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Mapping the Design Criterion Framework for Museum Exhibition Design Project

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Abstract

Currently, museums are struggling to develop and present their expertise by focusing on the interactive relationship with museum visitors. In order to meet the needs of museum exhibitions, an efficient and workable design process is of primary importance in order to work to develop high quality museum exhibitions. It would be advantageous to generate a design method which allows designers and curators to undertake design work in the context of museum exhibition project.

Based on an empirical analysis, this paper suggests that a systematic transformation develops specific aspects of detailed design to carry out its principle, and that the implementation of these aspects can be viewed as a process of organizational criteria of museum exhibition design projects. The paper is concerned with design process in organizations seeking to act systematic criteria in the design activity on the application of museum exhibition project development in complex theories. In particular, this study is developed to address the following objectives:

a) To identify the characteristics and concepts of the design activity as they relate to museum exhibition design;

b) To contribute to a more complete understanding of design process by developing guidelines for adoption in projects.

c) To establish the benefits of the application of design guide theory to the practice of museum exhibition design;

Keywords

Museum Exhibition; Design Criteria; Design Process.

1. Preface

Museum exhibition development is a complex activity, which is expanding beyond the design discipline. Various kinds of specialists have brought a new perspective to museum exhibitions especially in terms of digital technology, which has had a major impact on the design process in museum exhibition project development. Furthermore, traditional museum exhibition design is being increasingly replaced by multi-disciplinary practices that involve a wide range of design aspects, such as graphics, typography, lighting, products, space, interface design, design management, digital media and design production. The overall aim of the study is to produce a more sophisticated approach to the design and planning of design project development work.

This study provides both theoretical foundation and practical application by proposing a particular form of inter-disciplinary museum exhibition design work. The research will introduce the general concept of a design guide model particularly in the context of museum exhibitions. The aim of this research is to develop a systematic design criterion that allows designers to cope with the complexities of multi-disciplinary design working as well as meet curatorial requirements in the museum exhibition context. To develop the museum exhibition design criteria representing design tasks and information dependencies in a generic manner so that the criteria could be used to aid designers using traditional techniques in museum exhibition design projects.

2. The museum exhibition design approach

Designing a museum exhibition is becoming a complex process that requires a multitude of decisions to ensure a smooth progression after establishing the curator's needs. The design planning for museum exhibitions consists of participants and design information flows, which are the key elements producing the design approach. Planning a museum exhibition project should be to balance functional requirements, aesthetics and total cost in museum exhibition design by employing inter-disciplinary such as project management, subject specification, cost-benefit, design aspects, and production.

Museums exhibitions communicate with people by adopting different types, functions, sizes and approaches to visitor experience, such as displays, collection and exhibitions (Hooper-Greenhill, 1994, p.51). The roles and functions of a museum exhibition depend on the ways in which museum purposes are defined. The traditional purpose of the museum has been proposed as historical object display. Many museums have now defined their roles not only as preservation, collection, maintenance and research but also exhibition and education. These now form the basic roles of museum activities (Dean, 1994, p.7; Belcher; 1991, p.8; and Hooper-Greenhill, 1994, p.1).

The main purpose in putting exhibitions in museums is to communicate and interpret museological theories. The way an exhibition communicates should provide a very attractive visitor experience with the opportunity for observation or hands-on experiment resulting in pleasure, entertainment and the acquisition of museological knowledge (Belcher, 1991, p.39).

In particular, conducting inter-disciplinary museum exhibition projects is more complex than many other design projects. Managing museum exhibition design projects involves monitoring, planning, design, and technical problems in co-ordinating all the specialist disciplines involved in decision making. Because of the diverse features of a museum exhibition, managing the project requires the active participation of different professions as well as a specific curatorial approach.

3. A review of museum exhibition design process framework

This section provides a basic understanding of the MEDP (Museum Exhibition Design Process) model and to examine design process tasks in relation to the MEDP. In this section, The Discovery Center Museum Design Process is briefly explained and analyzed. The critical analysis of the design process will

influence the approach taken to form the design criteria model and the way the design process framework is considered for planning purposes.

The Discovery Center *Work Stage* (DCWS) model, originally developed in 1998 by MET Studio design consultancy, is a prescriptive model for multidisciplinary conceptual work in interior and exhibition design. The model describes a detailed conceptual framework for the development of ideal circulation, layout and key vistas, rather than a guideline (MET Studio, 1998, p.4). The outline of the specific needs of a museum exhibition can make a significant contribution to the development of the project.

