Outsourcing of Information Technology Services Application Software System Development

Contract Guidelines' technical aspects

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PREAMBLE

1. ***Objective***

   The aim of these guidelines is to emphasise the main points of concern that a UNESCO Sector or Division's head should take into account when contracting outside expertise services (outsourcing) for developing an **application software system** (to be processed by a computer in order to automate their working tasks), thus ensuring that a successful and secure system is produced.

2. *What is a computer?*

   According to Random House Webster's dictionary, "a *computer* is a programmable electronic device designed to performing prescribed operations on data at high speed, specially one housed with or linked to other devices for inputting, storing, retrieving, and displaying data". Computer equipment is also referred to as *hardware*.

3. *What is a computer program*?

   It is a set of instructions in form of predefined codes that is written by a computer-specialist in order to perform specific working tasks otherwise done manually by people. Computer program is also referred to as *software*.

4. *What is Information Technology (IT)*?

   Information Technology is a science that combines the utilization of various types of electronic devices, including computers, and software. Information Technology is only a tool, a means to perform working tasks faster and more accurate. It is not a solution in itself. Appropriate technology is the right tool for the right job; it gets the job done in a simple manner and does not waste time, money, resources or efforts. Technology alone does not solve any problem. It needs to be utilized in an effective manner in order to do the *right things in the right time*. The key ingredient for successful Information Technology deployment is the involvement of qualified people in this field, i.e., anything to be automated needs to be programmed by computer specialists.

5. *What is an application software system?*

   It is a set of computer programs that are written by computer specialists in order to perform specific working tasks otherwise done manually by people.

6. *What does it mean to "automate, computerize" the services in a working environment?*

In principle, any financial, administrative and other specific tasks that are routinely done by one or more person could be automated, as long as the establishment has or can easily obtain the necessary Information Technology resources and facilities. Computer software systems do the work a great deal faster and more accurate than any person would do it manually. On the other hand, since routine work needs to be done but is neither challenging nor creative (because it is something repetitive), by letting the computer do the work, it leaves the individual free to *think*, to be more creative, innovative and, consequently, more productive.

7. *In a working environment, such as in UNESCO for instance, what should be automated?*

There are many working activities presently dispersed throughout the Organization being performed wholly or partially on a manual basis which could be processed by the computer. For example:
Staff travel and travel claims, all types of staff leave, electronic distribution of administrative memos, internal circulation of documents, any routine work carried out by sectors and divisions, control over all sorts of contracts, financial activities carried out by field offices, registration of mail, filing, to mention few.

8. *How should the automation be done?*

To automate any working procedure it is necessary the participation of *four* key elements:
a) Top management commitment to support the automation procedures.
b) Budget resources for the project.
c) The computer specialist - to develop the project.
d) The end-user/s - to inform the computer specialist *what* are their needs as far as their work is concerned, and what they expect the computer to do.

9. *Who should carry out the automation tasks?*

The computer specialist. The computer expert should apply the technology resources by focusing efforts and concentrating knowledge to *providing solutions to the users.* The right automation of services should be easy to use from the user stand point (user-friendly), it should eliminate or reduce redundancies, improve the quality of the services, and eliminate many administrative work. If the computer specialist is part of the Organization's staff, the application system may be developed in-house, otherwise this service should be assigned to a third party (a contractor) for an agreed-upon price. Once the computer specialist is chosen, the unit should establish a *Steering Committee* made up of the following members:
a) Some designated end-users, among them a *senior user* who knows well the working procedures subject to automation and who should act as the *Project Manager.*
b) The computer specialist.
c) The computer auditor to advise, and ensure that necessary controls are included.

At the beginning of the work, the computer specialist should interview as many end-users as possible to find out and to confirm how the manual work is being done, what are the users' real needs, what are the essential procedures that need to be automated and what are the ones that may be eliminated. Further, it is equally important (from the stand point of automation) to find out whether the procedure that is going to be automated makes interface with other working segments (that may already - or will - be automated). Depending on *what* is going to be automated, the computer specialist may need to consult the UNESCO Manual. Surely this is one area where the computer Auditor comes in, ensuring that the automated procedures are in line with UNESCO Manual.

10. *What is the role of the computer Auditor?*

The computer Auditor should participate in the development stages of all application systems, i.e., *before the system is developed*, in order to provide a *pro-active* assurance services by supplying management with recommendations and/or guidance on solutions to problems, especially those surrounding the design and implementation of internal controls. The Auditor's contribution should ensure that the system of controls, financial and otherwise, established by management is adequate and effective in reducing, to acceptable levels, the risks faced by the Organization. Furthermore, the Auditor should confirm the level of reliability and integrity of information, the efficiency of the system process, plus fraud prevention controls, and compliance with policies, plans, procedures, laws and regulations, thus ensuring that the system will do *the right things - the first time*.

