MODULE: 5c) Course Material Development Models
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Based on the principles of media accessibility and adult learning theory discussed in the previous two sections, distance educators can proceed to developing appropriate strategies for ODL course development. The current section focuses on leading course development models. By way of example, it presents a description of the course development procedures being adopted in Asia's newest open university, Wawasan OU in Malaysia. This section complements the description of WOU given in Module 6.

Course Development Procedures/Strategies

Depending on their requirements, distance teaching institutions (DTIs) adopt a variety of course design and development models. The most common are the Course Team (CT) model followed at the UK Open University (UK), Athabasca University (Canada) and Deakin University (Australia), and the revised course team models followed by many other institutions. Many specialists comprise the course team: academics (subject experts), radio and TV producers, educational technologists, editors, graphic designers, counsellors, student representatives, and a course chairperson with varying levels of responsibility (*see section 4b*). Because different types of expert are actively involved in the process, the quality of materials produced is normally high. The application of the model in many DE contexts has shown that it takes two to three years to prepare a course, with an accompanying cost escalation.

DTIs also practice variants of the course team model. The Universidad Estatal a Distancia, Costa Rica, for example, follows the Author-Contract Model (ACM). The FernUniversitat in the Hague also follows the ACM, though in this case an individual teacher takes overall responsibility. The Everyman's University of Israel also works with this model (Rumble & Harry, 1982). Lockwood (1992-94) has discussed four additional course production models: personalised training, workshop-generated, text transformation, and wrap-around text, each considerably different from the original CT model. Besides the course team model, a variety of course development approaches is available to distance educators: e.g. the contract author and editor model, the educational adviser model, and the workshop model.

Course development models

1. *Personalised Training.* This model "is designed to equip authors with the skills and techniques they need to use when planning and producing self instructional materials at that moment in time when they need them" (Lockwood, 1994). This approach has been found suitable by designers for producing self-instructional materials in a short time, and by people having no previous course development experience. Timely help in the skills and techniques should be provided by educational technologists to generate good quality materials.

2. *Workshop-Generated.* As an improvement over the general CT model, experts (e.g. subject-matter specialists, media experts, graphic designers, language editors, etc) with different backgrounds, workshop the materials and generally take less time to complete them. Indira Gandhi National Open University (IGNOU) has developed large portion of materials for the Certificate in Guidance programme and B.Sc. Physics laboratory courses via this model (Panda & Garg, 2003). The model places major emphasis on detailed prior planning before the workshop.

3. *Text Transformation.* Using this approach, authors and designers follow a process of transforming existing learning materials into self-learning materials (SLMs). In India, for instance, the DTIs of dual-mode universities transform existing correspondence study materials into SLMs with support from the national Distance Education Council (DEC), and the Staff Training and Research Institute of Distance Education (STRIDE) of IGNOU. The process involves organisation of workshops for the transformer-authors, and follow-up support from instructional designers to quicken the transformation process.

4. *Wrap-Around Text.* Since high quality SLM development is time consuming and costly, existing printed texts are sometimes packaged with wrap-around text. The cost of developing course material by this approach is relatively low, and many DTIs are using it. Copyright issues, however, may need to be resolved, and non-availability of good, simple textbooks is a hurdle to high-quality learning.

5. *Educational Advisor.* This model is followed at Murdoch University and Darling Down Institute of Advanced Education, Australia. The educational advisors are usually senior subject experts with experience in educational technology. They advise and work in collaboration with the teaching faculty within their disciplines/ subject areas to develop high-quality learning materials.

6. *Contract Author-Faculty.* Via this model, authors from outside the DTI write course units, and the materials they produce are vetted by the internal faculty. This is the usual practice at IGNOU, with courses being designed by a team of experts, and the editors taking exclusive responsibility for content editing and quality. This model, with slight variation, is also known as the 'Author-Faculty-Editor Model' or 'Coordinator-Writer-Editor Model'.

7. *Contract Author-Editor.* Via this approach, the materials are developed by the external experts, and vetted and edited either by internal or external editors, who work on the materials as surrogate students. Caution is required to ensure that materials written by external authors are of high quality.

8. *Seminar-Generated.* This model of course development is useful when the subject matter is in the early stages of development, and experts and existing published literature in it is limited. In this situation, a seminar method is a good approach to generating new thorough discussion of potential course material by peer groups. The papers presented in the seminar proceedings become the basic material, and study guides and activities are subsequently developed by internal faculty. This approach leads to a relatively speedy development of materials.