The DCWS is a document of the terms of engagement between the curators, designers, museum specialists and architects, a systematic framework within which design work can be managed, co-ordinated and communicated. The DCWS also describes the complete criteria for the design process that are connected with the strategy for developing the project. Such criteria are important for designers to proceed with project work. There are four categories of work which are covered in the process model:

1) The general conceptual framework consists of project aims, objectives, service contents and communication & interpretation strategies.
2) The specification of information technology (e.g. Computer programs).
3) Job descriptions for the employer, designer, architect, project manager and contractor.
4) The specific description of detailed stages and guidelines for exhibition proposals.

The work focuses on the development of a description of museum exhibitions which provides a 'Starting Point' for design strategy, reflecting the 'global' context of scientific, technological and historical development, as a part of its expertise. The design methodology and management strategy are concerned with detailed job criteria and responsibility and very specific detailed working guidelines, in which all participants can perform to achieve the project purposes. The work guideline is a prescriptive model presenting a conceptual framework based on the nature of project practice in design, design management and new product development. The DCWS consists of five stages: 1) design brief, b) concept design, c) detailed design, d) implementation and e) completion. Each stage represents a particular set of detailed work and responsibility (Figure 1).

Phase	Process	Output
Concept Brief	The employer's requirements. Drawing and specifications. Outline timetable cost analysis. Development of exhibition purposes.	Working schedule & financial set out. Preliminary definition & concept proposal. Permission to proceed with the project.
Concept Design	Concept design development. Survey of cost analysis.	Approval of concept design.
Detailed Design	Development and approval of concept design. Provision of written specifications. Detail layout (mechanical and electrical). Storyboards and layout of graphics. Cost checks.	Design drawings approval. Design completion.
Implementation	Development of 'tendering purposes'. Invitations to tender. Monitoring, construction and installation. Financial report.	Design change. Preparing for construction.
Completion	Issues of the certificates of practical completion. Monitoring the condition of all structures and exhibits. Monitoring the correction of defects.	Fulfilment of business objectives Issues of certificate of completion.

Figure 1. The Discovery Center Work Stage (Adapted from MET Studio, 1998)

The DCWS was constructed as an integral part of a particular project and to improve the planning of exhibition design work. The following summarizes the process model:

1) A project memorandum of good design practice;
2) An immediate aid for traditional methods of planning;
3) A tool to monitor an exhibition project throughout the design process and
4) A good specification of designers' duties.

4. The museum exhibition design roles

4.1 The curatorial roles

During and after the work undertaken to develop the project, museum curators can introduce requirements that impact on designers' decision-making and which may influence design task flows. From the viewpoint of the curators, exhibitions involve policies, strategies and technology that determine the role and function of design aims (Figure 2).

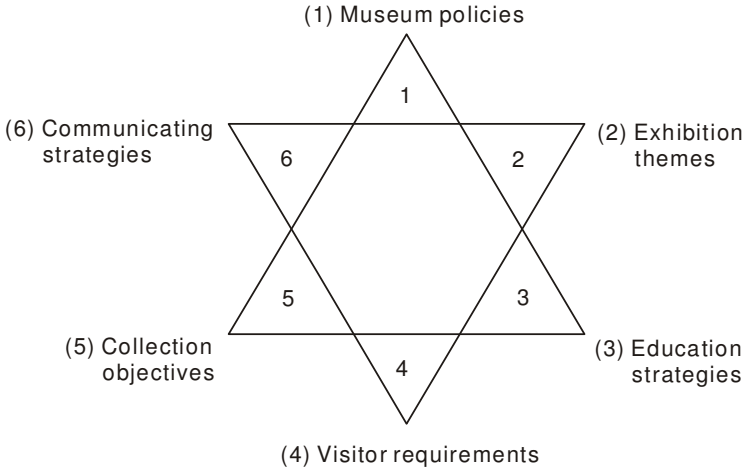

Figure 2. Museum exhibition design concerning curatorial roles

Unlike other design work such as product design, where the curator does not normally become involved in undertaking the design process within the developing design project. In contrast, museum curators or the museum director normally represent the museum and are involved in conducting the design project.

4.2 Museum exhibition roles

The roles of museum exhibition are currently considered within design development which includes design specifications and museum criteria (Belcher, 1991, p.5). Both factors involve important interactions between the professionals concerned: architects, designers, curators and other specialists, and ensure that museum exhibition design fulfills museum objectives (Lord and Lord, 1999, p.1).