Part 1: Contract guidelines

Outsourcing of Information Technology Services (IT/IS) to develop application software systems

1. *Management awareness*

1.a) Generalities regarding the terms of the contract

The **end users*** want a *software resource tool** *that optimises and speeds up the process of their tasks in a cost effective and reliable manner*. Such a resource should guarantee the integrity, reliability, and confidentiality of the information that it processes as well as the continuity of the service that it performs. It is important to bear in mind that internal controls outlined in the terms of the contract should be adequate to protect the application software system's integrity, i.e., to protect the information that the software system will produce. It is easier to make changes to a software system during the system development stage; after the system becomes operational, modifications may not be practical or economically feasible. Should the contract be altered once it is signed, probably all its terms ought be reviewed, as the contract cannot remain the same because the synergy of scales present in the original contract may no longer be the same. Thus, all possible *working procedures and conditions such as rules, regulations and restrictions, as well as interfaces with other systems* which are part of the **working task*** that is going to be automated should be clearly stated by the users and duly specified in the contract in order to avoid the following problems:

- Further expenditures not foreseen in the original budget for the development of a project (application software system) due to insufficiently understood requirements.
- Discontinuity of services from the contractor part.
- Having a system that does not meet the *users' real needs* and therefore may be rendered obsolete once it is delivered.
- Difficult in understanding, using and/or maintaining the system.
- Other sort of misunderstandings between UNESCO and the contractors.

***software resource tool** - is a set of software programs (a system) that are developed to perform automatically by a computer the working tasks (administrative, financial, scientific, others) that would be otherwise done manually.

***end users** - are the personnel who actually make use of the Information Technology resources to perform their work.

***working task** -Examples: Payroll, Accounts Payable, Participation Programme, Staff travel schedules, management Information Systems, etc.

☞ **attention:** These guidelines do not apply when purchasing a commercialised (ready-made) software application package.

1.b) Hiring contractor/s:

The development of a new system requires a significant investment of time, effort, and money. It is in the best interests of UNESCO that its personnel should ensure that proper systems are developed, the use of the Organisation assets are controlled, and the system achieves its design objectives.

Depending on the scope of the project to be developed, it would initially be advisable for UNESCO to carry out a preliminary feasibility study. This study may be carried out in-house by qualified personnel in the Information Technology field (which would not require writing a contract) or by an external reliable consulting firm, here called ***main contractor***, with proven experience in business management as well as being technically conversant with Information Technology matters. The objective of this preliminary study would be the following:

- **(a)** To advise/indicate the purchase of a commercial software package available in the market to do the work needed - **Or,**
- **(b)** To prepare a master plan regarding the project to be developed;
- **(c)** To provide an accurate estimate of the full cost of the project;
- **(d)** To assure that adequate resources and funding are available to develop and implement the project;
- **(e)** To obtain both Management commitment and approval.

If the party that carried out the feasibility study cannot develop the project, they should be able to indicate a software firm, here called a ***technical contractor***, responsible for developing the project as a whole (software planning, hardware, and other system components when necessary) and to manage them. ***Contractors*** may be selected based on their ability to perform the work, on strategic business alliances, as well as technical considerations. Further, the hiring of a contractor has to be in accordance with selection and bidding procedures outlined in the UNESCO Manual item 326 "Contracts Committee", and item 1025 "Selection of Supplies and Contractors".

The party responsible for the feasibility study should be responsible for the following:

- **(f)** To work with the *technical contractor* in order to both manage and monitor the latter work. This includes to establish commitments with the technical contractor, and tracking and reviewing the contractor's performance and results.
- **(g)** To ensure that planning, tracking, and oversight of activities are performed appropriately and that the software product delivered by the *technical contractor* satisfies the acceptance criteria agreed upon.

During this phase it is critical that the most accurate estimates are developed. Therefore this will require the appropriate supporting documentation which provides the intricate details of the various means of deriving such estimates.
The overall activities performed by the contractor/s should be monitored by the members of a Steering Committee.

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2. ***Systems development can be categorised into three broad phases:***

2.a) Planning.
2.b) Development.
2.c) Implementation and operation.

2. a) ***Planning***

The planning phase of systems development includes the following activities:

- Establishment of a ***Steering Committee*** with the participation of UNESCO's staff member/s who are acquainted with the procedures to be automated and the contractor, bearing the following responsibilities:
    1. Prepare and co-ordinate the working agenda.
    2. Confirm that funds and resources are available for the project's development and implementation.
    3. Monitor the contractor's administrative and technical activities.
    4. Verify that the contractor's interpretation and implementation of administrative/financial and technical issues conform to the specified requirements.
    5. Verify that commitments are being met.
    6. Verify that all pertinent issues are resolved in a timely manner.
    7. Establish the contract's change controls mechanisms and oversee the changes to the software contractor's statement of work as well as to assure that other commitments are resolved according to documented procedures.
    8. Establish the system's development milestones and confirm that proper testing, verification and approvals are taking place.
    9. Tracking and overseeing the project development in general.
    10. Prepare periodic progress report.

