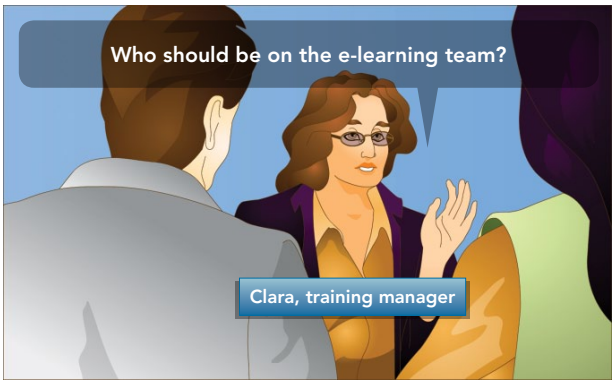
1.8 IN SUMMARY

KEY POINTS FOR THIS CHAPTER

- E-learning is a convenient option for organizations in certain situations (e.g. when there is a need to reach many geographically dispersed learners).
- In a self-paced e-learning course, learners can study course materials at any time they wish. This requires that learners have access to a set of interactive and self-contained materials. Facilitated or instructor-led e-learning takes place at a specific time and usually integrates self-study with collaborative activities such as discussions or group work.
- Facilitated and instructor-led e-learning courses use communication tools which allow learners to communicate with facilitators and other participants. Tools can be asynchronous, such as e-mail or discussion groups, as well as synchronous, such as chat and audio conference.
- Both facilitated and self-paced e-learning activities and content should conform to a set of quality standards to ensure the effectiveness of the learning programme.
- In a blended approach, e-learning sessions can be integrated with face-to-face traditional activities using a variety of approaches.

[5]The learning programme has been developed by FAO in collaboration with the German Agency for International Cooperation (GIZ) and in consultation with regional organizations (CILSS, NEDAP, ASEAN) as part of the project "Improving the abilities of Regional Organizations to develop, implement and monitor food security training programs".

2. WHAT IS NEEDED TO DEVELOP AN E-LEARNING COURSE?



Salim, the senior manager, has decided that e-learning is a good option for covering some training needs.

Clara, the training manager, is in charge of initiating and coordinating an e-learning project which will reach dozens of food security professionals living in different countries around the world.

Clara needs to know the process to follow and the resources required to develop e-learning content and deliver the course through the Internet.

This chapter will introduce the following topics:

- The ADDIE model for e-learning;
- The professional roles in an e-learning project; and
- The technology needed to produce and deliver e-learning.

2.1 THE ACTIVITIES

Good design and planning, while crucial for every type of training programme, are even more important for e-learning projects. In traditional training, the largest effort is in the delivery of training sessions, while in e-learning, it is in the design and development of structured materials which must be self-contained and able to be used multiple times without making ongoing adjustments.

REUSING COURSE COMPONENTS

Well-developed e-learning courses can be delivered many times to different learners using the same materials.

In addition, individual course components (e.g. units, lessons and media elements such as graphics and animations) can be reused in different contexts. For example, interactive e-lessons developed for a given self-paced e- learning course can be integrated into facilitated courses or can become part of another self-paced e-learning curriculum.[6]

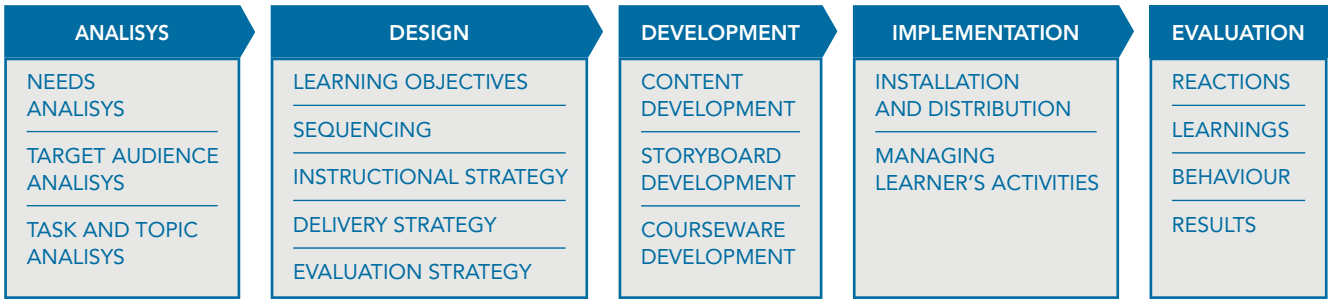
An instructional design model can be used to define the activities that will guide e-learning development projects.