As a research objective, the 'Museum Exhibition Design Process' (MEDP) model cannot exist without investigating the specification of design and the roles and functions of museums. The purpose of identifying museum exhibition design criteria is to create a sophisticated interpretation based on museum expertise. For example, the 'Discovery Center' exhibition in Birmingham has digital communication systems through which the majority of the information and images were delivered.

5. Planning the museum exhibition design criteria framework

Designing museum exhibitions requires the active participation of different professions and the co-ordination of communication between designers and other relevant people. Well-formed information processing instructions are required by the various disciplines during design development projects. Such information consists not only of planning data but also the design methods to guide designers in systematic exhibition design work to improve its quality.

The museum exhibition design criterion framework being developed, identifies the role of curatorial requirements as critical for project participants in making the process model functional and workable. Such a framework should enable all participants in the design team to examine their requirements, and to establish an understanding of how to adapt project criteria to design work (Figure 3).

Figure 3. Planning the framework

This study finally develops a systematic framework which can be described as a plan of design activity, particularly for science museum exhibitions. The aims of this study are therefore to deduce what aspects of the design criterion should be represented in the framework, what tasks should be identified, and to suggest the most suitable approach to modelling the design criterion itself. The following issues have been addressed during this study:

- To identify the aspects of the design process that need to be modelled for museum exhibition design.

- To define criteria for the design work that could improve the design process.
- To identify design roles that could effectively achieve project aims.
- To enable the proposed design criterion framework to be applicable to all design participants and their systematic and effective work.

5.1 Managing the documentation

Design projects are traditionally constructed on a discipline basis and then co-ordinated centrally. Information in this context concerns both design process and design team (Lin, 2003). Project information relates to the project and usually is expressed in terms of specifications or drawings and usually is expressed in terms of specifications or drawings and could be a design criterion. A serious of documents are required to develop a good project documentation are run the project and directly affect the success of the design outcome. These documents describe all relevant constraints, such as the brief, concept development, product specification and curatorial roles (Table 1).

Table 1. Categories of design documentation

Documentation	Aim	Function	Content
Design brief	Give general advice on how to proceed a project.	Clearly define the project objectives, organizational structure and planning and timing.	Strategic brief. Project brief
Sketch plans and drawings	A general indication for establishing real work.	A graphic description to show what an exhibition looks like.	Sketch plan. Outline design drawings. Working drawings. Scheme design drawings.
Checklist	To enhance the quality-asurance of exhibition work.	Defines the information which designers have developed to ensure appropriate solutions.	Design development. Product information. Production development.
Production specification	Prepare and develop the details in order to establish production work to meet project requirements.	Provide all detailed specification for fabrication and installation.	Checklists. Advance ordering forms. Letters to tenders.

The purpose of a document is to formalize and deliver information which others can understand to realize the design tasks. During the exhibition project development, a number of documents will be generated by each participant in order to present their plans and proposals. The purpose of providing these documents is:

1) to present sufficiently detailed specification to enable quantity surveys to quote costs;
2) to provide specifications of other participants' requirements in order to develop their work;
3) to provide a general plan and proposal for project;
4) to set out regulations for the overall project process; and
5) to provide information in sufficient detail for contractors to quote for implement production work.

5.2 The finding of the Discovery Center design process study

In order to construct the MEDP framework, a set of components of design method were isolated that were representative of the conceptual phase of museum exhibition design. Extensive discussions resulted in several solutions that were pertinent to the development of the criteria. To improve the productivity of the design process as well as the quality of design projects, the design process framework of Discovery Center review findings suggested consideration of the following issues:

1) Good utilization of design information

Based on observation of the 'live' case project, it was found that members of development team were good at communicating and sharing their expertise with each other.

2) Multi-disciplinary design based on curatorial criteria

After a brief discussion with the Discovery Center museum curators about design process objectives, they identified that a good understanding of criteria as expressed in the brief was important. They also described misunderstandings of curatorial criteria, which had caused ineffective design work. Therefore, a criteria-based design method should be utilized.

3) Design communication

Good communication between all relevant participants allows design decisions to relate to all members rather than one individual. According to interviews about The Discovery Center project designers, participants rarely had a clear understanding of the information requirements of other disciplines. In this sense, workable design documentation is required to cope with complexity of museum exhibition design.