- Designation of a ***Project Manager*** - UNESCO should designate a senior staff member (who is fully conversant with the working procedures to be automated) to act as *Project Manager* who would be responsible for negotiating the terms of the contract with the contractor, as well as for monitoring and reviewing the contractor's performance and results. This person should be a member of the Steering Committee

- User needs analysis - A study is conducted to determine whether a new system should be developed or the Organisation should purchase a commercialised software package available in the market. If a software package is purchased, then this type of contract would not be written.

- Review of the current working method.

- Cost/benefit analysis - Detailed financial analysis is conducted to determine the cost to develop and operate the new system, the savings or additional expense that will result, and its return on investment.

2.b) ***Development***

The following activities take place during the development phase:

- ***Project team*** - A group formed by the Project Manager, plus key end users, and the contractor who will be responsible for designing the new system ***is established***.
- ***Conceptual design*** - The systems flow and other information illustrating how the new system will operate ***are prepared*** by the contractor in conjunction with the Project Team.
- ***Computer processing design*** - A detailed system's graphic description that shows how the working procedures will be processed through the computer ***is prepared*** by the contractor in conjunction with the Project Manager.
- ***Output information design*** - Statements, in form of screens or reports, to be generated by the system ***are described*** by the contractor with the agreement of the Project Manager.
- ***Equipment requirements*** - Equipment requirements for system operation ***should be determined*** by the contractor. The equipment allocated for the system must be used effectively and efficiently. Financial analysis should be prepared for the purchase of new equipment (if needed), or viability study should be carried out to utilise existing hardware resources (if any is available). ***It is important to bear in mind and to take into account the system growth,*** i.e., to estimate what mass of information the system is expected to process at the beginning of its implementation and within two, three, five years time. The contractor should ascertain that the equipment configuration (e.g. RAM memory, disk storage capacity, LAN technology resources) will be sufficient to process the foreseen amount of information that the system will have to handle.

2.c) ***Implementation and Operation***

During system implementation and operation the following activities occur:

- ***Data file documentation*** - A field-by-field listing of what will be contained in each data file and a listing of the values that can be contained in each field ***is prepared*** by the contractor and reviewed by the Project Team.
- ***Detailed system design documentation*** - Specifications of the programs contained in the system ***are prepared*** by the contractor.
- ***System development*** - The program modules, and other software supporting tools needed to process the application system **are coded and tested.** The various levels of tests should be accompanied by designated end users, the Project Manager, and computer Auditor.
- ***Control procedures definition*** - Descriptions of systems operation and how the user will control the system once it is in operation ***are specified in writing*** by the contractor in the respective manuals: Operations, User and System manuals. This entails in *providing training* for the system's operations personnel (qualified technical staff) and end user personnel.
- ***Operation and maintenance*** - Change control processes are defined in writing and implemented in order to monitor and evaluate any subsequent changes made in the system, as well as to maintain the system's integrity.
- ***System acceptance testing*** - The users and the computer auditor conduct system's acceptance testing according to predefined and agreed schedules.

If the application system is being re-designed, the information is transferred from the old to the new system.

3. ***Information that the Project Manager should provide to the contractor:***

- Project document:

A statement of objectives to be accomplished by the proposed project.

A description of the services to be performed.

A description of how the requested project relates to other automated activities (if applicable). This is very important, as the processed information may the integrated with other software application systems.

A description specifying the level of confidentiality and security in handling the information, including segregation of conflicting functions within the system (for instance, when creating, updating and approving certain type of information, *who can do what and who cannot*).

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4. ***Required documentation provided by the contractor***

The contractor should provide the following documentation to UNESCO:

4.a) ***System Manual, containing:***

- An overall description of the application system a whole, its purpose, its objectives, and the performance capabilities of the system.
- A description or diagram of the computer-based operation, including the step-by-step procedures required to initiate processing.
- A description of the supporting software tools to run the system (e.g., Windows, UNIX, NOVELL, ORACLE, C ++, others).
- A description of the equipment needed to process the system.
- A description of all data files used by the system (including description of each and all field contents).
- A description of each program module, including the purpose of each module, calculating formulas contained in it, and logic decisions.
- A description of input (paper forms, screen, or magnetic data file), flow of data through the processing cycle, and output (paper forms, screen, or data file).
- The requirements for preparing and entering input data.
- The requirements relevant to each output (e.g., format and frequency).
- The detailed instructions necessary to initiate, prepare, process, and receive a query applicable to the data base.
- A list of error codes or conditions generated by the system and the corrective actions to be taken by the user.
- Creation of History files (when applicable).
- System's Security Administrator tasks and attributions (password administrator).

4.b) ***Operations Manual, containing:***

- A description of its operational environment (including LAN topology when LAN technique is applied).
- Software installation instructions.
- A diagram showing the inputs, outputs, data files, and sequence of operations of the computer-based system.