Instructional design is the systematic development of specifications using learning and instructional theory to ensure the quality of training. In job-related training, the aim of instructional design is to improve employee performance and to increase organizational efficiency and effectiveness.

[6]Reusable course components are also called "reusable learning objects (RLOs)". A learning object is the smallest reusable collection of content supporting a specific learning concept or objective.

There are many instructional systems design models, most of which are based on popular ones such as the ADDIE model, which is diagrammed below. The ADDIE model includes five stages: Analysis, Design, Development, Implementation and Evaluation.

The ADDIE model for e-learning



A NOTE ON THE PROCESS

Adapting existing models to match specific needs is wiser than proceeding without any plan. However, flexibility is needed to select and adapt a model to a given situation.

E-learning projects vary considerably in complexity and size. The process described below is comprehensive – it covers all the options that can be included in a complex learning project. However, some of the steps can be skipped or simplified according to project's objectives and requirements, such as budget, expertise or organizational constraints.

The five stages in the ADDIE process are described below:

1 - Analysis

A needs analysis should be conducted at the start of any development effort to determine whether:

> training is required to fill a gap in professional knowledge and skills; and

> e-learning is the best solution to deliver the training.

The needs analysis allows the identification of general, high-level course goals.

Target audience analysis is another crucial step. The design and delivery of e-learning will be influenced by key characteristics of the learners (e.g. their previous knowledge and skills, geographical provenience, learning context and access to technology).

Analysis also is needed to determine the course content:[7]

> Task analysis identifies the job tasks that learners should learn or improve and the knowledge and skills that need to be developed or reinforced. This type of analysis is mainly used in courses designed to build specific job-related skills (also called "perform courses").

> Topic analysis is carried out to identify and classify the course content. This is typical of those courses that are primarily designed to provide information (also called "inform courses").

2 - Design

The design stage encompasses the following activities:

> formulating a set of learning objectives required to achieve the general, high-level course objective;

> defining the order in which the objectives should be achieved (sequencing); and

> selecting instructional, media, evaluation and delivery strategies.

[7] *See R.E. and Clark, R.C. (2005). e-Learning and the Science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning. 2nd edition. San Francisco: Pfeiffer.*

The outcome of the design stage is a blueprint that will be used as a reference to develop the course. The blueprint illustrates the curriculum structure (e.g. its organization in courses, units, lessons, activities); the learning objectives associated with each unit; and the delivery methods and formats (e.g. interactive self-paced materials, synchronous and/or asynchronous collaborative activities) to deliver each unit.

3 - Development

In this stage, the e-learning content is actually produced. The content can vary considerably, depending on the available resources. For example, e-learning content may consist of only simpler materials (i.e. those with little or no interactivity or multimedia, such as structured PDF documents) which can be combined with other materials (e.g. audio or video files), assignments and tests. In that situation, storyboard development and the development of media and electronic interactions would not be conducted.

The development of multimedia interactive content is comprised of three main steps:

- content development: writing or collecting all the required knowledge and information;
- storyboard development: integrating instructional methods (all the pedagogical elements needed to support the learning process) and media elements. This is done by developing the storyboard, a document that describes all the components of the final interactive products, including images, text, interactions, assessment tests; and
- courseware development: developing media and interactive components, producing the course in different formats for CD-Rom and Web delivery and integrating the content elements into a learning platform that learners can access.

4 - Implementation

At this stage the course is delivered to learners. The courseware is installed on a server and made accessible for learners. In facilitated and instructor-led courses, this stage also includes managing and facilitating learners' activities.

5 - Evaluation

An e-learning project can be evaluated for specific evaluation purposes. You may want to evaluate learners' reactions, the achievement of learning objectives, the transfer of job-related knowledge and skills, and the impact of the project on the organization.

2.2 THE TEAM

Participation in e-learning projects requires capabilities in certain areas – such as technology and media-related skills – that are not essential in traditional education or training.

