



Project Deliverable

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Abstract:

The aim of D6.2 is to deliver a website which will act as a vehicle for the dissemination of information from other SEDENTEXCT Work Packages and as a permanent resource for materials relating to dental CBCT. In addition the site will provide access to the Provisional Guidelines document and feature social software applications as well as a training and assessment section. The site design is derived from user requirements reported in SEDENTEXCT deliverable D6.1.

The development of the site was split into two distinct phases; the 'prototype' site and the 'pre-definitive' site. The prototype site involved the development of the underlying technologies required to meet the user requirements, while the pre-definitive site development involved the population of the prototype site with CBCT information.

The prototype site was based on the Drupal content management system, and configured to provide the functionality required. It was completed in Month 21 and provided the functionality required to develop the pre-definitive site, specifically a 'wiki' section, forums, intranet, general information pages and a 3D image viewer. Responsibility for the generation of CBCT content for the pre-definitive site was allocated to the appropriate project partners. Content was added to the wiki and forum sections and substantial work carried out in delivering the training section of the site.

A plan for raising awareness of the site following the launch was devised, with project partners collating information on potentially interested organisations.

Work continues toward the development of the final, 'definitive', iteration of the website which will include full training and assessment materials and the addition of further content to the wiki and forum sections.

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1. Executive Summary

WP6 is concerned with the development of a website which will offer training, education, information and guidelines to stakeholders regarding CBCT. The development of this site took place in two phases: the 'prototype' and 'pre-definitive' sites. The prototype site comprised the various technical elements required to meet the requirements of the site dictated by the earlier analysis of stakeholder needs and the Description of Work (DoW). The pre-definitive site is built on the foundation of the prototype site, refining some of the functionality but principally adding CBCT content to the site. The current version is available at <http://www.sedentexct.eu>

1.1 Methodology

1.1.1 Prototype Site

The results of the earlier needs analysis, along with requirements from the DoW, were combined into definitive lists of content and functionality required from the site.

Several potential software solutions were identified and tested for suitability in delivering these web applications. A dedicated server was established, and the default Drupal system was customised to provide the functionality discussed above and the built-in design templates completely redesigned.

1.1.2 Pre-definitive Site

The wiki section of the new site was populated with data by designated individuals from each of the SEDENTEXCT work packages.

The forums were seeded with topics for discussion among registered site users.

An initial training module was developed and deployed on the site and substantial work was undertaken on developing nine more modules.

A method of navigating CBCT image data was developed and an example model deployed using this technique.

1.2 Results

1.2.1 Prototype site

The Drupal CMS system was identified as offering the most desirable balance between functionality and rapid development potential. This prototype Drupal site was available to the public and forms the basis for the pre-definitive site.

The site was successfully deployed using Drupal as the basic platform on which the other elements have been built. Much of the site is open to the general public, but a login system allows access to the intranet and to edit various pages.

An editor allows users to create content within the intranet, wiki and forum sections of the website, depending on the level of access granted to that user.

The prototype site contained little content, but satisfied the technical requirements of the various stakeholder groups.

1.2.2 Pre-definitive Site

The wiki section has been populated by content by the project partners while the intranet section is maintained by members of the UNIMAN team.

The forums are in use and accessible by any registered site user.

The training section of the site has been established and learning outcomes agreed for the ten modules for which training materials are to be delivered. A Powerpoint presentation with voice-over has been created for Module 3 ("Principles of Radiation Dose and Risk").

The pre-definitive site provides an example model of a three-dimensional (3D) representation of CBCT image data, the technology for which will be used in the later stages of the project.

1.3 Conclusion

The site is now technically complete with the exception of the functionality required for training assessment. The website provides substantial information on CBCT, forums that are starting to be used, and a sample training module.

1.4 Further work

An assessment section will be added to the site following the completion of all training materials for the ten modules identified. Development of the website will continue according to further requirements identified from user feedback.

2. The Context

2.1 SEDENTEXCT Aims and Objectives

The aim of this project is the acquisition of the key information necessary for sound and scientifically based clinical use of dental Cone Beam Computed Tomography (CBCT). In order that safety and efficacy are assured and enhanced in the 'real world', the parallel aim is to use the information to develop evidence-based guidelines dealing with justification, optimisation and referral criteria and to provide a means of dissemination and training for users of CBCT. The objectives and methodology of the collaborative project are:

1. To develop evidence-based guidelines on use of CBCT in dentistry, including referral criteria, quality assurance guidelines and optimisation strategies. Guideline development will use systematic review and established methodology, involving stakeholder input.
2. To determine the level of patient dose in dental CBCT, paying special attention to paediatric dosimetry, and personnel dose.
3. To perform diagnostic accuracy studies for CBCT for key clinical applications in dentistry by use of in vitro and clinical studies.
4. To develop a quality assurance programme, including a tool/tools for quality assurance work (including a marketable quality assurance phantom) and to define exposure protocols for specific clinical applications.
5. To measure cost-effectiveness of important clinical uses of CBCT compared with traditional methods.
6. To conduct valorisation, including dissemination and training, activities via an 'open access' website.

At all points, stakeholder involvement will be intrinsic to study design.

2.2 Work Package 6 (WP6) Objectives

- to perform a needs analysis amongst the professional community and public so as to provide an opportunity for public and expert participation in design of content;
- to provide a robust and cost-effective means of delivery of on-line training and information dissemination;
- to provide an open repository of knowledge and experience on CBCT, including the Guidelines developed by Work package 1;
- to facilitate growth and sharing of knowledge and experience.
- to ensure continued support and maintenance of the resources developed in the Work package beyond the lifetime of the project.

2.3 Deliverable D6.2

Deliverable D6.2 ("Pre-definitive website launched") describes the two phases of website development work:

- prototype website (milestone M6.4)
- pre-definitive website (D6.2 and milestone M6.5)

The prototype website is the output of the main technical development phase of the project. The pre-definitive website is defined as being a website containing substantial CBCT content. This deliverable concerns the continuing development of the SEDENTEXCT website and building the following onto the foundations of the prototype site –

- all CBCT information topics specified in the Needs Analysis contain substantial content;
- the discussion forum in active use among partners, to encourage other people outside the project to use it;
- at least one training module complete, and substantial work has taken place on all modules;
- the methodology for developing three dimensional (3D) models of CBCT images established and at least one 3D model available.

3. Methodology

The main purpose of the site is to deliver information on Cone Beam CT through the web. The development of the pre-definitive site was primarily driven by the findings of the surveys described in deliverable D6.1. These provide user requirements for site content and site functionality. The design of the site was derived from these results and development of the site conducted in two phases, prototype and pre-definitive, according to the Description of Work.

3.1 Requirements

3.1.1 Content

The list of contents for the site was derived from three sources

- i) Requirements outlined in the Description of Work (DoW)

The DoW specifically requires the inclusion of The Provisional Guideline document, produced as part of Work Package 1, as well as a more general requirement that the website provides access to other materials produced by other Work Packages during the life of the project.

- ii) Content requirements dictated by the findings of D6.1.

These reflect the findings of surveys conducted among dental professionals, physicists and manufacturers of CBCT equipment described in deliverable D6.1. Full details of these surveys and results are contained in Appendix A. The aggregated and ranked findings of the surveys on site content are listed in Table 1 below.

