Required Reading; Lighting Design Process

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Context

Lighting design in Ball State's Environmental Systems courses is split between Arch 273 and Arch 373. Arch 273 addresses daylighting—the use of naturally available resources to light a building; Arch 373 addresses electric lighting systems—the use of technological elements for the same purpose. The key difference between daylighting and electric lighting is the source of the light being employed—whether it is captured from the site or manufactured within the building enclosure. Architectural design plays a role in the success of both approaches, but much more so with daylighting because it is a passive system.

As should be clear from the design studio experiences you have to date, there is not a single universally-accepted vision of the design process. You have likely seen several design processes endorsed by studio faculty; you will see more before you graduate. There are clearly some common aspects of most design processes, such as program, precedent, ideation, iteration. These aspects may in fact be universal.

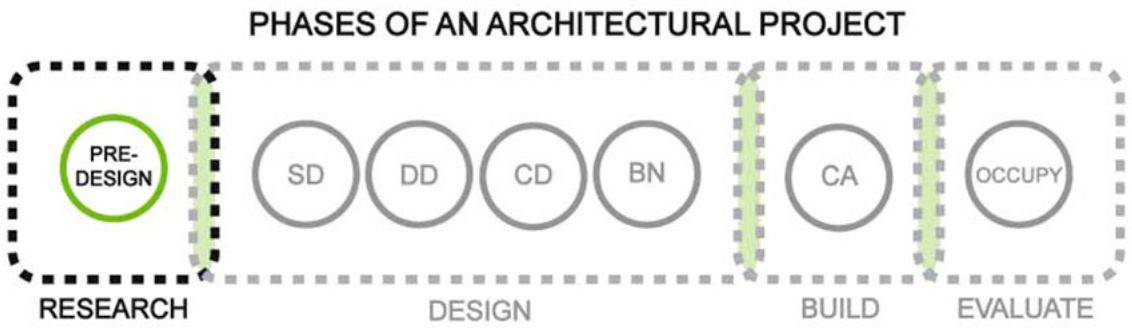
The design of a lighting system will also follow the design process as applied to buildings—but with a more restrained scope and with a tighter focus. This reading does not ask you to change your favorite version of the design process as you shift your focus to lighting design. It does ask that you seriously consider the addition of what may be a new element to the design process—that of developing owner's project requirements (OPR) that will guide design decision making. We'll come back to OPR in a bit.

It can be argued, and the case is being made here, that the big-picture design process is essentially the same for daylighting and electric lighting. What varies between the two approaches are implementation methods (such as windows versus light fixtures) and analytical tools (such as software). The focus of this reading is the pre-design phase or stage of the design process.

Views of the Lighting Design Process

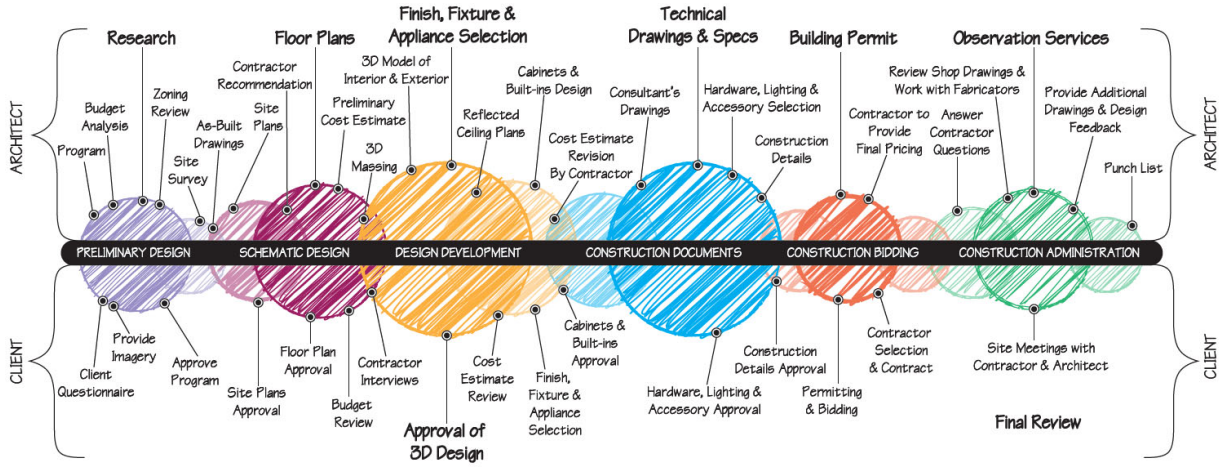
The following diagrams are presented to jump-start this discussion of the lighting design process. They illustrate thinking about the design process as presented by a range of design firms. The details vary but the big picture seems consistent. I have added comments about the process in each of the figure captions.