Moreover, people may have to diverge from their traditional roles and perform new tasks. For example, a subject matter expert (SME) in an e-learning project still provides the required knowledge for the course, but does not directly teach the learners. Instead, the SME interacts with another professional, the instructional designer (ID), who defines the activities and e-learning content formats and develops the e-learning products.

Some of the roles described in this section could be combined into a single job profile. In fact, the composition of the team depends on factors such as:

- the size of the project;
- the amount of work outsourced;
- the capacity of team members to cover different roles; and
- the specific media and technologies required.

The roles described below are required to perform the ADDIE model's activities:

- **Human resources/Capacity development manager**

This managerial-level person conducts needs and audience analyses before starting the e-learning project, coordinates all activities and roles in the different stages of the process and evaluates the degree of transfer on the job and the results for the organization/institution.

> Instructional designers (IDs)

IDs are responsible for the overall instructional strategy. They work with managers to understand the training goal, collaborate with SMEs to define which skills and knowledge need to be covered in the course, choose the appropriate instructional strategy and support the team in defining delivery and evaluation strategies.

IDs also are responsible for designing specific e-learning activities and materials that will be part of the course, including storyboard development[8]. At this stage, content provided by SMEs is pedagogically revised and integrated with instructional techniques and media elements which will facilitate and support the learning process. In large self-paced e-learning projects, a lead ID may delegate the design of specific lessons to other designers.

> Subject matter experts (SMEs)

SMEs contribute the knowledge and information required for a particular course. They collaborate with IDs to design a course and define evaluation strategies.

In self-paced e-learning, SMEs can be charged with writing the text of e-learning lessons (i.e. content development), while in facilitated or instructor-led e-learning, SMEs can act as online instructors leading or supporting online classroom activities. They can prepare and present material, assign tasks to participants and answer their questions.

> Web developers and media editors

Web developers and media editors are responsible for developing self-paced courses; they assemble course elements, develop media and interactive components, create the courseware, adapt the interface of a learning platform (e.g. Moodle) and install the courseware on a Web server.

Servers/database programmers may be needed to install and configure databases and to collect learners' data.

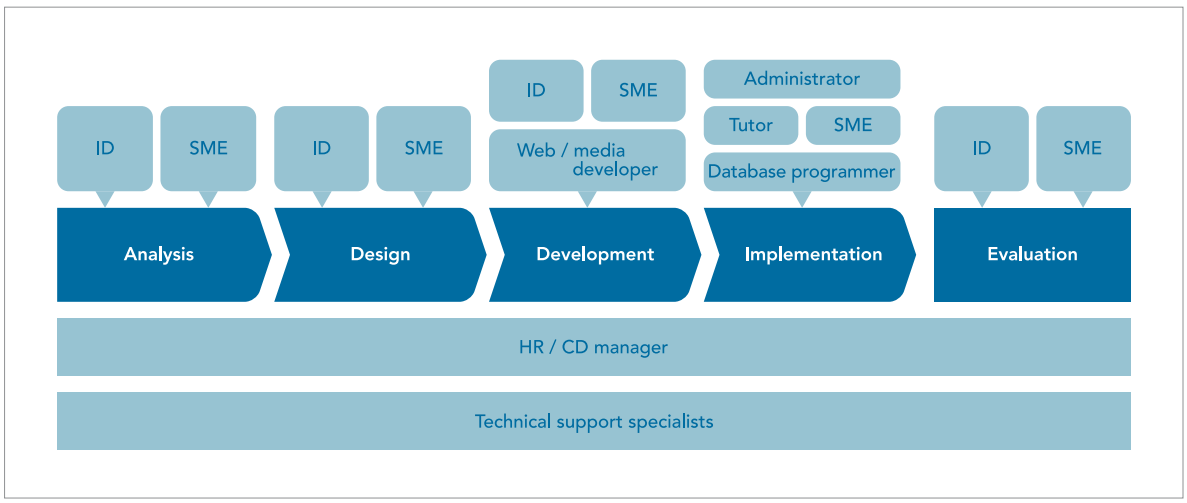
> Course administrators, online facilitators and tutors

These are roles involved in the implementation stage. Course administrators manage learners' subscriptions. Online tutors and facilitators support participants' learning activities and motivate learners during the course. They create an environment that inspires participants' confidence in the learning process, assure the flow of information among the different stakeholders, motivate participation and facilitate and mediate participants' exchanges.