- iii) Additional requirements imposed by the project team during development.

The need for some additional content became apparent during development of the site. Any such additional content was incorporated into the site during development.

Table 1: Content requirements derived from surveys conducted among various groups during D6.1

Source	Content requirements
DoW	<ul style="list-style-type: none">• Provisional Guideline document• Work generated by other Work Packages
D6.1 surveys (ranked)	<ul style="list-style-type: none">• Information about Radiation doses and risks of CBCT• A Quality Assurance Programme for users of CBCT• Information about Quality Control Test Tools for CBCT• A strategy for Radiation Protection of patients• A strategy for Radiation Protection of staff• Evidence-based Referral/ Selection Criteria for CBCT

Source	Content requirements
	<ul style="list-style-type: none"> • Descriptions of the Dental clinical uses of CBCT • Anatomical CBCT reference image library • Dose Maps for CBCT • A detailed technological description of how CBCT works • A regularly updated database of links to scientific publications on CBCT • An objective technical comparison of different CBCT machines • Information about Radiation doses and risks of CBCT • A Quality Assurance Programme for users of CBCT • Information about Quality Control Test Tools for CBCT • A strategy for Radiation Protection of patients
Development team	<ul style="list-style-type: none"> • Information for patients undergoing CBCT scans

3.1.2 Functionality

The functional requirements of the site were derived from three sources.

i) The minimum requirements outlined in the DoW

The DoW specified certain requirements at the outset of the project. These included wikis, blogs, guideline documents, training and assessment materials. These requirements were intended to be general and to be refined by the findings described in deliverable D6.1 and the project team during the development of the site.

ii) The specific requirements dictated by the findings of D6.1.

The results from D6.1 showed a close alignment in the requirements of the dental practitioners, physicists and manufacturers polled. The main areas of agreement were that the site should include diagnostic forums, discussion boards, text-based information, PowerPoint lectures with audio and a 'wiki' type section. See Appendix 1 for a full list of stakeholder requirements.

iii) Additional requirements imposed by the project team during development.

These extra requirements were imposed during development and include meeting W3C¹ web standards, accessibility issues and security.

A full list of functional requirements is summarised in Table 2 below.

¹ W3C: World Wide Web Consortium, an international community where member organizations, a full-time staff, and the public work together to develop Web standards.

Table 2: Functional requirements derived from surveys conducted among various groups during D6.1

Source	Functional requirements
DoW	Wiki Blog Access to CBCT Guideline documents Training Materials
D6.1 questionnaires	Diagnostic Forums Discussion Boards Text-based information PowerPoint lectures Wiki Section
Development team	Accessibility Standards Secure Intranet Levels of user access Ability to interact with CBCT scans rather than viewing flat images.

3.1.3 Design

The site design was formulated using the content requirements and functionality requirements described in sections 3.1.1 & 3.1.2.

These produce the following three main requirements of the site's design and dictate the functionality required of the final solution.

3.1.3.1 Discrete Content Elements

This describes the method of delivering each of the content requirements.

The general list of functional requirements in Table 2 was rationalised into the following list

- Forum
- Wiki
- Rich Content
- Text-based information
- Security system

The content requirements described in section 3.1.1 were then matched with these methods of delivery (Table 3).

Table 3: Appropriate methods of delivery for each of the content requirements previously specified (note: forums are not included in this table as they are not intended to carry a specific content topic)

Content Requirement	Method of delivery
Provisional Guideline document	Text-based information
Work generated by other Work Packages	Text-based information
Information about Radiation doses and risks of CBCT	Wiki
A Quality Assurance Programme for users of CBCT	Wiki
Information about Quality Control Test Tools for CBCT	Wiki
A strategy for Radiation Protection of patients	Wiki
A strategy for Radiation Protection of staff	Wiki
Evidence-based Referral/ Selection Criteria for CBCT	Wiki
Descriptions of the Dental clinical uses of CBCT	Wiki
Anatomical CBCT reference image library	Wiki/Bespoke image tool
Dose Maps for CBCT	Wiki
A detailed technological description of how CBCT works	Wiki
A regularly updated database of links to scientific publications on CBCT	Wiki
An objective technical comparison of different CBCT machines	Wiki
Information about Radiation doses and risks of CBCT	Wiki
A Quality Assurance Programme for users of CBCT	Wiki
Information about Quality Control Test Tools for CBCT	Wiki
A strategy for Radiation Protection of patients	Wiki
Information for patients undergoing CBCT scans	Text-based information
Ability to interact with CBCT scans rather than viewing flat images.	Bespoke image viewing tool

It was envisaged that the training materials specified in Table 3 would consist of a combination of Powerpoint-based presentations along with links to pertinent articles within the wiki section of the site.

3.1.3.2 Site Programming and Design

This describes the application development which would be required in order to deliver the elements described in Table 3 through the web. The main components of this section would be

- Scripting (PHP, ASP etc)
- HTML
- CSS
- Flash, Silverlight etc.

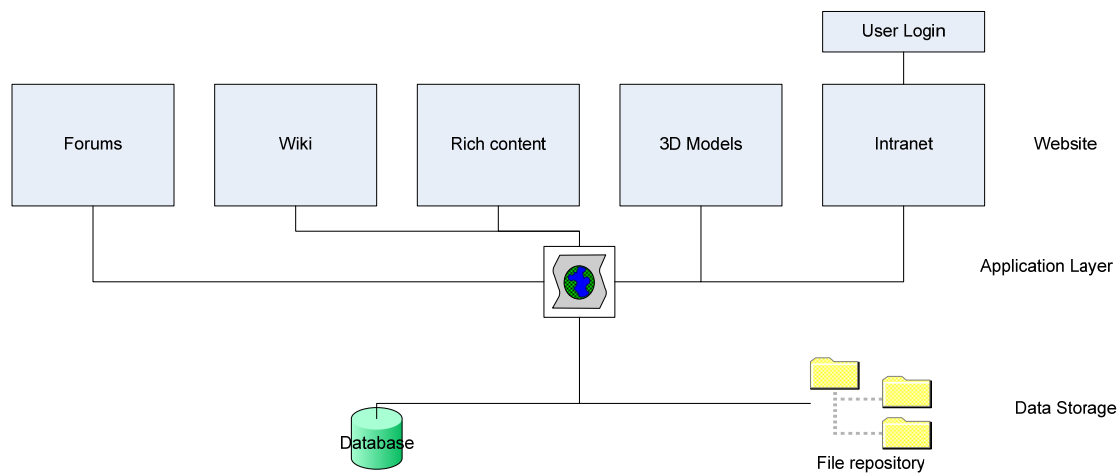
This section would form the framework through which all content and functionality would be delivered.

3.1.3.3 Data Storage

The methods of content delivery required, such as the forums, made necessary that a database was established along with the main site. The ability to deliver PDFs and other documents through the site also made it necessary to provide a file repository.

Figure 1 summarises the way in which the interactions between each of these three separate elements of the site would work in practice. Users come directly into one of the sections of the site and the application delivers content to the browser, making calls to the database or file repository where necessary.

Figure 1: Site layout showing the layers of content, application and data storage



3.2 Prototype Site

The implementation of the site was divided into two distinct phases; the prototype site and the pre-definitive site. The prototype website, which was delivered in month 21 as Milestone 6.4, describes the state of the development website up until month 21, during which time various software solutions were deployed and tested. At the delivery date of Milestone 6.4 the prototype website became the basis for the pre-definitive website and development continued.