4) Collaboration in the design process

The plan for designing a museum exhibition should clarify the parties involved in its direction and provide a pattern for a 'project development team' rather than a 'design team' alone. Collaboration is needed to initiate the development of the design project. Collaboration is an active principle to and involves negotiation, agreement, and discussion in order to carry out decision-making in the design process (Chiu, 2002, p.205). The design process should provide feedback loops for all members of the team.

5.3 Mapping the museum exhibition criterion framework

A well-structured method is a key factor in developing an efficient and systematic process. The successful execution of multi-disciplinary design work requires co-ordination to ensure all participants are constantly aware of the progressive status of the project (Figure 4).

Design stages	Documentation	Design brief	Sketch plans and drawings	Checklist	Production specification
Concept brief	Museum objectives	Cost appraisals		Project requirements	
	Project proposal			Design requirements	
				Curator requirements	
Concept design	Cost plan	Feasibility studies	Sketch plans	Specialist requirements	
	Project plan				
	Design specification				
Detailed design		Site surveys	Outline design drawings		
		Research	Scheme design drawings		
			Working drawings		
Implementation	Production plan			Production requirements	Details of finishes
	Production specification				Detail of materials
					Detail of fittings
Completion	Design report			Overall requirements	Methods of access
		Evaluations			Cost evaluations

Figure 4. Mapping the criteria

5.3.1 Documentation

A series of documents are required to develop a good project brief and run the project and they directly affect the success of the design outcome. They describe all relevant constraints, such as the scope of the work, the designers' approach, criteria, specifications, design tasks, client requirements, materials and production.

The purpose of a document is to formalize issues and deliver information which others can understand to realize the development situation. Design information includes questions, objectives, strategies, meeting records, design briefs, plans, checklists, answers and statements, and reference points about the action being taken or which should be taken as the work proceeds (Tunstall, 2000, p.36). Key design documents describe full design proposals in graphics, words or symbols. To achieve complex design work, an adaptable methodology for information should be produced within each exhibition project.

5.3.2 Design data

During project development, a number of documents will be generated by each participant in order to present their plans and proposals. The purpose of providing these documents is to provide specifications of other participants' requirements in order to develop their work.

To facilitate an understanding of these documents, a definition of each document follows:

1) Museum objectives: A document describing the themes and contents of the museum collections and museum strategy.
2) Project proposal: An integration of general concepts from each discipline to form a proposal which represents the overall project idea.
3) Project plan: The overall concept of how the project is to be undertaken based on client requirements and project aims.
4) Project feasibility report:
    a. Strategic brief: An appraisal of the client's objectives, procedures and organizational structure resulting in broad aims for the design project.
    b. Design cost estimate: An estimate for purposes of charging design fees.
    c. Specialist service plan: A description of the subject specialist's general services.
    d. General cost plan: A description of funds required and a cost evaluation of the overall project.
    e. Design feasibility report: An overall preliminary review allowing designers to evaluate the project, estimate resources and record action points for the project.

f. Specialist feasibility report: An overall preliminary review allowing specialists to evaluate the project, estimate resources and record action points for the project.

5) Alternative project proposals:

   a. Alternative design proposals: Preliminary design concepts which illustrate different ways of achieving the objectives, allowing the client and specialists to evaluate, advise and contribute to decisions.

   b. Alternative specialist proposals: Preliminary specialist concepts which illustrate different ways of achieving specialist objectives and allowing the client and designers to evaluate, advise and contribute to decisions.

   c. Alternative budget proposals: An opportunity for alternative income generation and spending plans to be evaluated.

6) Cost plan: A description of funds required by the project including a cost evaluation of the requirements of each discipline.

7) Outline design proposal: A preliminary planning and design concept for the overall scheme.

8) Design specification: Describes the detailed attributes of exhibition content and form.

9) Design report: Full documentation of detailed design proposals for production including structures, components, information and cost plan.

10) Production specification: Detailed manufacturing and construction information for exhibits which enables the contractor to manufacture everything from display cases to software.

11) Production plan: A specific plan of fabrication and installation systems, procedures and timescales.

5.4 Design brief

At an early stage of planning the project, all the information to be communicated should be prepared, ideally as part of the brief which should consist of all ideas, background data and statistics (Velarde, 2001, p.55). The design brief forms the basis of the exhibition criteria and the specific requirements of the project. A design brief provides a framework within which the exhibition design team may deal with detailed procedures during the design project.

The British Design Council defined a brief as describing all relevant constraints, such as cost, materials and quality. It should define the deadlines for the deliverables and the checkpoints along the way and give a clear description of the role of each of the team participants (British Design Council, 2001).