- An inventory of all programs included in the system.
- An inventory of each permanent file that is referenced, created or updated by the system.
- A list of the various runs possible and a summary of each run's purpose.
- A description of the entire run cycle.
- Description of emergency procedures, such as:
  In case of a program halt, how to re-process it (the restart and recovery procedures for each run).
- Files backup and files retention periods.

4.c) ***User Manual, containing:***

- General instructions on how to operate the system.
- A concise description of the purpose of each program module, and instructions how to access and process them.
- Description of screen's contents, and instructions how to enter information on it. Field specification (numeric, alphabetic or alphanumeric).
- Field validation procedure instructions (when applicable).
- Use of *password* (when applicable).

4.d) ***The source code of all programs:***

- All program source code modules (developed by the contractor) must be duly handed to the Organisation that paid for the development of the software system in reference.

4.e) ***User training:***

- Besides the system's documentation, the contractor has to provide the end users with proper training once the application system is finished and ready to be implemented in a production environment. The Project Manager should assure that all end users receive proper training on how to use the system adequately.

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5. *Warning:* *Source x Object coding:*

5.a) *Program software is made up of two versions or phases:*

The first version is the ***Source*** module/coding (it is the way the *programmer* originally codes a program using a programming language like Basic, C++, COBOL, others). Once a program is coded, the computer's internal supporting software system converts it into machine language creating the so called ***Object*** module/code. It is in this version that the program modules are made available to execute/process the end-user application tasks.

5.b) *Maintenance and updating*

Changes in general to program modules are done in the *Source* modules. Therefore, much care and attention must be dedicated to the programming *source modules*. Source modules should be entrusted to a senior staff member responsible for the software application system. However, at end-user level, only the *Object* modules should be installed or made available to them in their computers. These measures serve to protect the source modules from *unauthorised changes* which might be made deliberately or inadvertently by anyone who may have access to them (to the source).

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6. *Source Code Policy*

Many contractors or vendors of application software provide the purchaser (licensee or client) with only the executable machine language (*Object*) copy of a program. It is therefore impossible for the client to modify the application that was purchased, for enhancement purposes, or to correct problems at later time.

Should the software vendor or contractor go out of business, or prove unable to fulfil his responsibilities (specified in the terms of the contract), or "disappear" from the market for any other reason, the client could find himself/herself "locked in" to a software package with no means of making modifications or having problems corrected. In these circumstances the client is left with no resource, and as consequence the system will be rendered unproductive if not obsolete . When a system does not offer a reliable solution, it becomes yet another problem.

UNESCO (the client) should bear in mind the following:

6.a) Commercialised software package:

If the software "tool" is a commercialised package, i.e., sold to the public, this problem may be solved by contracting with the software vendor to place a copy of the application source code in the custody of an independent third party. This software "escrow" account becomes available to the purchaser only when it has been determined that the software vendor has defaulted on the maintenance agreement or has otherwise failed to live up to the signed software contract.

However, these precautions should be taken only when the vendor is not well known in the market. A small software firm may be acquired by another party, or go out of business, in which case the availability of the source code might be impossible. With firms/products well established in the market at the level of Microsoft®, Oracle®, IBM® or Java™ for instance, there would be no need to take special measures to insure the availability of the software application source code.

6.b) Ownership: custom-made software package:

If UNESCO is paying (a firm or an individual) to develop a software package, then it should be clearly specified in the contract that UNESCO is the **sole owner** of the entire application software system, including its *Source coding modules* (because UNESCO is paying for its development). As a matter of fact, all work performed by the contractor under a contract shall become the exclusive property of UNESCO. This includes the program modules and the documentation as well. The contractor shall have no right to such work unless UNESCO defaults on the contract, in which case title shall revert to contractor.

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7. *Confidentiality*

The contractor should agree to hold confidential any information belonging to or pertaining to UNESCO. Contractor staff who are exposed to such data should sign an agreement to keep such information confidential. Failure to maintain confidentiality shall be considered a breach of contract.

The contract should make it clear whether the contractor may or may not use UNESCO's name or its logo in sales literature, or in written proposals to prospective and current customers.

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8. *Writing a contract*

8.a) Eliminating unnecessary expenditures is a goal of any sector or division (or any business segment in general). Writing Information Technology (IT/IS) service contract carefully can prevent unnecessary expenditures. In a working environment, carrying out finance and administrative tasks are the responsibility of staff members (users). However, many of these tasks may be automated with the help of information technologists who may be outside experts.

The purpose of any contract is to clarify for both parties their obligations and their rewards; therefore the first general problem is to relate clearly and concisely ***who*** will do ***what, when, where, how*** and ***at what price.*** An accurately written contract protects both parties from future disagreement, usually eliminating waste of time, poor relationship, and, in some cases, litigation.