Three options were considered as platforms on which to develop the site design and provide the functionality outlined above.

- 1) Building a bespoke site
- 2) Using an application framework such as CakePHP
- 3) Using an off-the-shelf system such as Drupal, Joomla etc.

3.2.1 Option 1: Bespoke Site

The option of building the site entirely from the ground up was first considered. Using a development language such as PHP this option would provide maximum flexibility as the development team would not be constrained by the limitations of existing software. This option would also offer maximum flexibility in terms of the database

being used. Tables within the database could be expanded whenever the developing software layer required it do so. This development path presents no obstacle in terms of meeting the requirements set out in section 3.1.

The downside to this flexibility is the increased development time required. In such cases detailed plans and database schemas are required which are both time-consuming and prone to error. An important reason for not following this path is that long term maintenance of bespoke sites can be problematic when the original developer is no longer available.

3.2.2 Option 2: Application Framework Development

Application frameworks such as Cake PHP and Ruby on Rails are relatively new phenomena in website development. Although they do not offer the full-blown application capabilities of, for example, CMS software, they do provide a ready-written library of frequently used functions and database connectivity. By using a 'scaffolding' system, much standard functionality such as field validation and CRUD database functions can be built into pages with minimal developer intervention. These application frameworks also have built in security features such as data sanitisation and adhere to the MVR method of development, again obviating bespoke development work. This development path presents no obstacle in terms of meeting the requirements set out in section 3.1.

Although application frameworks offer the opportunity for rapid development they do still require a significant amount of programming to form meaningful applications and also require a certain level of configuration. These systems often use a highly modified version of their 'parent' language (e.g. PHP for Cake PHP) which can present a significant learning curve to existing developers, as well as difficulties with long term maintenance.

3.2.3 Option 3: CMS Systems

The final option considered was that of an of-the-shelf CMS application such as Drupal or Joomla. These systems constitute a fully functioning piece of software which requires minimal set-up and provides the ability for users to login to a website and modify pages through a simple web interface, rather than altering the underlying code. The major advantage to these systems is the ability to deploy websites rapidly. In their most basic form, such sites require little more than a few web pages being uploaded to a web server to become functional, allowing the developer to concentrate on areas such as design.

These applications are also highly extensible in that many optional plug-ins are available which can provide extra functionality to a website, such as the ability to upload pictures. With such plug-ins, these websites can act as file repositories and offer fairly sophisticated word processing functionality.

Active user communities for software such as Drupal release regular updates to their software, improving security and adding functionality, again taking this responsibility away from the developer.

This development path presents no obstacle in terms of meeting the requirements set out in section 3.1.

The main drawback with such systems can be their lack of flexibility. Although they are generally released with open source licences the underlying code is so highly specialised that alterations by 3rd party developers are very time-consuming. In addition, such alterations often prevent the software from being updated as described above, as doing so would overwrite such changes.

Table 4: Summary of benefits of various web development solutions

Software Type	Examples	Benefits	Disadvantages
Bespoke	PHP, ASP	Maximum Flexibility	Increased development time
Application Framework	CakePHP, RubyOnRails	Flexible systems Built-in security	Still require development Learning curve for developers
CMS application	Drupal, Joomla	Very rapid development Adhere to web standards Large library of add-ons to improve functionality	Least flexible solution

3.2.4 Chosen Solution

Although other options offered greater flexibility, time constraints meant that a CMS application was the obvious choice for development of the SEDENTEXCT website. Because of existing expertise within the University of Manchester it was decided to use the Drupal CMS system. This software has a large and active user community providing support and a wide range of extensions to the core application.

Table 5: Summary of ways in which Drupal meets the requirements set out in section 3.1.

Functionality required	Drupal
Wiki Text-based information PowerPoint lectures	Several extensions used to replicate wiki functionality, including the ability to upload documents such as powerpoint presentations
Access to CBCT Guideline documents	Basic link from home page to relevant documents
Training Materials	Able to create text pages and embed powerpoint materials

Functionality required	Drupal
Diagnostic Forums/ Discussion Boards	Forum functionality provided by Drupal extension
Accessibility Standards Secure Intranet Levels of user access	All provided as standard by core Drupal software

3.3 Pre-definitive Site Development

Development of the pre-definitive site continued directly from the final iteration of the prototype site and required the addition of the elements described in section 3.1.1.

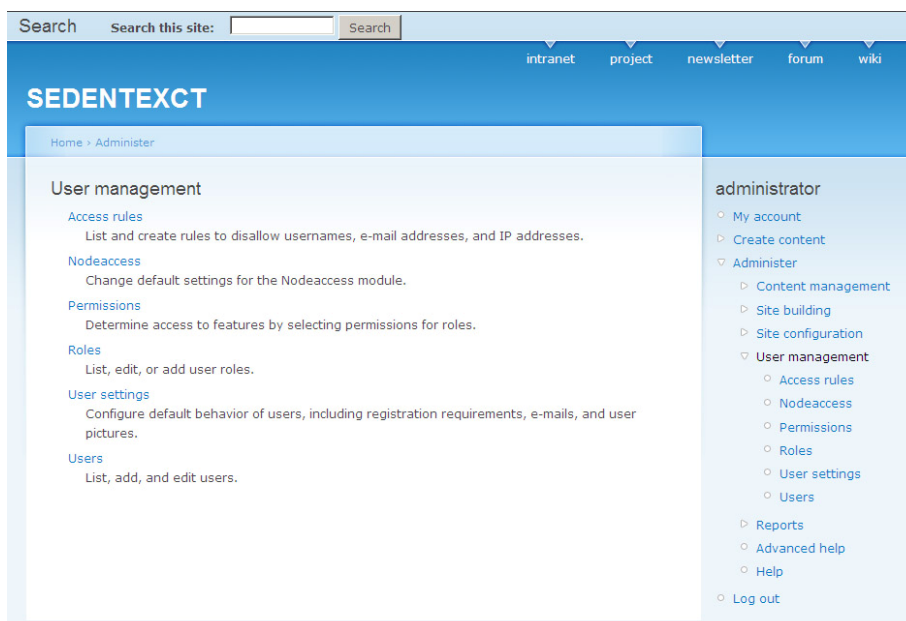
3.3.1 Server

The Drupal software was installed on a dedicated server running Apache webserver software with MySQL database. The server IP address was registered and linked to the URL <http://www.sedentext.eu>.

3.3.2 Drupal Configuration

The front end graphical design was developed as a series of templates using cascading style sheets (CSS) which override the default Drupal design. The default design can be seen in Figure 2.

Figure 2: Basic Drupal graphic design



The default Drupal design was, however, retained for use in the administration section of the site, due to its simple and clear layout being adequate for the purpose.

Drupal was next configured to allow various levels of access depending on the security level assigned to each new account. A different set of options is available depending on whether the user logs in as an administrator or with a regular user account. Administrators are able to access the full range of configuration options and regular users are limited to the creation of new site content.

Although Drupal offers no out-of-the box wiki functionality several plug-ins were modified to provide the required features. The resulting software provides a rich text editor with the ability to add wiki links, other internal and external links, upload images and add references to articles.