> Technical support specialists

Technical support specialists usually are required to assist both producers and users of e-learning courses at every stage of the process.

Areas of responsibility for key roles in the ADDIE process



[8] *See chapter 6 of this guide for more information on storyboard development.*

2.3 THE TECHNOLOGY

Technology is required to produce and deliver e-learning. Different tools can be used to produce e-learning content, depending on which file formats will be used and the nature of the desired final product.

Microsoft PowerPoint or even Word can be sufficient to create simple learning resources like a presentation or a tutorial. However, more sophisticated tools are required if you want to create interactive content.

Courseware authoring tools are special-purpose tools that create interactive e-learning content. They add text, graphics and other media, but also provide a framework to organize pages and lessons for reliable navigation. While most of these tools are stand-alone packages that incorporate assessment and quiz capabilities, some integrate those functions from other programs. To create media components, authoring tools need auxiliary software (e.g. Adobe Photoshop for bitmap graphics, Adobe Illustrator for vectoral images or Adobe Flash for animations) and other tools for video and sound creation and compression.[9]

Organizations and education institutions increasingly are turning to learning platforms to deliver courses to learners and manage their online activities. A learning platform is a set of interactive online services that provide learners with access to information, tools and resources to support educational delivery and management. They provide access and services to a wide user base through the Internet.

Learning platforms are usually referred to as a learning management system (LMS) or a learning content management system (LCMS), terms which often are used interchangeably. There are a variety of learning platforms with different levels of complexity, and despite their differences, they also have many features in common.[10] Their most important features include:

- learning content management: creation, storage, access to resources;
- curriculum mapping and planning: lesson planning, personalized learning paths, assessment;
- learner engagement and management: learner information, progress tracking; and
- tools and services: forums, messaging system, blogs, group discussions.

2.4 CASE STUDY: THE IMARK WORK FLOW TO PRODUCE AND DELIVER E-LEARNING CONTENT

The ADDIE model was adopted by the Information Management Resource Kit (IMARK), an e-learning initiative in agricultural information management developed by FAO and partner organizations **(www.imarkgroup.org)**.

The following steps were taken to design, develop and deliver the IMARK self-paced e-learning modules and are presented here as a suggested process that could be followed when developing a similar course:

1 - Analysis and curriculum design

FAO and its partners analyse the learning needs and characteristics of the target learner groups and produce a module outline which defines the areas of content to be addressed in each module.

An SME, who has a broad understanding of the content areas to be addressed, is hired or appointed as a module coordinator to develop a draft module plan in consultation with an ID, other experts and institutions.

A consultative workshop with SMEs and potential partners is held to review, revise and approve the draft module plan, incorporating the views of a wide range of external experts and potential users.

2 - Content development, storyboard development and translation

The approved plan is revised by the module coordinator with the guidance of the ID into a series of stand-alone lessons of fixed length (30 minutes) suited to asynchronous self-paced learning.

SMEs are commissioned as content authors to develop lessons, or a series of lessons, in their area of expertise. Authors also are needed to provide knowledge assessment tests, glossary terms and a list of resources for each lesson. Content authored by SMEs is peer reviewed by other experts in the field.

[9] *See chapter 7 for more information on authoring tools.*

[10] *See chapter 9 for more information on learning platforms.*

The materials are then provided to one or more IDs who determine the overall approach and instructional strategy to be used for each lesson. The lesson is then storyboarded and subjected to an SME review. The SME reviews the storyboards to check that the content has been correctly reworked by the ID.

An English version of the storyboard is provided to experts to adapt and translate it into the other four FAO languages. This is followed by limited testing and proofreading for each of the language versions.