When writing out a contract with an external party, it is important that the users correctly and clearly specify their métier/working tasks, and that the information technologists (the contractors) place more emphasis on software engineering than on the underlying technology, as technology by itself will not solve any problem. Poor definition of working tasks is far and away the major culprit when projects fail to deliver.

The relationship between UNESCO and the IT/IS contractor is governed by the contents of the contract between the two parties. UNESCO should expect to receive precisely what is specified in the contract - no more and no less. Therefore, the key to a satisfactory relationship with a software service firm lies in clearly underlining and defining the contract and in providing adequate safeguards for UNESCO.

Failure on the part of UNESCO to specify desired items in the contract as deliverable items will generally result in their being provided only for additional cost at later date, if at all.

UNESCO should also bear in mind that *oral representations*, no matter how well intentioned, have weigh in the eyes of the contractor (and of the law) only when they can be proven beyond question. Therefore, anything that is wanted in the contract should be included in writing.

The ripple effect of incorrect and incomplete requirements through the life of an application system is the major contributor to the widespread legendary woes: high costs, low returns, eternal maintenance and dissatisfied users. A word of caution worth saying here: be aware, many **outsourcers may overpromise and underdeliver**.

8.b) It is possible to get what one wants at the price one expects by drawing up a ***statement of work*** for each IT service contract. The *statement of work* is an attachment to the contract between the Organisation and the service provider (the contractor). The more detail the Organisation includes, the better control and protection will be over the project. It may also serve as a legal document in the event of a dispute. The *statement of work* should include the following matters:

- Summary project description;
- Tasks and responsibilities of each party;
- Time: in which period of time the project should be accomplished;
- Estimated start and end dates;
- Hours of coverage each week;
- Resources required (hardware and software);
- Property rights (who owns the produced project);
- Work acceptance terms and conditions;
- Maximum amount to be paid to the contractor.
- Penalties to be applied to the contractor in case the service produced does not meet the requirements specified by the Organisation.
- Who is to determine acceptability of the deliverable.
- Payment terms and conditions.

8.c) It is important that the language used in the *statement of work* be unambiguous, to avoid misinterpretation. For example, if the contractor is producing an application system (software programs) for the Organisation, the property rights clause should clearly specify who will own what after the completion of the project.

8.d) By detailing the criteria for work acceptance, one may strengthen *quality and objectivity* in determining whether the contractor's performance is in line with the terms of the contract.

8.e) One should also include a time frame for acceptance, so that to avoid overpayments. The maximum payment clause is to protect the Organisation from excessive overruns on the contract.

8.f) Putting project details in writing forces the contractor to line up required resources ahead of time and saves the cost and trouble of adding an attachment to or amending the contract at later time. For instance, if the contractor is hired to develop an application software but he is not technically conversant with LAN interface technologies, a written project specification will make the contractor to think ahead of time about this important matter and gives him time to seek a person who can handle this task accordingly.

The user should be well informed about the proposed hardware configuration and network architecture requirements to run the application system. By hardware configuration it is meant the technical specifications of the computer, i.e., its operating system and storage (memory) capacity. This is to avoid having an application system that requires a more upgraded hardware resources than the one that might be available, which would incur further unforeseen expenditures.

There may be hidden infrastructure costs when planning to run a system under a network architecture. *Server installation area* may require to buy extra lines and routers to support that request. *Where the servers are located* has a big impact on network topology and costs, that is why it is important to think ahead of *network architecture cost* when planning multiple-users application systems.

8.g) *System's Acceptance Criteria*

Acceptance of contractor's work (programs) shall occur as soon as the contractor demonstrates that the entire set of programs are performing in accordance with the specifications provided by UNESCO and that the documentation specified in the contract is in place.

A word of caution: Failure to correctly process the system (in part or as a whole) by wishing to process certain procedures not described or described incorrectly in the statement of work shall not bar acceptance. This means, in the event that the system's specifications are incorrect or incomplete and, therefore, the programs do not do what UNESCO expects, it is not the contractor's fault.

8.h) User*'s training*

It should be foreseen in the contract **end-user training** provided by the contractor.

UNESCO should ensure that the application system be used in an efficient and cost effective manner. For this to be attained it is important that all users have a clear understanding of how the system works and be adequately trained to use it. Knowledge and experience are vital factors for the proper use of a system, and this can only be attained by providing proper *training* to the users.

It is important to bear in mind that a comprehensive written documentation developed by the contractor is a vital resource for the users. Thus, the *system manual*, *operation manual* and *user manual* provided by the contractor, should be reviewed by the EDP Auditor and Project Team in order to ascertain the quality of this documentation, i.e., its level of clarity, transparency and understanding. All system's functions and options should be clearly explained in these manuals.

9. *Future system maintenance/upgrading*

Every application system will need, eventually, to be updated, modified or enhanced, in other words, will need to be changed in the future. Thus, the user has to negotiate/define with the contractor the terms of system maintenance. Application system maintenance can only be carried out by someone who is technically conversant with the software coding language. Either the Organisation will have a staff member technically qualified to do this task or it should negotiate/establish a system's *maintenance contract* with the contractor.

