What is Multimedia Knowledge Object?

In today's world one can learn and acquire knowledge from many sources, but in most cases we are flooded with information and not gaining enough knowledge at the time and place where it is needed most. One of critical barriers for sharing knowledge is inappropriate form of knowledge presentation to an intended audience. We describe and present knowledge in forms ranging from documents, books and multimedia materials to oral stories, street theatres, and poetry recitation events. For these forms to make a real impact, both the knowledge object and the process of its uptake are important.

Knowledge object is a presentation/description of a "chunk" of knowledge in a form that allows for building capacity to take effective action by those to whom the knowledge object is communicated. One of the functions of knowledge management is to deliver needed knowledge objects at the right time and place.

The process of development and delivery of knowledge object encompasses:

- defining the scope and objectives of knowledge object;
- understanding of information internalization capabilities and existing sources of knowledge of target audiences;
- exploring formats of delivery (structure, contextualization, localization, media);
- testing the method of learning and sharing knowledge by intended audience;
- creating knowledge objects and facilitating their sharing.

Explaining the concept of knowledge object

It is very important that the concept of knowledge object is well understood by its creator and also that the creator is able to explain the concept and demonstrate the advantages of using knowledge objects in helping people to gain knowledge.

The main **purpose of knowledge object** is to provide information (content) in the format that will allow the addressee/beneficiary to gain the knowledge needed to take effective action, for example to cultivate a new variety of vegetable for the market. I will use this example to explain and illustrate the most important features of knowledge objects.

The most important is to structure and present the information in appropriate format for intended users. A simple video clip may not be sufficient to learn how to do things, because the following and absorbing all information on a 10-20 minute video may not be possible for some users/viewers. Excellent short videos from Sri Lanka and Sudan (please see them on Practical Answers social website, if you are registered member) are very good for presenting the problems, but I am not sure that after seeing the video people will be able, for example to produce flavored powdered drinks as it is shown on the video from Sudan.

We may divide the entire process of preparing the drinks in the independent modules that people can select and repeat playing easily without stopping the video, rewinding to desired place, etc.

For example we may have the following modules combined in one presentation:

- Module1: brief explanation why making flavored drinks makes sense and is worth the effort, for example as a very short video clips in which a local women explains the problem);
- Module 2: A list with photographs of required accessories and ingredients, if possible with audio explanations, and if appropriate with prices of all shown elements ;
- Module 3: Demonstration of the process of preparing the drink; (the process itself may have sub-modules, if appropriate);
- Module 4: Demonstration of "packaging" the drink if it is to be sold on the local market and intended for later use.

The above example is just for illustration of the issue of structuring the knowledge object, so that the viewer can absorb the information in her/his own pace. It is not a prescription how to make a knowledge object about flavored drinks.

From the technical point of view this kind of presentations can be implemented using Adobe Acrobat, PowerPoint, or Solanta, or combination of these tools. It is also possible to make a video with menu, but it would require from the user a basic knowledge of manipulating the video player and may not be good for presenting such objects as texts or still photos. A critical issue here is to decide about the content and size of each module having in mind the recipient of the knowledge object and possibility of non-linear access to components of the knowledge object.

Some more examples to illustrate the concept of knowledge object

A **document** (in electronic or paper format) describing the operation of a steam engine. The knowledge entity is the knowledge on how the steam engine works. This kind of knowledge object is appropriate for literate people who are used to study printed materials and have sufficient understanding of technical terminology relevant to engine operations.

A **map** presenting the distribution of health care centers is an encoded representation of an entity of knowledge from the field of the health care in a country. A capability to read and understand maps is needed in this context.

A **video film** that shows how to build a bee hive is a knowledge objects for those who understand the language used in the video and are able to understand and replicate the operations shown in the video.

Knowledge is what a person knows. It means that the main purpose of knowledge objects is to enable to gain knowledge - to know more or to know better.

The intended user/recipient of knowledge object is one of main attributes of the knowledge object. The ability of the recipient to absorb the knowledge represented by the knowledge object is the characteristic that distinguishes the knowledge object from data or information objects.

For example, a knowledge object describing a bio-sand water filter and intended for a literate farmer in Nepal could be a leaflet with a sequence of pictures and short texts in Nepali. The purpose of this object is for the farmer to gain knowledge on how to assemble the filter, where to find needed materials, and how to obtain financing (microcredit?). Therefore the attributes of the bio-sand water filter knowledge object (leaflet) must include values (context) such as:
- the problem addressed by the knowledge object (better drinking water)
- intended users (characteristics of the users – Nepali farmers)
- language (Nepali or perhaps one of many dialects)
- geographic location for usage (mountain regions where water in rivers is muddy)
- links to complementary knowledge objects (e.g. concerning market and suppliers of filter components)
- links to comments from other users of the knowledge object
- format of knowledge presentation (in this case – the leaflet).