All models of course development have varied implications on the cost, timeliness, effectiveness and quality of the materials produced (Panda, 2000). The variables influencing the choice of the best approach/ process for particular situations include number of learners, course length, time scale, support, contributors, budget, and institution-specific factors. Each model has its own complexities and constraints at the procedural level, and different individuals, agencies, and institutions favour different approaches. An understanding of the subject-matter sources, cost-effectiveness, and limitations of different models help in the appropriate selection and use of course development models.

The above approaches have evolved in the design of print-based course materials for traditional DE delivery. The development of online resources or learning materials may not necessarily follow these approaches, though some of them may be useful when print-based materials are developed before being converted into interactive multimedia materials and uploaded to the internet. Meaningful engagement between students and online resources requires the development of interactive materials facilitating group collaboration, resource-based learning, and reflection. Mason (1998) emphasises three models of interactive online course development.

1. *Content and Support Model:* In this model, the content development is separated from tutorial support. Pre-produced content is provided by the teachers, and applied in a framework of learner collaboration, online assessment, and computer conferencing. As the content and support elements are not necessarily integrated, students spend less time actually online, and sometimes find conflicts between offline course reading and online interaction and assessment.

2. *Wrap-Around Model:* The materials available in textbooks, CD-ROMs, etc. are packaged with online study guides, activities and discussions. The teacher assumes a greater role in the development process, and the students devote approximately half of their study time for offline study and online interaction and activities.

3. *Integrated Model:* Online materials are dynamically accessed in a sequence determined by the completion of individual and group activities. The learning resources and activities are integrated and available online. This model can achieve economies of scale since the high costs of course development are compensated by low costs of course delivery.

The Wawasan OU course development model

As any other ODL system, Wawasan Open University (WOU) depends on good self-instructional materials to support its learning and teaching activities. As the youngest OU in Asia, established in 2006, WOU has taken advantage of the opportunity to plan a course development model using the most up-to-date educational media and design principles. In its early months, WOU has relied heavily on printed course materials, which will be supplemented by video, audio and other multimedia material, as appropriate, in the years ahead. As access to appropriate technology becomes more widespread, the greater use of the digital medium (CD-ROM, Web and streaming audio and video) will all become part of WOU's learning environment.

In developing its instructional materials, the University uses two methods. The first involves identifying a textbook that covers the majority of the course syllabus at an appropriate level, accompanied by a 'wrap-around' study guide. This approach includes working with academic publishers to customise off-the-shelf textbooks for the University's purposes. Learners use the study guide to navigate through the content of the textbook and any other source material. As appropriate, supplementary materials are included in the learning package. The supplementary materials can contain explanations, detailed descriptions of concepts, and self-assessment tests and responses.

The second method of course materials development involves the creation of a fully self-contained and comprehensive materials package. This contains everything the student needs to complete the course successfully: content, enrichment material, self-assessment tests, and responses to them. Additional reading materials (e.g., journal articles) are provided in the form of 'readers'. WOU is in discussion with other open universities around the world to use and adapt their materials.

In designing procedures for designing and developing learning materials, international 'best practices' guidelines are adopted. WOU envisages a flexible yet robust system of course development that meets all academic quality requirements and serves the independent self learner in a friendly and effective way. Learning from other DTIs provides a framework for course development in three phases. The first two phases relate to material development, and the third is the delivery of the course for the first time. Currently, WOU's tight development schedule does not permit pilot-testing of materials. The first-time delivery of the course serves as a test leading to subsequent modifications. Figure 1 illustrates the three phases of course development as follows:

Phase 1: Preparation of Blueprint for Course Development		
1.1) Course curriculum reviewed by external course assessor approved by Senate; formation of course team	1.2) Course developers and instructional designer convert curriculum to course blueprint	1.3) Course blueprint is endorsed by School and external course assessor
Phase 2: Preparation of Course Materials and Publication		
2.1) Preparation of draft course guide, and course SLM	2.2) Review and endorsement of SLM by School, external course assessor, educational technologist	2.3) Feedback incorporated into final contents of the course guide and SLM according to in-house style
2.4) Training of course tutors with course guide, SLM, and on conduct of tutorials	2.5) Final editing by course team, publication and distribution	
Phase 3: Presentation of Course Materials, and Evaluation		
3.1) Senate approves presentation of SLM to students; students work through the SLM, attend tutorials, complete assignments, and sit for examinations	3.2) Formative and summative evaluation of course conduct; feedback about course SLM obtained from external course Assessor, tutors and students	3.3) After examinations and tutor-marked assessment are completed, and final scores tabulated, the course team reports to School and Senate on continuation or revamp of course SLM.