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10. *Software Quality Assurance*

Compliance of the software product with applicable standards, procedures, and product requirements is independently confirmed by the Electronic Data Processing (EDP) Auditor. The Auditor shall work with the software project team starting from the project's early stages to establish plans and procedures that will add quality value to the software project. The Auditor should confirm the level of reliability, confidentiality and integrity of the system.

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11. *Contract visa*

Once the contract and the *statement of work* are prepared, these documents may be sent to IOM/EDP Auditor and/or DIT for a technical appraisal before negotiations with the contractors, should the party involved feel necessary.

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12. *Signing the contract*

The Organisation should sign the contract only after confirming that funding is available, and that in-house qualified personnel are available to monitor the project.

OBS. We look forward to receiving your contribution/suggestion to enhance the efficiency and effectiveness of this work.

If further information is needed, please contact:
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Part 2 Contract checklist

Checklist for drawing up contracts for the development of Information Systems and Information Technology (IS/IT) projects

Whenever a decision is made to automate, to computerise, or to re-design a working segment such as some financial or administrative procedures for instance, its development should be duly discussed with the personnel responsible for carrying out such procedures and a Steering Committee and Project Team should be established in order to ensure the proper planning, development and follow up of the project by the Secretariat with the contractors. The following checklist has been prepared to facilitate writing mainly the technical terms of the contract, however not all captions may need to be applied extensively to all contracts, nor is the list considered to be exhaustive.

Topics	yes	no	n/a	comments
Step 1: Establishment of Steering Committee and Project team				
Note: UNESCO should establish a Steering Committee and designate a senior user to act as the **Project Manager** who, with other members of the Steering Committee, would be responsible for tracking and reviewing the contractor's performance and results. This Committee would ensure that plans for the work are duly documented, the activities are performed satisfactorily and that the software system developed by the contractor satisfy the user's acceptance criteria.				
a) Has the Steering Committee been established?				
b) Has the project team been defined?				
c) Among the members of the project team, is it included at least one senior user (who knows the working procedures well) and the contractor?				
d) Has an end user being designated to be the official contact (the **Project Manager)** to work with the contractor?				
e) Is there a clearly defined system's user group?				
f) Has the working **LANGUAGE** (English, French, Spanish, other) being specified in the contract?				
Note: ***Working language*** is the language used to write the project documentation and non-reserved words (codes) used by the programmer when writing the software programs.				

Topics	yes	no	n/a	comments
Step 2: Management awareness/commitments				
a) Are there two parties (contractors) engaged in the development of the new system, i.e., has management engaged formally with a *Main Contractor* and a *technical contractor* to develop the system? b) Has the main (or sole) contractor prepared a system Master Plan? c) Has the Master Plan been approved by the Steering Committee? d) Has the main contractor presented an accurate estimate of the full cost of the project? e) Has management approved the system's budget? f) Has the selection of the main contractor and/or technical contractor followed the contract and bidding procedures specified in the UNESCO Manual? g) Are all agreements between UNESCO and the main contractor and technical contractor duly documented and approved? h) Has UNESCO's management specified in the contract that the contractor/s should submit a written progress report specifying the activities performed during the preceding week or another period agreed upon? i) Has UNESCO's management specified that the progress reports should also enumerate any problems encountered that may adversely affect the foreseen schedule?				
Step 3: Project specifications				
Note: The work to be performed by the contractor/s ought be defined and planned according to documented procedures. a) Has the user specified in writing to the contractor/s the objectives to be accomplished by the proposed project? b) Before putting in writing these objectives, has the **Project Manager** held meeting/s with all users in order to discuss and confirm their real needs in reference to the service that is going to be developed? c) With reference to segregation of conflicting functions, has the **Project Manager** made clear to the contractor/s which information (if any) has to be treated differently from general data, by the system, in a manner such as not to allow a given person to create, update, change and delete the same information? d) Has it been made clear to the contractor that the system should let only authorised users access the information in the computer? e) Has a functional requirements document been prepared to provide a basic understanding between users and designers of the system?				
Step 4: Cost/Benefit analysis				
a) Has the Project Manager carried out a cost/benefit analysis? b) If yes, in this study has it been considered *hidden costs*, such as cabling (if applicable), equipment acquisition such as *servers* and possible *UPS* (uninterrupted power supply), personnel training, system's technical maintenance, back up equipment, equipment's installation location such as different floors or different buildings, supporting software?				