Several extensions allowing the deployment of forums through websites are available for the Drupal CMS. A fairly simple version was selected for the SEDENTEXCT site and integrated with the rich text editor already developed for the wiki section, allowing modifications to text and the uploading of images.

3.3.3 Site Content

Following the initial deployment and development user accounts were created and distributed among the project team and a period of testing was initiated prior to the site being made live.

Responsibility for the development of specific areas of content was allocated to each of the partner organisations contributing to WP6. SEDENTEXCT partners then added content directly into the wiki section of the site.

The intranet section was populated by the development team in Manchester with materials from the various work packages and other project documentation. At the same time the forums were seeded with topics from project partners.

3.3.4 Image Viewing Tool

One of the requirements generated by the development team was for the development of an image viewing tool which would aid in the delivery of CBCT images through the web. Although CBCT scans can be viewed as 'volumes' that is, as 3D reconstructions, this is normally only possible using the proprietary software provided by CBCT machine manufacturers themselves. The possibility of providing similar functionality through the web was examined, principally using Adobe Flash in order to reduce the overhead on end users as this plug-in is generally installed for modern web browsers.

This, however, proved to be beyond the current capabilities of the software. With a limit of 2000 polygons, images were of such low resolution as to be of little value as either training or diagnostic tools.

An alternative method was instead developed which allows users to move slice by slice through models in the sagittal, axial and coronal planes, allowing CBCT volumes to be viewed in three dimensions at a much higher resolution. This was again developed using Flash.

3.3.5 Training Materials

It was required that the training materials form a discreet section of the website with some original design features. The two main elements of the training materials are

- Powerpoint presentations
- Structured links to wiki articles

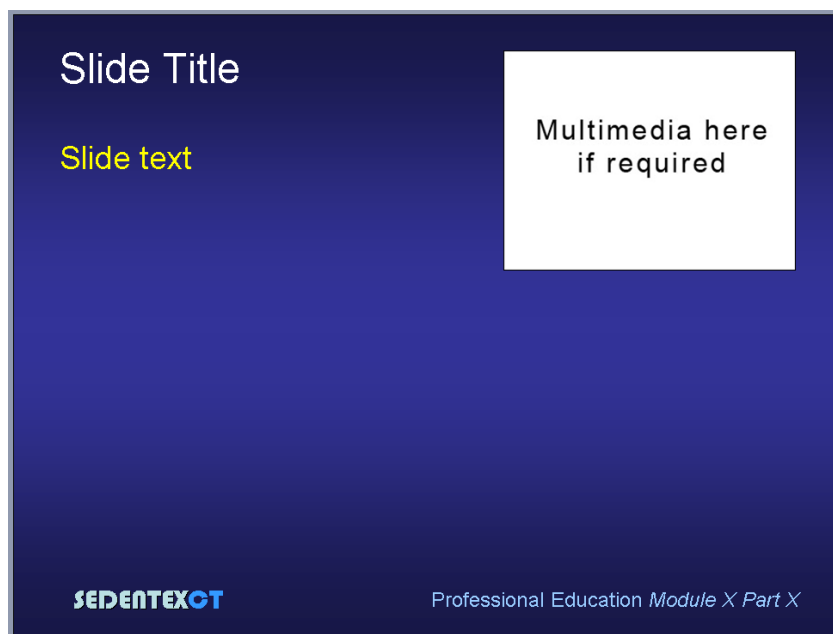
A list of modules to be developed was derived from the user feedback on content requirements in D6.1 and finalised as follows

- Module 1: How does CBCT work - Part 1
- Module 2: How does CBCT work - Part 2
- Module 3: Principles of Radiation dose and risk
- Module 4: Radiation dose and risk in CBCT
- Module 5: Justification - principles
- Module 6: Justification - referral criteria
- Module 7: Dose optimisation - patients and staff
- Module 8: Dose optimisation - quality assurance
- Module 9: Anatomy on CBCT images
- Module 10: Interpretation of pathology on CBCT images

A 'brainstorming' section was established within the site intranet and project partners were encouraged to make contributions to the elements required within each of these modules. This was done in two phases, firstly the collection of broad ideas for content and secondly for specific 'learning objectives' which the training materials should be able to meet. These comments were then fed back into the development of the modules.

A PowerPoint template was developed and distributed among project partners in order to produce a standardised form of presentation throughout the training materials (Figure 3).

Figure 3: Training presentation template



3.3.6 Community Engagement

A further requirement of the DoW was that awareness raising activities should take place following the launch of the pre-definitive site in order to aid in community engagement and ensuring that the website continues to self-perpetuate beyond the life of the project.

Individuals from each partner organisation were nominated to take responsibility for awareness raising activities. Each of these has responsibility for the following:

- Identifying potential member groups
- Planning and facilitating community events, e.g. the launch of the community, web seminars etc
- Helping build the training materials and content
- Facilitating postings on forums
- Informally link community members with common interests through the forums

To this end, project partners were asked to collect information on local, national and international bodies who could be contacted regarding the website and who would hopefully act as partners in the future.

The forums are intended to be the main focus of stakeholder engagement in the site with discussions being 'seeded' by members of the project team in order to stimulate discussion therein.

4. Results

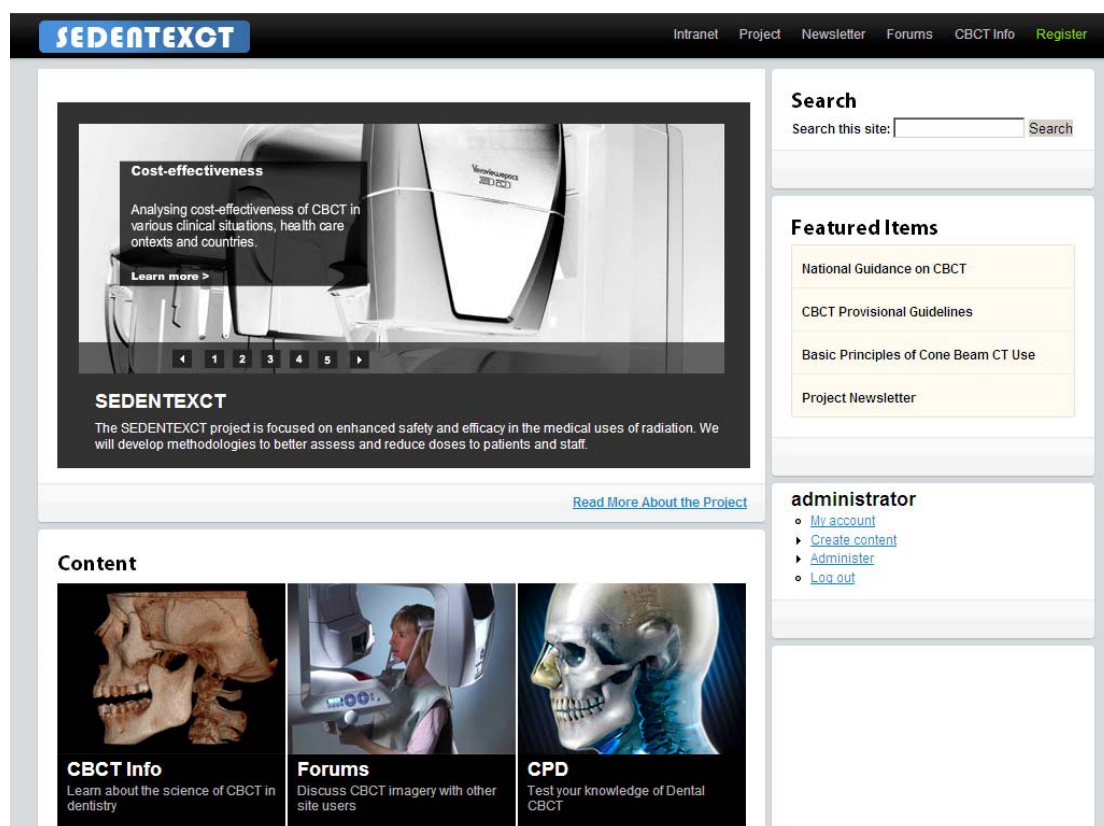
4.1 Introduction

The pre-definitive website consists of modified Drupal software, providing a secure intranet, forums and wiki pages.