First, from FABRIC[K] we see a very broad view of the project acquisition process (from an architectural perspective) and a sense of the phases that constitute the design process phase of project acquisition. Note the relative importance imputed to research and pre-design—which is where owner's project requirements would be developed.



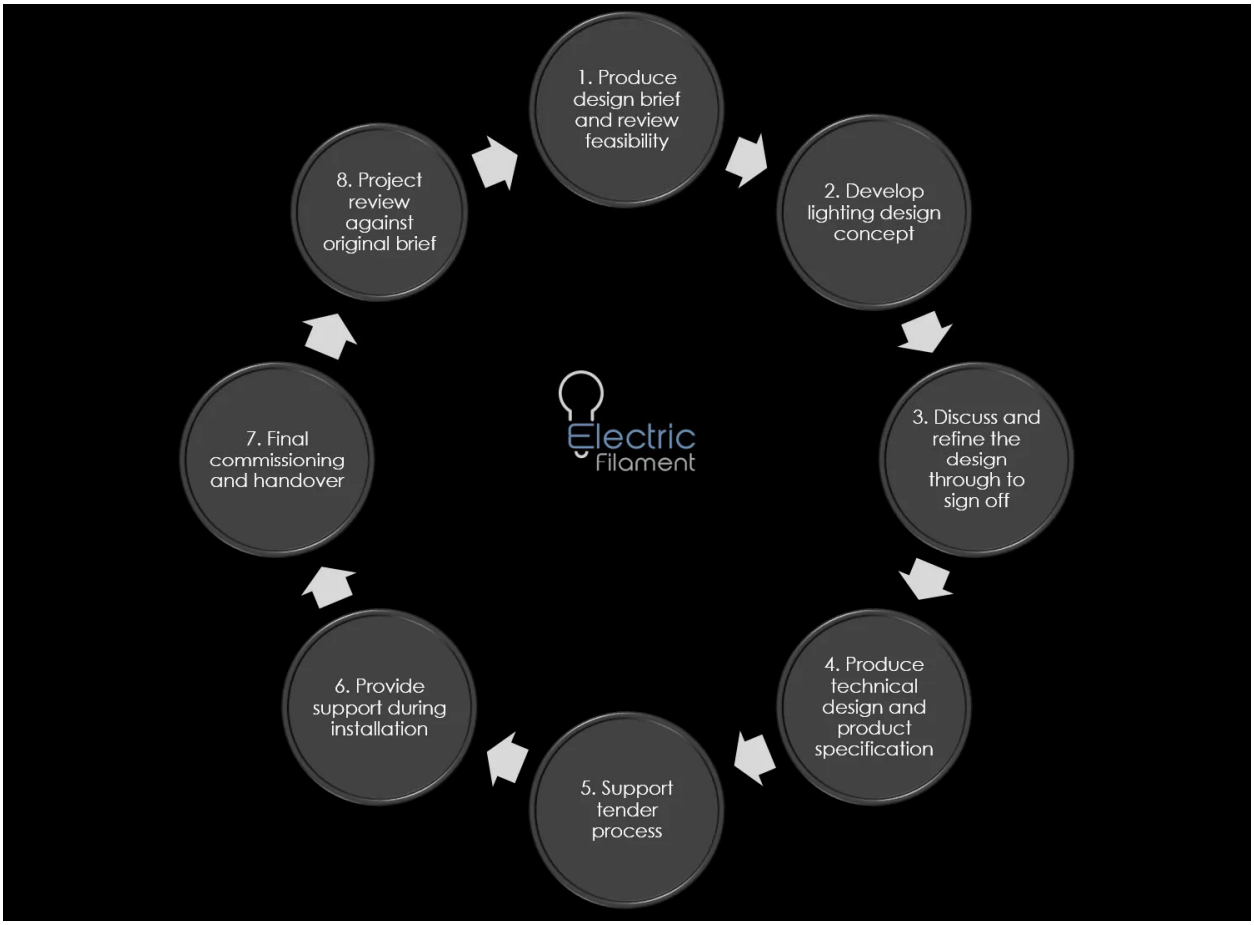
FABRIC[K] places pre-design within the context of the larger design process and the even larger acquisition process. SD is schematic design, DD is design development, CD is construction documents, BN is bid negotiation, CA is construction administration. It all starts with pre-design. Source: https://fabrick-design.com/thekornerblog/2017/10/18/the-business-of-architecture

A much more detailed view of the same general territory (but without the occupancy part) is provided by IS Architecture in an online article titled Ask and Architect. I personally adore this graphic because it conveys certainty and rigidity in the text notations and the horizontal spine while suggesting vagueness and flexibility in the crosshatching within the work elements.