Topics	yes	no	n/a	comments
Step 5: Responsibilities and payment conditions				
Note: Before writing the contract, UNESCO should ascertain that adequate resources and funding are available to pay for the entire *development and implementation* of the project. a) Has the contract clearly specified the responsibilities and tasks of each party (UNESCO x contractor)? b) Has the contract clearly specified the responsibilities of the Steering Committee? c) Has the price of the services been officially agreed upon? d) Has PRICE being specified **with or without taxes**? e) Have payment terms and conditions been clearly specified in the contract? f) Is there funding available to pay for the entire development and implementation of the project - *including the availability of proper hardware equipment and supporting software*? g) Have penalties been specified to be applied to the contractor in case the service produced does not meet UNESCO's requirements? h) Have penalties been specified to be applied to the contractor in case of abandoning the project before completion? i) Has the entire project development and implementation time period been clearly specified? How long will it take to be developed? How long will it take for the testing stages? How long will it take to be fully implemented? j) Have estimated project's start and end dates been fixed? k) Have system's testing stages been specified? l) Has a clause been written in the contract addressing the possibility of UNESCO wishing to implement conceptual **changes** in the project - *during its development stage* or changes in the *terms and conditions* of the contract?				
Step 6: Software property rights				
Note: In case UNESCO is paying for the development of a specific software, the contract ought specify that UNESCO is the sole owner of the software source code and its corresponding object modules, and documentation. If not, the contractors will be the sole party capable of carrying out future maintenance/changes/updates to the system, because they will **own** the source software that UNESCO has paid for its development. a) Has the contract specified that UNESCO is the sole owner of the software source coding and its corresponding object modules as well as the documentation produced by the contractor? b) Has the contract specified that the contractor is not authorized to use the system (as a whole or in part) without formal written consent from UNESCO?				

Topics	yes	no	n/a	comments
Step 7: Confidentiality				
a) Has the contract specified that the contractor should hold "confidential" any information belonging or pertaining to UNESCO? b) Has it been made clear in the contract that failure to maintain confidentiality shall be considered a breach of contract? c) As for the contractor staff who are exposed to UNESCO's data - have they signed an agreement to keep such information confidential? d) Has the contract made clear whether the contractor may or may not use UNESCO's name and/or its logo in sales literature or in written proposals to prospective and current customers?				
Step 8:Documentation: A users' manual				
Note: the **Project Manager** should assure that this manual includes the following captions: (i) A narrative description of the computer-based system; (ii) A description of the step-by-step procedures required to initiate up to finalise the entire processing of the system; (iii) Screen layout descriptions and instructions on how to enter information on them; (iv) A description of input, flow of data through the processing cycle, and output of each programme (reports or data files); (v) Specifications about restart and recovery procedures for each run. The contractor should provide in writing detailed instructions on how to re-process the system in case of system's halts, i.e., how to restore the files and restart the processing of the system from the point where the problem occurred. a) Is it specified in the contact that the contractor has to develop a users' manual addressing the items mentioned in the above captions, mainly containing function descriptions (step-by-step) of the computer-based system, and instructions to the users on how to use the system? **OBS.** In small systems, it may be the user who might perform the system restart/recovery procedures, thus he/she should be properly trained regarding *system backup procedures* in order to perform system recovery and re-process procedures whenever necessary. In larger shared systems, this function should be delegated to the system's technical administrator (LAN Administrator).				

Topics	yes	no	n/a	comments
Step 9: Documentation: System manual				
Does this manual include: a) A general system flowchart? b) A general description of the system's objectives? c) A narrative description of each program module, i.e., its purpose, its logic, formulas, decision tables? d) Are there data file descriptions (explaining the meaning of each field's contents, as well as whether the fields are alphabetic, numeric or alphanumeric)?				
Step 10: Documentation: Operations manual				
Does this manual include: a) Instructions on how to install the system? b) A diagram of the computer-based operation? c) A description of the equipment needed to process the system? d) A diagram indicating the sequence of operations of the computer-based system? e) An inventory of all programs included in the system? f) An inventory of each permanent file that is referenced, created, or updated by the system? g) Instruction on how to run the system? h) Instructions on how to take files and program libraries back up? i) Instructions on how to restore files and programs in order to re-start, re-process the system whenever necessary?				
Step 11: System's Acceptance terms and conditions				
a) Has it been specified in the contract the system's acceptance conditions from the Organisation's standpoint? b) Has a system's test plan been defined? c) Has intermediary system verification and tests been specified - to take place during the various stages of its development, such as conceptual design stage, development stage and parallel testing stage before its final implementation in the operational environment takes place? d) Has the Project Manager planned to carry out exhaustive tests before officially accepting the system as concluded ?				

Topics	yes	no	n/a	comments
Step 12: System maintenance/upgrading				
Note: The system maintenance function requires the co-operation of various user departments, and the programming specialist, as the *users should all agree* upon the changes that are to be made in the system by the programmer. Adequate controls should be present to prevent unauthorised changes from being made to production programs and to prevent unauthorised access to production data files. Systems software executes application program logic, which in turn updates data files. Therefore, if the system software can be purposefully modified, it can process application logic, and thus the files, in an unauthorised manner. Systems documentation is very important at maintenance times, as it facilitates the programmer's work when performing updating/corrections in the existing programme modules. Equally important is the *documentation maintenance*. Written procedures should be in place for maintaining up-to-date the system documentation itself. a) Has it been made clear who will be in charge of carrying out system maintenance functions? b) Have the system's change control procedures been defined? c) If maintenance is to be made by the contractor, has this matter been specified in the contract? d) If maintenance is to be made in-house, can UNESCO count on the staff expertise as being technically conversant with the system's software tools? e) Is UNESCO providing technical training to a staff member? f) Does the system documentation give the programmer sufficient information to understand the programs, their operating environment, and their maintenance procedures? g) Are the program logic charts and/or decision tables well documented?				