4.2 Home Page

Figure 4 shows the home page of the site, which provides links to the main sections.

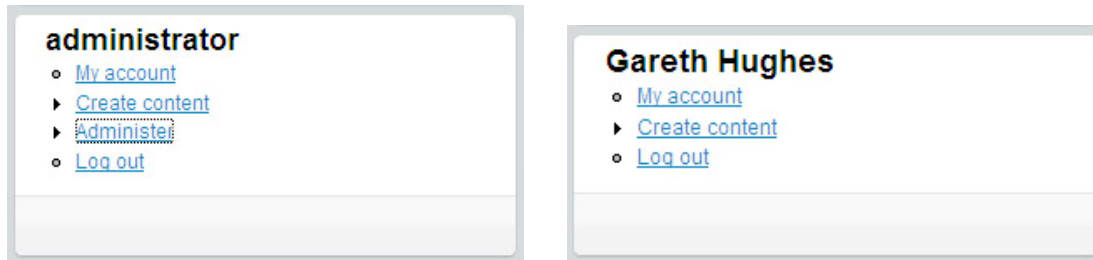
Figure 4: SEDENTEXCT home page



The wiki section has been labelled as 'CBCT Info' to avoid confusion in users as true wikis generally allow contributions from all users, whereas the ability to contribute and update information here is limited to the project team.

In Figure 4, the user is logged in as an administrator. Figure 5 shows the difference in the contextual menu on the right when logged in as a regular user. No access is provided to the administration section of the site, preventing unauthorised changes being made to the core software.

Figure 5: Context sensitive user menus

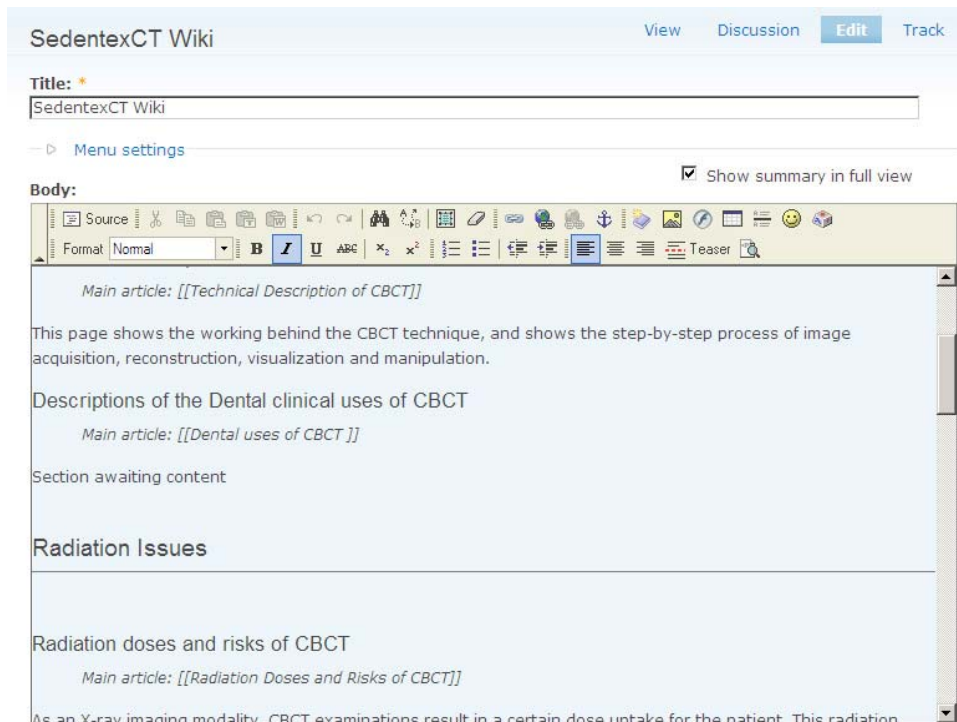


Once successfully logged in, users are able to create new wiki content, make postings on the forum and view material placed within the intranet, these sections normally being restricted.

4.3 Wiki Content

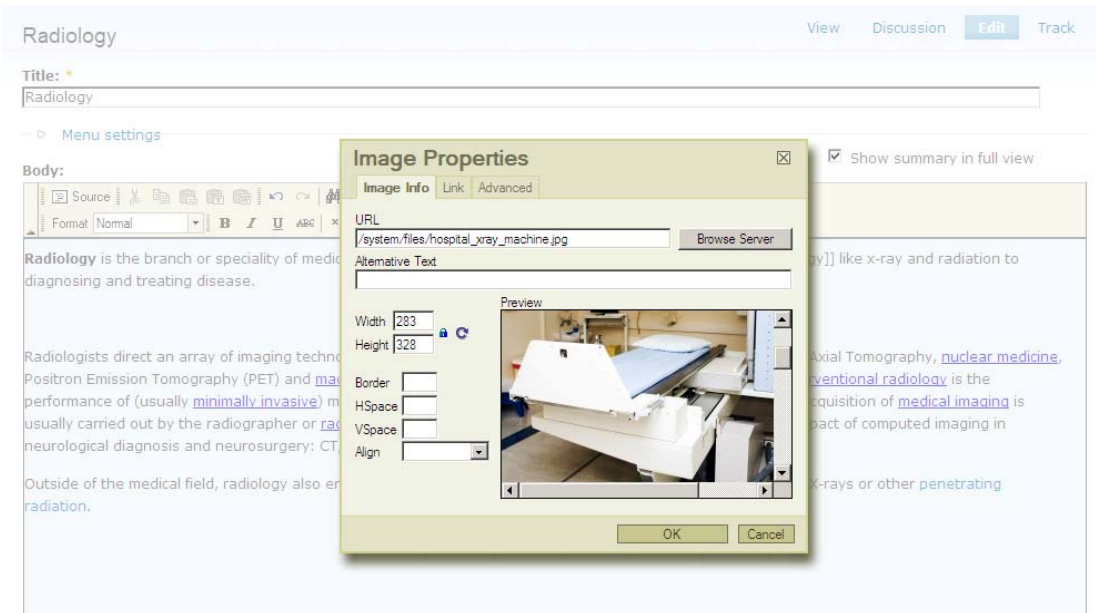
Figure 6 shows the wiki editing page, through which logged in users can contribute content to the site. A wysiwig² editor provides access to the full range of word processing options commonly found in stand-alone applications. The Drupal software allows wiki markup to be used within these pages in order to create links to other user-generated and external content. Drupal also allows images stored within the document repository to be embedded within the page (Figure 7). In a similar way documents such as PDFs and word documents can also be attached to pages.