Figure 3: The three phases of course development at WOU.

The material development and production process is recursive and reiterative, so that as much review and elaboration as possible can be conducted during the cycle. The academic staff of the School, external course Assessor, and Senate are all informed on the progress made in the design and development of the course materials, with inputs from WOU's Educational Technology & Publishing Unit.

Course Delivery

WOU has selected its programme delivery techniques and technologies to best suit the Malaysian context, through learning from the experience of others, especially in Asia, and recognising the strengths and weaknesses of the nation's physical and IT infrastructure. Current circumstances and costs clearly preclude the use of broadcast media for course delivery. On the other hand, broadcast media have a value for marketing the programmes and for motivating working citizens to embark on further education and skills training through DE methods. WOU therefore currently uses the mass media, both print and broadcast, for its marketing functions exclusively

For its academic purposes, WOU currently uses printed text as its core medium, and almost all instruction is embedded within text-based materials. Self-instructional materials are supported through:

- personal tutors (one per 30 learners);
- telephone tutoring and counseling;
- a learning management system on an open-source platform, continually available for peer-to-peer discussion, learner-to-tutor dialogues, and tutor-to-course coordinator interactions;
- contact sessions between part- and full-time academics and students; and
- point to multi-point video-conferencing for specialised lectures.

Students can maintain continuous contact with the University either directly or indirectly through their course tutors. The tutors meet with their students regularly throughout the semester at WOU's learning centres around the country. There are currently five centres, with more being planned. All of the learning centres are fully equipped with technology assets connected to the main campus in Penang on a 24/7 basis.

WOU's forward planning includes moving gradually into a highly technology-driven delivery system. The pace at which this transition will take place will be determined by the country's conquest of last-mile challenges. Meanwhile, halfway steps include equipping regional centers with IT facilities that learners can access on call for up to eighteen hours a day. This access includes a digital library, online submission of assignments, access to one's own academic records, study calendar, and programme and course-related announcements.

Technology Infrastructure

The youngest of Asia's open universities, Wawasan Open University (WOU) opened its student enrolments in 2006. WOU is committed to providing a rich technological environment for all of its functions. Its original vision was to establish a virtual university; but with the realisation that Malaysia's present state of IT infrastructure would have marginalised large proportions of its population from WOU's offerings, the University's sponsors decided to pull back from a totally virtual learning approach to one in which technology will support a large part of the University's administrative and student support systems, while moving slowly in the development of its teaching and learning environment. This final section is based on an extract from WOU's IT planning document, that describes the elements comprising the university' IT infrastructure:

"Wawasan Open University (WOU) has a vast inventory of enterprise-wide and specific applications residing on mid-size computer and microcomputer platforms (PCs). New applications and application enhancements are constantly being evaluated, developed, acquired, and implemented as older "legacy" applications are retired. At WOU, its application and data architecture is to use and create industry standard application development tools and language environments that are adaptive in client/server and Web-enabled models. Further, this should allow WOU to protect its investment in 'existing' systems by providing enhancements that facilitate greater user-friendliness, better data manipulation and reporting, and end user controls.

"In addition, by keeping abreast of emerging technologies such as Web Services, XML, SCORM and so forth, WOU is positioning itself to take advantage of the opportunities these technologies offer. Equally, WOU moves toward finding a balance between COTS (Commercial-of-the-shelf) vs. in-house development, a framework for development activity is being put in place. First and foremost, this framework will incorporate the concepts of Software Engineering, Information Architecture, and Application Development Methodology. These principles and techniques will be used to augment the current Systems Development Life Cycle Standards (SDLCS). This approach will encompass application life cycles from the earliest stages of planning, through requirements and design, to implementation and post-implementation support.

"These new applications will be built on the most current and promising platforms and an architectural framework based on the future of IT, not on the past. The adaptation of *.Net* and emerging standards such as XML and Web Services will provide the foundation for the next generation of both departmental and enterprise-wide applications. .Net provides a stable application environment with more opportunity for componentization of business logic, sharing of common components and the integration of business processes across application boundaries. A new class of tools such as *Visual Studio.Net* will provide WOU developers with a robust and flexible development environment. Encapsulating both existing and new business logic into "Web services" will provide the ability to expose business processes across organizational and application

boundaries. XML will provide the common "glue" to hold together and provide consistent information across these boundaries to facilitate the need to share data from disparate platforms and systems.