In addition, the creator or distributor of this knowledge object should be able to check if the receiver of the knowledge object was actually able to use the acquired knowledge and assemble the filter.

A knowledge object is considered as a triad:
- presentation entity (e.g. book, multimedia material, oral story, live show)
- context (collection of attributes mentioned above)
- process (absorption and application of knowledge and its results).

The analysis of knowledge objects is a very complex issue because it involves the consideration of:
- the actual knowledge represented by the object (the knowledge that is valid and verified by experts/practitioners),
- the cognitive and learning capacity of users,
- the suitability of the presentation format,
- the process of applying the knowledge and its effects.

A picture below shows a knowledge object – live demonstration of new varieties of grass to be used as a fodder for cattle. The receivers are illiterate farmers engaged in a government programme of recultivation of wastelands.

A multimedia knowledge object in this case could be a combination of video clips from this demonstration supplemented by recorded comments from farmers and additional explanations written or recorded in local language.

Fig. 1 Knowledge object in the format of live demonstration (technical briefing for illiterate audience)

A **multimedia knowledge object** is a computer-based presentation of a structure of elements such as texts, photographs, video clips, audio clips, maps, animations, and graphics designed to share knowledge with intended audience.

Following the determination of the problem to be addressed by the knowledge object and intended audiences/recipients and their characteristics, and other attributes mentioned above, the process of development of the multimedia knowledge object includes:

a) Deciding which topics relevant to the problem must be included in multimedia presentation, for example, the knowledge object about candle may include topics such as materials for candle making, preparation of wax, candle moulding procedure, and packaging of candles;
b) Design of a logical structure of particular topics (browsing through the elements of the presentation) covering the problem area;
c) Collecting of multimedia materials to be used for presentation of specific topics;
d) Selecting and formatting multimedia materials to be included in the presentation;
e) Selecting the software tool and compiling the multimedia presentation;
f) Testing the presentation and if possible obtaining some feedback/evaluation of the knowledge object from intended users;
g) Producing the multimedia presentation (knowledge object) in delivery format.

A multimedia knowledge object can be a relatively small structure addressing very specific problem, for example - the preparation of fruits for juice making or a complex multilevel structure, for example - the beekeeping manual.

A computer-based presentation of candle making is a knowledge object that can be delivered by village telecentres or development workers/project staff equipped with a laptop. For example, a PowerPoint presentation showing slides with pictures, voice explanations and short video clips can explain how the candle works, what materials are needed to make candles, how to prepare materials, make candles and package for market. The picture below illustrates the concept of candle making knowledge object.

Fig. 2. Knowledge object in the format of PowerPoint presentation

Another example of knowledge objects is the presentation about beekeeping developed using the experimental software produced by Canadian company Solanta Technologies Inc. The software allows generating a browser of multimedia materials in any language. Only basic skills in computing are needed to compile the presentation that includes text, audio and video clips, images, and slide collections. Users of the browser do not need training. They only need to know how to use a pointing device (mouse or touch screen). The picture below shows the screen of the beekeeping browser.