Figure 6: Showing rich text editor toolbar and use of wiki markup within text



² wysiwyg = 'what you see is what you get'

Figure 7: Uploading an image to a wiki article



Lines of text marked as references within the editor allow a reference section to be added automatically to the footer of each article (Figure 8).

Figure 8: Wiki article demonstrating use of the referencing tool

Radiology

Radiology is the branch or speciality of medicine that deals with the study and application of [imaging technology](#) like x-ray and radiation to diagnosing and treating disease.

Radiologists direct an array of imaging technologies (such as [ultrasound](#), [computed tomography](#) (CT) Computed Axial Tomography, [nuclear medicine](#), Positron Emission Tomography (PET) and [magnetic resonance imaging](#) (MRI)) to diagnose or treat disease . [Interventional radiology](#) is the performance of (usually [minimally invasive](#)) medical procedures with the guidance of imaging technologies. The acquisition of [medical imaging](#) is usually carried out by the radiographer or [radiologic technologist](#)¹

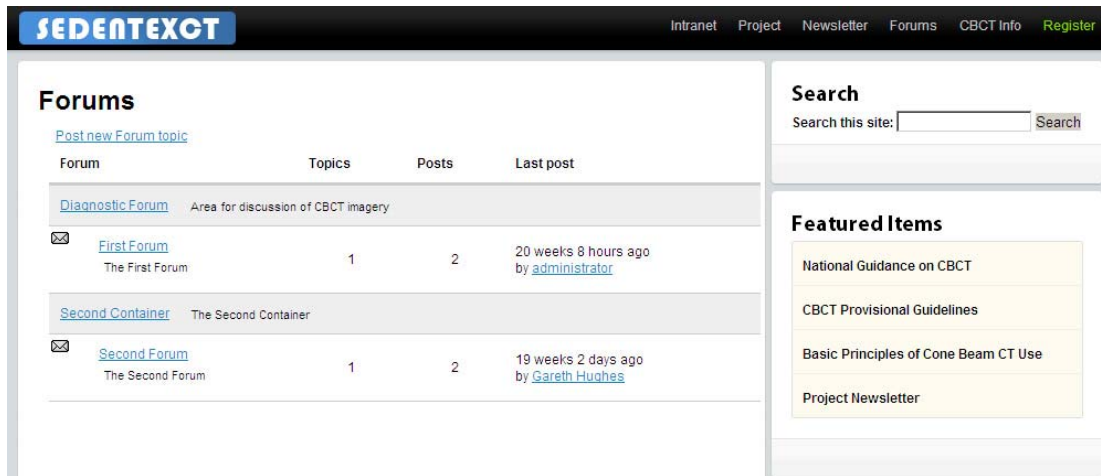
Outside of the medical field, radiology also encompasses the examination of the *inner structure* of objects using X-rays or other [penetrating radiation](#).

¹ Filler, AG: The history, development, and impact of computed imaging in neurological diagnosis and neurosurgery: CT, MRI, DTI: Nature Precedings DOI: 10.1038/npre.2009.3267.4.

4.4 Forums

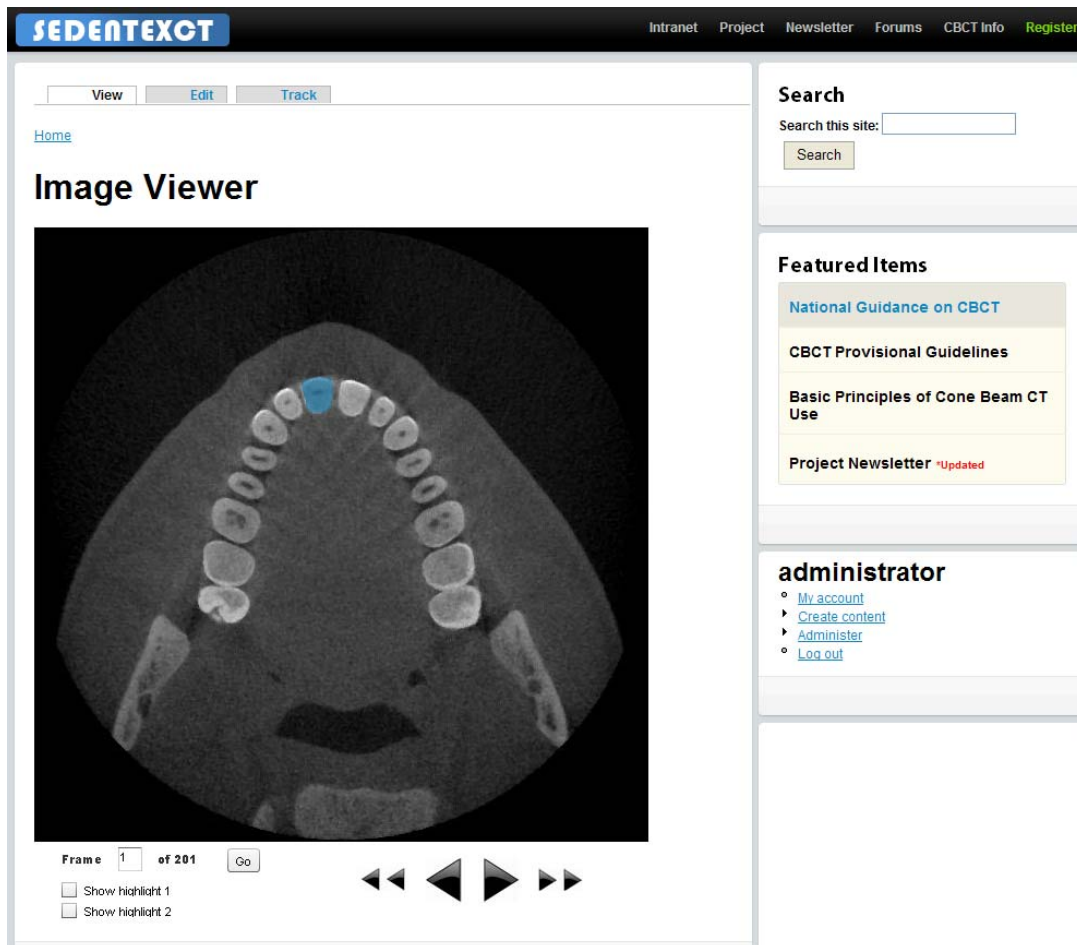
The forum section provides standard features, such as the ability to create threads and posts and reply to posts (Figure 9). The same wysiwig editor seen in the wiki section (Figure 7) is used to enable post creators to embed images.

Figure 9: Front page of the SEDENTEXCT site forums



The image viewing tool exists as a Flash file which can be embedded into any wiki or forum page using the wysiwig editor (Figure 10).

Figure 10: CBCT image viewer embedded within a wiki page



Users can use the controls below the image to move through the CBCT volume slice by slice and use the checkboxes to highlight anatomical features within the current image.

4.5 Training Materials

The training section of the SEDENTEXCT website is intended to provide users a structured method of learning about CBCT through use of the materials contained within the wiki as well as specially written training materials.