"Equally with the rapid adoption by the open source community to use PHP as a web-programming language to develop web based application on Open Source *MySQL* database will provide an opportunity to do the same. Furthermore, Enterprise Application Integration (EAI) products will allow the ability to share and bring into a diverse environment, information and business process from older client/server and other kind of applications. Our approach to such a framework is intended to be an organic document, which will be flexible enough to reflect and incorporate the rapid advances in information technology:

"Enterprise Systems Applications: WOU is deploying tested Commercial-Off-The-Shelf (COTS) Enterprise systems that consist of Student Information System, Financial Management System, HR Management System, Inventory & E-Procurement Systems that provide relevant process integration, interoperability on a common database platform, and advance manageability of the data for Business Intelligence purposes.

"Office Systems: WOU uses the *MS Office Suite* installed on PCs attached to LAN based servers and printers to facilitate shared file and printing requirements for word processing, spreadsheet, groupware presentation software, workflow database applications, project management and collaborative group work process and workflow. *GroupWise* email client is preferred on the desktop supported by *GroupWise* email server running on Netware.

"Learning Management System: WOU is deploying the Open Source *Moodle* LMS solution to work in concert with our own course management system platform that can tie in a variety of best of breed online learning solutions.

"Production Applications: Although a fair majority of enterprise applications use *MS Access* or *MS SQL Server* as their database and programming language architecture, WOU also employ PHP/ *MYSQL* for much of its web-based applications development. The IT standards call for complex, Internet accessible or high access databases to use *MS SQL Server*, *Oracle*, or *MySQL* as appropriate. Most server-based systems reside on *Windows 2003* servers that support applications services running on them.

"Application Tools: Application tools are the information technology components used to develop and support the functioning of the applications. Application tools also include the support systems used to facilitate work planning and communications.

"Programming/ Development Tools: New applications are currently being developed using fourth generation object oriented languages and tools. This approach will continue as additional client/server applications are developed and as COTS system components are purchased. Standard lifecycle methodologies are employed to define, develop and implement new systems. The models and design documents that are created are updated throughout the system development and maintenance life cycle. In specific instances, expert system technology will be use to incorporate complex rule based functionality into systems. Third and fourth generation languages and tools are used in only a few specific development efforts and as utility programs. WOU uses a suite of tools to assist in the integration of applications at the presentation, business logic, and data layers. Software Engineering technologies are being incorporated into the Systems Development Life Cycle Standards (SDLCS) to provide a disciplined and consistent development approach.

"Database Management Systems (DBMS): WOU uses several database management systems to support its business applications. For UNIX, LINUX, & *Windows* platforms, *Oracle*, *MySQL*, and *Microsoft SQL Server* are WOU's database standards. *Crystal* (Business Objects), *MS Excel*

drawing upon *MS SQL* bi-functionality support ad-hoc query and reporting. Relational database design activities, such as creating entity-relationship diagrams, the data dictionary, the process models, the logical and physical data models, and the database definition language, are supported through appropriate tool-sets.

"Office Automation/Workstation Software: WOU's office automation tools are the *MS Office Suite* including *Word* for word processing, *Excel* for spreadsheets, *PowerPoint* for presentations, *Access* for desktop application databases, *Groupwise* for e-mail/groupware, *Internet Explorer* and *Mozilla Firefox* for Web browsing,. Other desktop software used includes *MS Project* for project management/ tracking, *VISIO*, *Adobe Acrobat*, *Photoshop*, *Illustrator*, and *Pagemaker*.

"GroupWare/ Collaborative Software: WOU uses *Groupwise* as its primary corporate collaborative group software. *Scopia Desktop* web conferencing/ collaboration solution is deployed to provide cross-platform PC-to-PC easy-to-use interactive whiteboard, application sharing, real-time video and messaging. Groups also use the computer-supported meeting center and its *LifeSize* video conferencing system as avenues for meetings, teaching & learning support. Other software is used to support activities dealing with the group output/results, e.g., *Word*, *Excel*, databases, presentation and process modeling software.

"Technical Support Center: Help Desk Software - The Technical Support Center provides WOU staff and students with a centralized point of contact for computer support. A multi-channel ('phone, email, web) help desk system is employed to capture, manages, and attend to feedback and enquires. Self-help web-based applications & diagnostic tools are developed to assist in contact resolution."

The architecture and configuration of WOU's course development and delivery system allow it the necessary flexibility to scale up its various components as the University's needs change. At some point in the future, 'morphing' into a totally virtual style of learning is a real possibility.

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