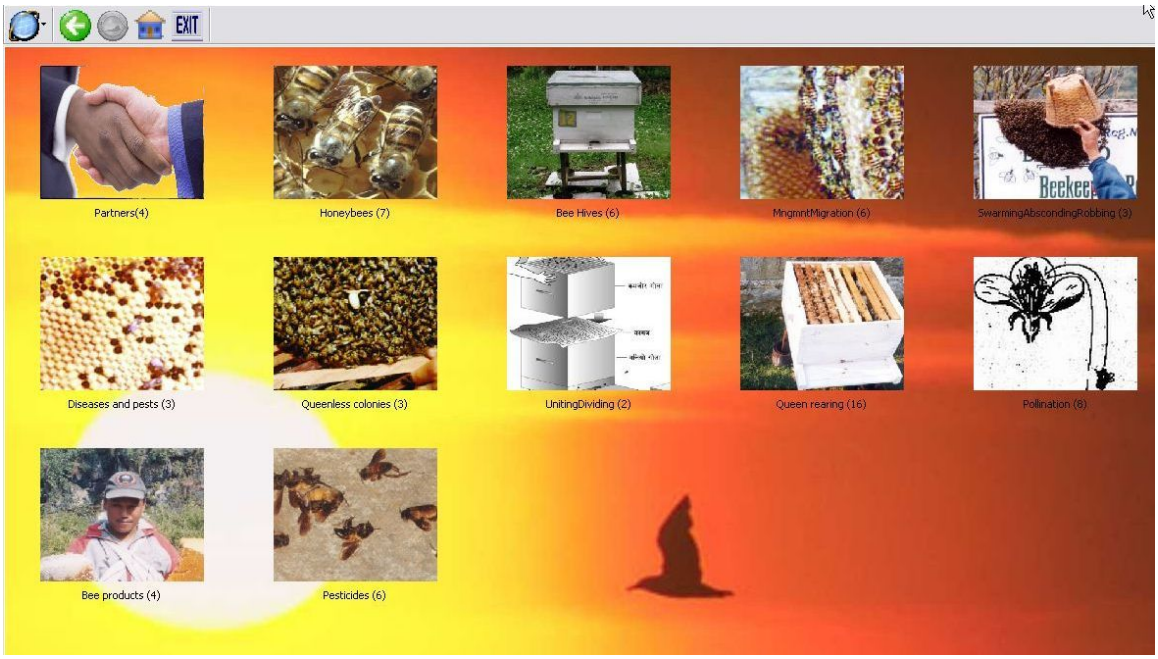


Fig. 3 Multimedia presentation generated using the Solanta Editor

We believe that in time the availability of tools for making and sharing knowledge objects (digital cameras, voice recorders, mobile phones, easy-to-use authoring software) will allow for participatory creation of knowledge objects including farmers, women groups, young people, i.e. creating and sharing of knowledge objects at the community level.

Step-by-step example of creating a knowledge object about cultivation of vegetables for market

The problem:

Creating new opportunities for income generation by introducing the cultivation of vegetables for local and external markets.

Local experts told us that in the target area it is possible to cultivate eggplants and that the demand for this vegetable is growing in the region and possibly on international market.

The problem is that eggplants were not cultivated in target area on a larger scale and local farmers have no experience in cultivating this vegetable.

We decided to provide to village centres and extension workers a multimedia presentation (knowledge object) from which farmers can learn how to cultivate eggplants and deliver them to the market.

a) Topics of the knowledge objects (multimedia presentation)

In consultation with agriculture and market specialist we select the topics to be included in the presentation.

We decided (this is just my example for the sake of illustrating the process) that the following topics will be considered. Usually it takes several iterations to identify all topics and their structure. It means that in the subsequent steps we revise and modify both the selection of topics and their structure.

Cultivation of eggplants - topics:

Topic 1: What is eggplant?

Topic 2: Message from a grower of eggplants.

Topic 3: What environment is needed for cultivating eggplants (soil, water, sun)?

Topic 4: Tools, seeds, fertilizers.

Topic 5: How to prepare land?

Topic 6: Seeds and planting process?

Topic 7: Weeding, watering, soil management.

Topic 8: Pest management and plant protection.

Topic 9: Harvesting eggplants

Topic 10: Packaging and delivery to the market

Topic 11: Economics of eggplant cultivation

Please see attached a research paper on eggplant cultivation. This paper is a quite good knowledge object for me (actually I have some experience in producing eggplants for the market), but I doubt it could be a knowledge object for a farmer in Sri Lanka or Nepal.

b) Logical structure

A structure for this knowledge object could be just simple sequence of elements describing the above topics. Perhaps it would useful to have separate elements for sub-topic in some topic. This will be resolved when the creator of the knowledge objects analyzes the scope and formats of materials to be included in each topic. Just for the sake of this example and discussion let us assume that each topic will be presented as a single slide in the PowerPoint presentation. Each slide may include text, voice, images and video.

c) Collection of materials

This is a continuous activity through the entire cycle of producing a knowledge object. As we develop the presentation structure we may conclude that a better way to present some issue is to make a slide show and not a video or we realize that a voice story from a local farmer may be the best way to present a specific issue. We may also find new materials that can be easier adapted to our needs.

d) Formatting multimedia materials

This is a tedious and time consuming work, in particular for audio and video elements. It is important to set up a computer with appropriate software tools. We recommend the following software:

- multimedia package from AVS (audio and video editors and converters, system utilities)
- Adobe Acrobat Pro, version 8 or higher
- PowerPoint 2003 or higher
- Solanta multimedia editor
- MSOffice 2003 or higher

e) Compiling the multimedia presentation

Please see the Solanta manual for general information about developing multimedia presentations. The process includes the creation of a multimedia object for each topic (sub-topics) and corresponding elements such as icons, voice recordings and text items that are used to build menus and visual and audio links to the multimedia object (topic). In practice, several steps (restructuring, modifications) are needed to achieve an acceptable structure and content. If possible, obtaining an opinion about the presentation is highly recommended (a sort of participatory design).