3 - Courseware development, CD production and roll-out

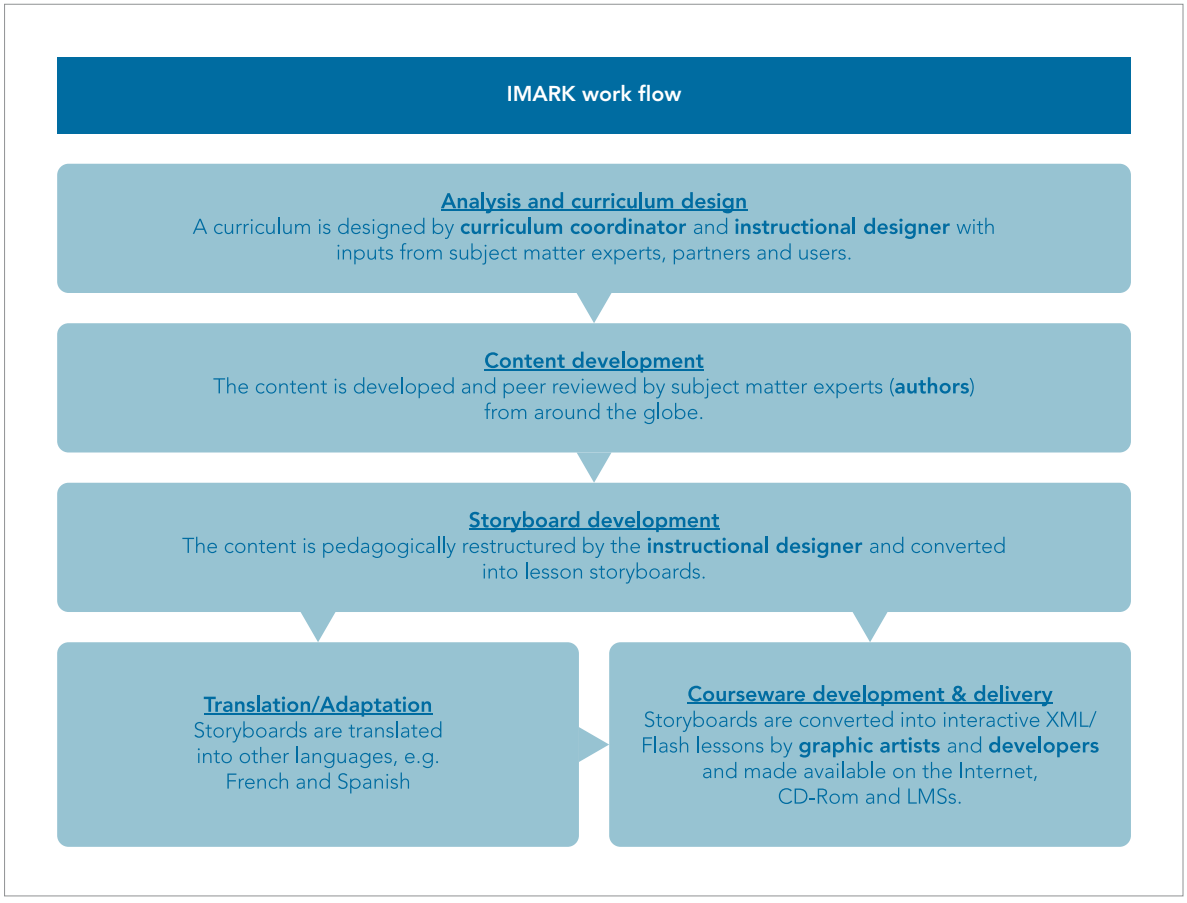
The lessons are then embedded in the IMARK learner interface, along with the glossary terms, software and manuals, resources, case studies and sample datasets. The IDs will check the work of graphic artists and developers to make sure that the final product conforms to the instructions provided in the storyboard.

A CD is published for alpha testing in-house at FAO. Once tested, and revised if necessary, the Version 1.0 CD is produced in English.

The module CDs are disseminated directly by FAO and through: i) partner organizations, ii) national, regional, and international agricultural and food security organizations, iii) distance education faculties and universities, and iv) selected development projects and programmes.

The module release is announced on the IMARK and partner institution Web sites, and through the IMARK on-line community. A learner support e-mail is set up at FAO.

The IMARK work flow for e-learning development



2.5 IN SUMMARY

KEY POINTS FOR THIS CHAPTER

- A series of activities are required to develop e-learning. According to the ADDIE model for instructional design, they can be grouped into five main stages: Analysis, Design, Development, Implementation, Evaluation.
- The following roles are generally required at different stages of the process (but some of them can be combined into a single job profile): project manager; instructional designer; subject matter expert; online administrator; e-tutor/facilitator; web developer; media editor; technical support specialists.
- Technology is needed both to create e-learning material and make it accessible to learners. Big projects may require the use of an LMS or other type of learning platform to track and administer learners' activities and manage e-learning content.