In developing exhibition projects, briefing is a continuous process which can be regarded as evolving from the client's needs, specialists' advice and designers' specifications. The brief should be used to explore and define the true functions and requirements of the exhibition project. The design brief

clearly establishes what the elements of the museum exhibition are, or should be, and involves collecting and recording information about these elements in order to assess their significance.

The briefing process must be appropriate to the nature of the exhibition project and consists of two levels: the strategic brief and the project brief. The strategic brief is a document which covers technical, managerial and design intentions, and shows how requirements are to be met. It is likely to be the result of research and development involving all the project team, with additional expertise and advice from commissioned specialists. It will be the outcome of activities such as: (1) feasibility studies; (2) site and museum surveys and studies; (3) research into functional needs; and (4) cost appraisals; and (5) evaluations.

The project brief should define all design requirements. It should be prepared by the designer in collaboration with the client, and with coordinated contributions from all consultants and museum specialists. The project brief should cover:

1) the aim of the design, including prioritized project objectives;
2) the site, including details of accessibility and planning;
3) outline specifications of general and specific areas; and
4) a budget for all elements.

5.5 Sketch plans and drawings

Drawings present in varying detail exhibition content, form, material, layout and, storylines in accordance with design brief. Detailed drawings enable contractors to proceed with production work and, quantity surveyors to quote costs. Drawings describe design proposals, concepts and production details and are used to communicate to other team members. Drawings can be supported with written specifications, layouts of site and space, samples, software prototypes and storyboards. In the museum exhibition design process, there were different levels of drawings that are prepared at different stages.

1) Sketch plans: The sketch plan is normally free-hand. The sketch is rough and inaccurate showing only style, layout, or a sense of reality with limited detailed explanation. Project developers normally use the sketch plan to present the general concept of exhibition themes.
2) Outline design drawings: These scale drawings show overall form and appearance of site plan, layout or exhibit environment. They are produced in sufficient detail to indicate the main elements in principle.
3) Scheme design drawings: The drawings show design concepts, situating exhibit elements, objects or location. These drawings are used to explore different options different including materials, dimensions, sizes, interpreting methods, colors, or forms.
4) Working drawings: These are usually CAD drawings and present every detail of how all the individual parts of the exhibition fit together. Also, a relationship between the exhibited items and their site and location would be accurately shown based upon the concept approved at the design stage. These drawings, also detail manufacturing and

production to establish costs and to inform the contractor how to proceed with production.

5.6 Checklists

As the design concept is developed and design issues are determined, a serious range of issues should be examined. Checklists are used to ensure that none of these issues has been overlooked in the preparation of documentation. Checklists are also used whenever a complex review is undertaken throughout the design process (Table 2).

Table 2. MEDP Outline checklist

Main objectives	Checklist item
The project planning requirements	What the project stages be required to identify? What the museum theme be required to identify? What are the principle exhibition features? What is the participant expertise involved? What is the intended date of completion of the project? How to co-ordinate the exhibit developers? What are the relationships between the client and other parties?
Designer requirements	What are the designer's responsibilities? What are the site plan features? What are the exhibition themes of the project? When will the design work stage start? How to test the design process? How to test exhibit work? When is the design work deadline? What is the interactive exhibit strategy? How to arrange the design plan? What are the exhibition features? What features of exhibits should be considered?
Client requirements	What are the client's responsibilities? What are the client's needs of the project? What information the client should provide for designers? Will the client participate in exhibition development team? Will the client need to set an in-house design team? How does the client consider design study with design team? How does the client consider approval of each work stage? How does the client review the report and change required? How does the client commence work stage?
Production requirements	What are the fabrication requirements? What is the maximum exhibit cost? What are the anticipate exhibit total quantity? Are there size and weight restrictions? What are the total budget of the production work? Are there preferred materials or processes? When is the complete date? What are the contractor' responsibilities? What are the production document needed?
Specialist requirements	How many categories of specialists are involved? What are the specialists' responsibilities? What are the contributions of the specialists to design process? How do the specialists communicate with designers? How do the specialists communicate with the client?

To enhance the productivity of the design process and quality-assurance of the exhibitions, it is vital to have a careful evaluation of the design issues. A checklist is intended as a basic guide, and lists all the potential design elements, to be amended to suit the particular requirements of the project. When completed, it forms a directory for the client's future evaluation (Hill, 1982, p.87). The checklist describes specifications for each work stage which can be used to evaluate the design solutions, enhancing the productivity of the design process and the quality-assurance of the exhibition.