f) Testing and production

Testing and production of the presentation in a delivery format (for example as an autoplay CD or DVD, or website pages) is a critical step. The delivery format must be robust and tested for all possible environments of delivery since the target users in the

field will not be able to receive a technical assistance in most circumstances. Simply, every element of the presentation must work.

g) Delivery format

The multimedia knowledge objects will be disseminated on CDs and DVDs, in most cases by delivering them to local knowledge nodes and village telecentres. Extension workers should be able to download the presentations to their laptops, when possible. Knowledge objects in PDF or PowerPoint format can be disseminate via Practical Action and partners' websites.

> *A template for the sample eggplant presentation in Solanta format can be found on the Practical Answers Forum website (social network).*

From the University of Maine (website):

Nutrition Information
Like most vegetables, eggplant is naturally low in calories and has no fat. It is a fair source of potassium, iron, and protein. A cup of plain eggplant has only 38 calories. Eggplant is a very good source of fiber.

Eggplant is a member of the nightshade family, and therefore related to potatoes, tomatoes, and peppers. Some writers, such as food author and columnist Jane Brody, recommend always cooking eggplant before eating to destroy any toxic solanine that may be in the vegetable. The cooked peel can be eaten with the pulp in any recipe.

Selection
Choose eggplant with a bright purple color. If you select a newer variety, you may find pink, striped, or even white eggplant. For best quality, look for eggplants that are firm, heavy for size, and free of scars. The skin will be glossy, and the flesh will be firm. Smaller, slender selections usually have smaller seeds and are more tender. Avoid eggplant with brown or blue streaks, or that are shriveled and flabby.

Storage
While eggplant can be stored for a short time at room temperature, the ideal storage temperature is between 46 and 55°F. Storing below 46° will damage eggplant. Store unwashed in the vegetable crisper of the refrigerator without forcing or squeezing them in the crisper, as excess pressure on the delicate skin will cause bruises and decay. Premium quality fresh eggplant will last for about a week in the refrigerator.

Preparation
Wash the eggplant just before cooking and cut off the cap and stem. Eggplant can be cooked with or without its skin. It can be baked, boiled, fried, sautéed, steamed, or stewed. The vegetable can be served stuffed, and used as a meat extender. The varieties of ways in which it can be prepared make it a favorite with people who limit meat in their diet. It is said that eggplant absorbs fat faster than other vegetables, so limit the amount of fat you add to recipes.

Bake eggplant whole in a 400°F oven. Pierce the skin, as you would a potato, before baking. Cook for 30 to 40 minutes, and then remove the flesh from the skin. The flesh can be mashed or pureed and combined with other ingredients, or used in spreads or dips.

Bake eggplant halves by slicing the vegetable in half lengthwise. Brush the cut side with oil, season, and bake, or scoop some of the pulp and stuff with meat or vegetable stuffing. Cook for 20 to 30 minutes at 425°F. Or try broiling or grilling halves that have been sliced lengthwise, lightly oiled, and seasoned.

Eggplant can be stewed alone or with other vegetables to form the colorful stew call ratatouille. Sauté eggplant chunks in a little oil, then add stock, tomato juice, or other liquid. Simmer, covered until the eggplant is tender. Cooking time is 20 to 25 minutes.

Diversity of Knowledge Objects

Technical Brief

WAICENT Portal

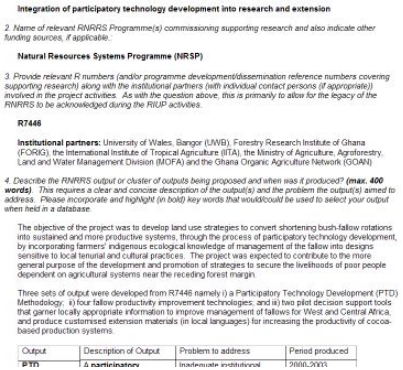
Puppet

Multimedia Presentation

Story

Song

Database



Research paper

Suitability of Formats

Format / User	Technical Brief	Research Report	Database	Video film	Multimedia Presentation	Live demo	Face-to-Face	Email	Voice email / Phone	Radio TV
Nomadic or Tribal Community										
Farmer (educated)										
Farmer (uneducated)										
Policy maker										
Government official										
NGO staff										
Extension worker										
Community-based org.										
Academic										
Development Agency										