Topics	yes	no	n/a	comments
Step 13: Network concerns				
Network architecture a) If the application system is to be operated/used in a shared manner via a local area network (LAN) or wide area network (WAN) has the network infrastructure been duly planned to ensure the availability of cabling, installation of *servers*, *routers*, *workstations*, and *special telephone lines*? ***Network environment*** b) Has the location of the building been identified for the placement of the LAN *server/s* and the overall infrastructure installation? ***Network traffic*** c) Work *load and reliability* is very important to the overall network requirements. Has *data's average and peak traffic volume* been taken into account when planning the network capacity? ***Network growth and maintenance*** d) Network growth and maintenance are important requirements that affect planning. *Growth* is important to determine the requirements for network capacity and protocol architecture. Additional *nodes* are examples of network growth. Have these factors been taken into consideration when planning the network resources? e) ***Maintenance*** must be planned ahead because it may represent the single largest cost over the network's life. Requirements may dictate the need for network monitoring equipment to control maintenance. *Hardware* and *software* might be required to be compatible with *standards* so that replacements can be obtained easily. Have these factors been taken into consideration when planning the network resource's requirements? ***Network operating environment*** **Note:** Once network requirements are identified, potential security and privacy exposures in the *operating environment* must be evaluated. Networks pose additional exposures because of the telecommunication links that connect the various network nodes. The physical security, access controls, and other measures for centralised systems also apply to networks. Further, the systems are vulnerable to threats from authorised users (e.g., programmers and operators), unauthorised users (hackers) and to disaster (fire, flood). f) Have *potential threats* in the network environment been evaluated, risk assessment been performed? If yes, have necessary network security measures been taken to comply with these matters? g) Has the project team performed a detailed *risk assessment* study and determined what security countermeasures must be implemented? h) Is there data encryption, protocol security or other countermeasures being employed to increase security of data in the network?				

Topics	yes	no	n/a	comments
Step 14: Network administrator				
Note: Identifying the end-users' needs is just half of the task. Microcomputer networking tools and techniques have become very intricate and it requires a qualified and well trained professional to administer its resources. The network administrator should be technically conversant with operating system features, time sharing performance, and availability of common connectivity solutions in order to be responsible for the following issues, among others: (i) Provide a sound development environment which includes support for middleware layers such as database server, distributed application interoperability across heterogeneous environments. (ii) Provide a security service with authentication and authorisation facilities across networks, as well as directory services, distributed time services, access to a distributed file system, and support for distributed multitasking. a) Have the above matters been taken into consideration by the *project team*? b) Has a *network administrator* been designated? **Obs.** Once **steps 13 and 14** have been identified and solved, a sound structure of network security should exist.				
Step 15: Personnel training				
Note: UNESCO should ensure that the application system be used in an efficient and cost effective manner. For this to be attained it is important that all users have a clear understanding on how the system works and be adequately trained to use it. Knowledge and experience are vital factors for the proper use of a system, and this can only be attained by providing *training* to the users. a) Has it been specified in the contract that the contractor should provide training to the end users? b) Has the EDP Auditor and Project Manager confirmed the quality of all manuals provided by the contractor? c) Are all manuals clear, easy to understand? d) Are all system's options and functions clearly defined in the User Manual?				

Topics	yes	no	n/a	comments
Step 16: Software Quality Assurance				
a) Has the Steering Committee foreseen the participation of the EDP Auditor in meetings where important system's issues are to be discussed, such as feasibility study, conceptual design, possible interface with other automated systems? b) Has the Auditor confirmed the presence of audit-trails within the system? c) Has the Auditor confirmed the proper segregation of conflicting functions within the system? d) Has the Auditor confirmed the level of reliability, confidentiality and integrity of the system? e) Has the Auditor effected tests along the various stages of system's development? f) Have all these test been documented?				
Step 17: Contract visa				
Note: All contracts established by UNESCO must be in accordance with the selection and bidding procedures outlined in UNESCO Manual item 326 "Contracts Committee" and item 1025 "Selection of Supplies and Contractors" . a) Has the signing of the contract followed the above norms? b) Before the signing of the contract, has it been submitted to IOM/EDP Auditor and DIT for technical appraisal? c) Before the signing of the contract, has management confirmed the availability of funds necessary to develop the project and implement it (including purchasing of possible hardware equipment and supporting software?				

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