A list of modules to be developed was derived from the user feedback on content requirements in D6.1 and finalised as follows

- Module 1: How does CBCT work - Part 1
- Module 2: How does CBCT work - Part 2
- Module 3: Principles of Radiation dose and risk
- Module 4: Radiation dose and risk in CBCT
- Module 5: Justification - principles
- Module 6: Justification - referral criteria
- Module 7: Dose optimisation - patients and staff
- Module 8: Dose optimisation - quality assurance
- Module 9: Anatomy on CBCT images
- Module 10: Interpretation of pathology on CBCT images

A full list of learning outcomes was developed for each of these modules and made available on the intranet. Figure 11 shows the front page of the training section and Figure 12 shows a screen from the Module 3 Powerpoint presentation.

Figure 11: Screenshot showing the front page of the training section

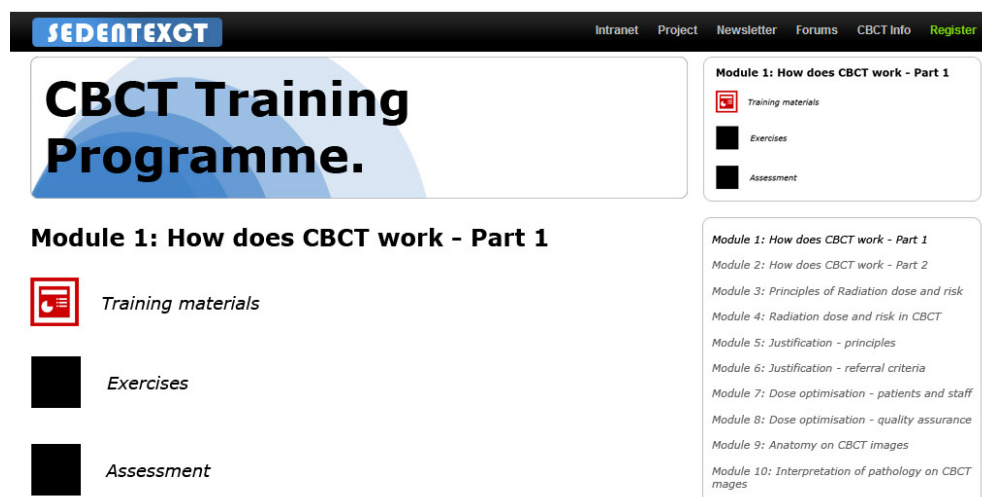
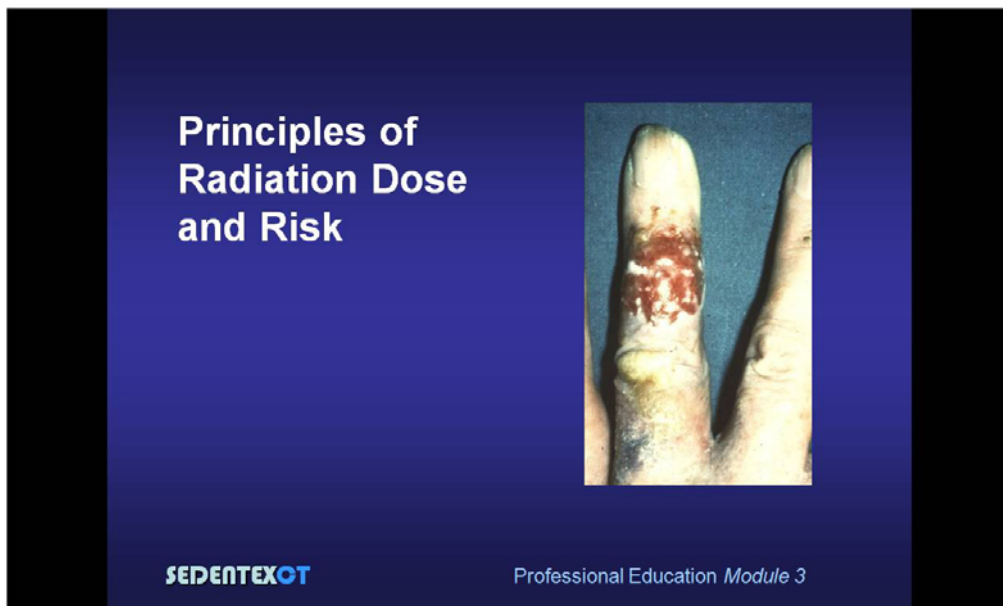


Figure 12: Screenshot showing Module 3 PowerPoint presentation



Module 3, on “Principles of Radiation Dose and Risk”, has been developed with audio commentary and deployed on the site.

5. Conclusions

5.1 Objectives

The objectives set out for deliverable D6.2 have been met. The Drupal content management system has provided a solid framework for containing and delivering all of the requirements identified during work for deliverable D6.1 and as set out in the DoW.

5.2 Further work

Further work is required to add the body of knowledge within the wiki section of the site.

Consideration also needs to be given to the post-project future of the site, such as the physical transfer of data to another server and the update of information within the site. Site statistics will also be analysed to assess the impact of various sections of the site.

The next stages in development will be to develop the assessment tools which will allow users to test their knowledge of CBCT and to attain recognition of this knowledge, probably in the form of CPD points. It will also be necessary to encourage stakeholder involvement in the forums and to engage actively with organisations which have been identified as potentially being interested in the SEDENTEXCT project and site (Table 6).

Table 6: Organisations identified as potential targets

International professional organisations	
EADMFR	European Academy of Dentomaxillofacial Radiology
EFOMP	European Federation of Organisations for Medical Physics
National professional organisations	
Belgium	VVT (Association of Flemish Dentists)
	VBT (Flemish Professional Association of Dentists)
	BHPA (Belgian Association of Hospital Physicians)
Greece	Hellenic National Dental Society
	Athens Dental Society
	Hellenic Society of Dentomaxillofacial Radiology
Lithuania	Lithuanian Association of Radiology
Romania	Romanian Dentists Association (CMDR)
Sweden	The Swedish Dental Association (SDA)
	Swedish Society for Maxillofacial Radiology (SFOR)
UK	British Dental Association
	The Royal College of Surgeons of England
National bodies / organisations	
Belgium	FANC (Federal Agency of Nuclear Control)
France	AFSSPS (French health product safety agency)
Greece	Greek Atomic Energy Commission
Lithuania	Radiation Protection Centre
Romania	National Commission for Nuclear Activity (CNCAN)
UK	Health Protection Agency

Appendix 1

Table 1: Ranking of needs (website content) taken from responses to the web surveys conducted through EADMFR and EFOMP (and other means of contacting Medical physicists)