5.7 Production specification

Production specification is a set of documents including working drawings, and other related data which enable complete preparation for fabrication and production. In museum exhibition projects, normally, the designers are appointed by the client and provide the client with a full set of information showing details of all finishes, materials, fittings and methods of access.

Production information is submitted to the client for approval, to the quantity surveyor for the appraisal of tenders and recommending qualified contractors, and to the principal contractor for the preparation of background information for production work.

5.8 Mapping the design criterion framework

This framework has a number of properties. Its application in real practice is more complex than any other model of the design process intended for this purpose. The MEDP model enables participants to understand the various disciplines that are involved in the design project. In order to carry out the inter-disciplinary co-ordination activities of the development team, process-users need to focus on its application within their discipline, as well as the project. The criterion framework is constructed to develop a clear understanding of the museum exhibition design development (Figure 5):

1) the project input performed by each role;
2) the information flow between tasks at all levels;
3) the design team needed to perform the process;
4) the design stages necessary for an efficient approach to planning; and
5) the general forms of design output.

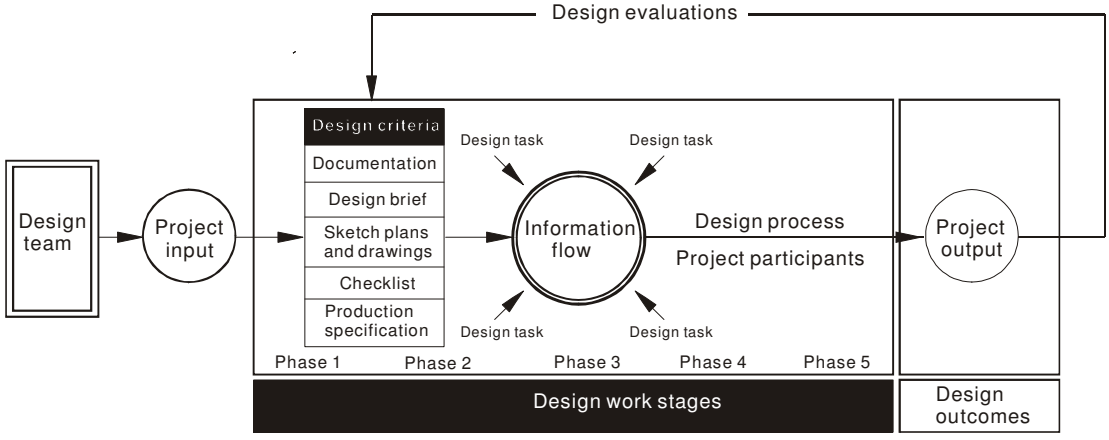

Figure 5. The function of the design criterion framework

Museum exhibition strategy has changed from representing preserved collections to interpreting information using a variety of media and technology, such as computer-based interactive devices. Museum curators set out museum exhibition aims and objectives according to their research in

order to define their ideal museum exhibition functions. Such objectives will guide the designer during project development.

Design projects using the "Design criterion framework" can vary considerably in content and form depending on the nature and complexity of the exhibition project. The framework provides a way of defining, ordering and specifying museum objectives and design specifications, as well as of achieving design aims. The framework is primarily concerned with mapping information flows. Such a framework does not show how a process is performed, but what is needed to perform the tasks and what design information and work should be produced. The criterion framework offers many advantages over existing methods for the designer:

1) It allows designers to identify their role in the design project;
2) It allows designers to handle interdependent tasks and reduce the number of tasks within each interactive cycle;
3) It indicates to designers which tasks require cross-disciplinary co-ordination and integration;
4) It enables designers to understand museum exhibition requirements.

6. Conclusions

This study has developed into a structured way to enhance inter-disciplinary museum exhibition design work, by developing a prescriptive design process framework. The view taken by this research is that a design criterion provides the system necessary for the identification of appropriate user needs and the realisation of information necessary to create design concepts (Pugh, 1991). Therefore, a particular design criterion framework will be developed to identify the basic properties of roles for museum exhibition design.

In this research, multiple research methods were adopted that involved considering the information needs of each design task, and then verifying them with appropriate designers and museum curators. The modelling approach provides an insight into the weaknesses of current museum exhibition design practices. The criterion framework is primarily concerned with mapping information flows. Such a framework does not show how a process is performed, but what is needed to perform the tasks and what design work should be produced. From the outset of the application to museum exhibition design projects, the design criteria allow the project team to develop and put forward design concepts.

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