Rank	EADMFR survey (principally dental radiologists)	Rank	EFOMP/ Medical Physicist survey
1	Information about Radiation doses and risks of CBCT	1	An objective technical comparison of different CBCT machines
2	A Quality Assurance Programme for users of CBCT	2 =	Information about Radiation doses and risks of CBCT
3	A strategy for Radiation Protection of patients	2 =	A Quality Assurance Programme for users of CBCT
4	A strategy for Radiation Protection of staff	4	Information about Quality Control Test Tools for CBCT
5 =	Anatomical CBCT reference image library	5	A detailed technological description of how CBCT works
5 =	Pathological CBCT reference image library	6	A strategy for Radiation Protection of patients
7	Evidence-based Referral/ Selection Criteria for CBCT	7	A strategy for Radiation Protection of staff
8	Dose Maps for CBCT	8	Dose Maps for CBCT
9	Descriptions of the Dental clinical uses of CBCT	9	An image library of faults on CBCT images
10 =	Information about Quality Control Test Tools for CBCT	10	A regularly updated database of links to scientific publications on CBCT
10 =	An image library of faults on CBCT images	11	Evidence-based Referral/ Selection Criteria for CBCT
12	Descriptions of the Oral and Maxillofacial Surgery clinical uses of CBCT	12	Descriptions of the Dental clinical uses of CBCT
13	A detailed technological description of how CBCT works	13	Descriptions of the Oral and Maxillofacial Surgery clinical uses of CBCT
14	An objective technical comparison of different CBCT machines	14	Links to manufacturers' websites
15	A regularly updated database of links to scientific publications on CBCT	15	A list of available CBCT equipment on the market
16	Descriptions of the "non-dental" clinical uses of CBCT	16	Descriptions of the "non-dental" clinical uses of CBCT
17	A list of available CBCT equipment on the market	17	Anatomical CBCT reference image library
18	Links to manufacturers' websites	18	A Pathological CBCT reference image library
19	Pictures of available CBCT equipment on the market	19	A history of the development of CBCT technology
20	A history of the development of CBCT technology	20	Pictures of available CBCT equipment on the market

Table 2: Needs analysis of manufacturers for website content


Manufacturers' survey	
<p style="text-align: center;">Greatest need</p>  <p style="text-align: center;">Least need</p>	<ul style="list-style-type: none"> • Descriptions of the Dental clinical uses of CBCT • Descriptions of the Oral and Maxillofacial Surgery clinical uses of CBCT • Evidence-based Referral/ Selection Criteria for CBCT • An image library of faults on CBCT images • Descriptions of the "non-dental" (e.g. imaging of sinuses, middle ear) clinical uses of CBCT • A Pathological CBCT reference image library • A regularly updated database of links to scientific publications on CBCT
	<ul style="list-style-type: none"> • An objective technical comparison of different CBCT machines • Information about Radiation doses and risks of CBCT • An Anatomical CBCT reference image library
	<ul style="list-style-type: none"> • A list of available CBCT equipment on the market • A detailed technological description of how CBCT works • A strategy for Radiation Protection of staff • A strategy for Radiation Protection of patients • Information about Quality Control Test Tools for CBCT
	<ul style="list-style-type: none"> • Pictures of available CBCT equipment on the market • Links to manufacturers' websites • A Quality Assurance Programme for users of CBCT
	<ul style="list-style-type: none"> • Dose Maps for CBCT • A history of the development of CBCT technology

Table 3: Ranking of needs (method of online delivery of training) taken from responses to the web surveys conducted through EADMFR and EFOMP (and other means of contacting Medical physicists). Shading in red indicates statements that were rejected by respondents.

Rank	EADMFR survey (principally dental radiologists)	Rank	EFOMP/ Medical Physicist survey
1	A diagnostic forum where I can upload images for discussion would be valuable	1	A Discussion Board for interaction with other registered users would be valuable
2 =	Text-based information for training is essential	2 =	Text-based information for training is essential
2 =	A Discussion Board for interaction with other registered users would be valuable	2 =	PowerPoint lectures are essential
2 =	There should be restrictions on access to parts of the website according to the user's status (professional, public etc)	4	The website should only be a source of information, from which I can passively choose relevant things to view
5 =	PowerPoint lectures are essential	5	A diagnostic forum where I can upload images for discussion would be valuable
5 =	Video presentations are essential	6 =	PowerPoint lectures with audio (voiceover) are essential
5 =	A "wiki" approach (like www.wikipedia.org), to maximise user involvement, would be valuable	6 =	A "wiki" approach (like www.wikipedia.org), to maximise user involvement, would be valuable

8	The website should only be a source of information, from which I can passively choose relevant things to view	8	There should be restrictions on access to parts of the website according to the user's status (professional, public etc
9	PowerPoint lectures with audio (voiceover) are essential	8	All parts of the training elements of the website should be open to everyone, including the public
10	The public (patients) should be given priority over the professions in determining the content of their part of the website	8	The public (patients) should be given priority over the professions in determining the content of their part of the website
11	All parts of the training elements of the website should be open to everyone, including the public	11	Video presentations are essential

Table 4: Needs analysis of manufacturers for delivery of content



Manufacturers' survey	
<p style="text-align: center;">Greatest agreement</p>  <p style="text-align: center;">Least agreement</p>	<ul style="list-style-type: none"> • A diagnostic forum where I can upload images for discussion would be valuable • A "wiki" approach (like www.wikipedia.org), to maximise user involvement, would be valuable • Text-based information for training is essential • Powerpoint lectures are essential • A Discussion Board for interaction with other registered users would be valuable
	<ul style="list-style-type: none"> • The public (patients) should be given priority over the professions in determining the content of their part of the website • The website should only be a source of information, from which I can passively choose relevant things to view • Powerpoint lectures with audio (voiceover) are essential • There should be restrictions on access to parts of the website according to the user's status (professional, public etc)
	<ul style="list-style-type: none"> • All parts of the training elements of the website should be open to everyone, including the public • Video presentations are essential

Table 5: Ranking of needs (methods of assessment of training) taken from responses to the web surveys conducted through EADMFR and EFOMP (and other means of contacting Medical physicists). Shading in red indicates statements that were rejected by respondents.

Rank	EADMFR survey (principally dental radiologists)	Rank	EFOMP/ Medical Physicist survey
1 =	Accreditation/ validation of the training from an external body would be important	1	Accreditation/ validation of the training from an external body would be important
1 =	Assessment using visual interactive elements (e.g. labelling images) would be essential	2 =	Assessment using visual interactive elements (e.g. labelling images) would be essential
1 =	Multiple Choice Questions (MCQs) would be essential	2 =	Multiple Choice Questions (MCQs) would be essential
1 =	Short answer questions (one word answers) would be essential	2 =	Extended matching Questions (EMQs) would be essential
1 =	"True or False" questions would be essential	2 =	Short answer questions (one word answers) would be essential
6	Extended matching Questions (EMQs) would be essential	2 =	"True or False" questions would be essential
7	I will only consider using the training elements in the website if they are accredited for CPD ("Continuing Professional Development") purposes	7	I will only consider using the training elements in the website if they are accredited for CPD ("Continuing Professional Development") purposes
8	No assessment is needed because I am happy to judge the success of training myself	8	No assessment is needed because I am happy to judge the success of training myself

Table 6: Needs analysis of manufacturers for assessments

Manufacturers' survey	
<p>Greatest agreement</p>  <p>Least agreement</p>	<ul style="list-style-type: none"> • Multiple Choice Questions (MCQs) would be essential • Assessment using visual interactive elements (e.g. labelling images) would be essential • Extended matching Questions (EMQs) would be essential <hr/> <ul style="list-style-type: none"> • Accreditation/ validation of the training from an external body would be important • Short answer questions (one word answers) would be essential • "True or False" questions would be essential • No assessment is needed because I am happy to judge the success of training myself



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