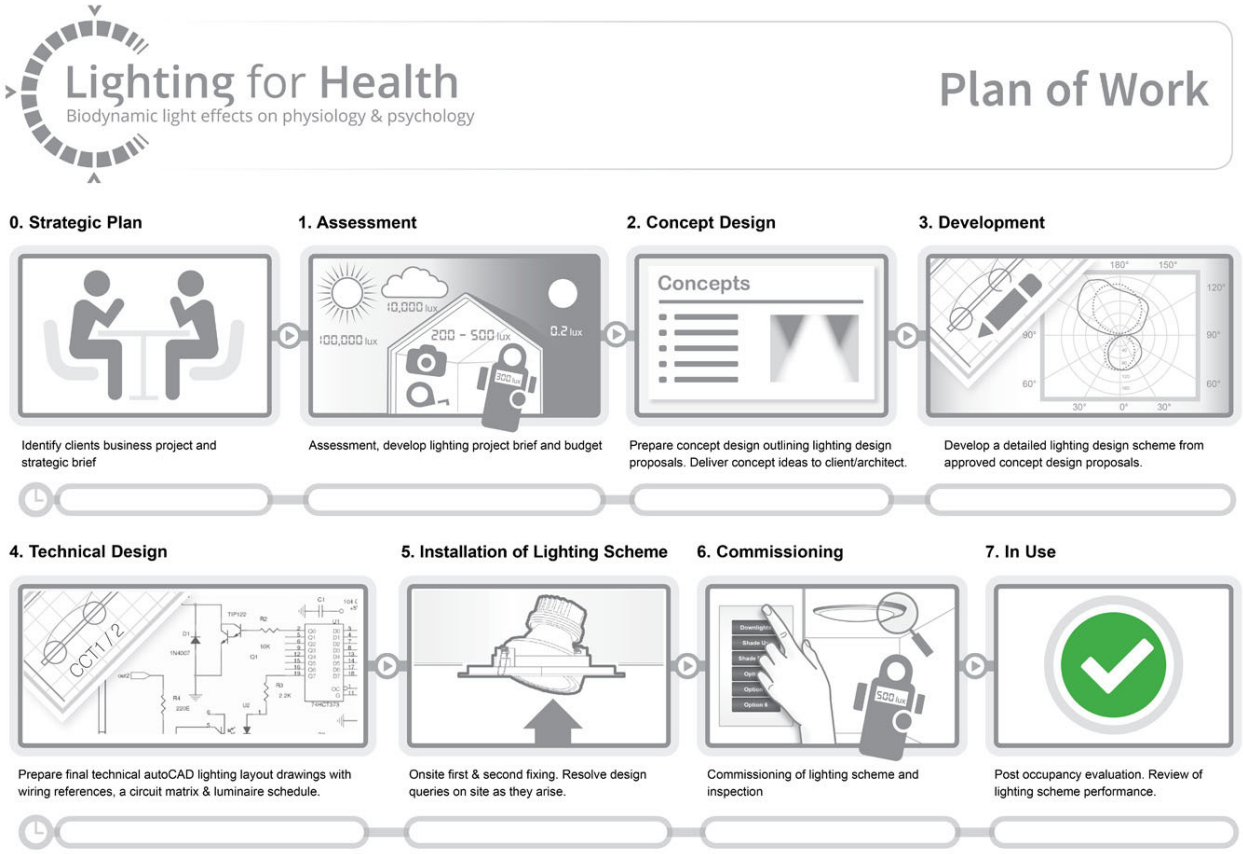


What I'd like to focus on, the development of owner's project requirements, is embedded in "Program." Although seemingly a small part of the much bigger and complicated process—program is the first element and could be viewed as the critical starting point for all else. Source: https://isarchitecture.com/ask-an-architect-may-2017-edition/

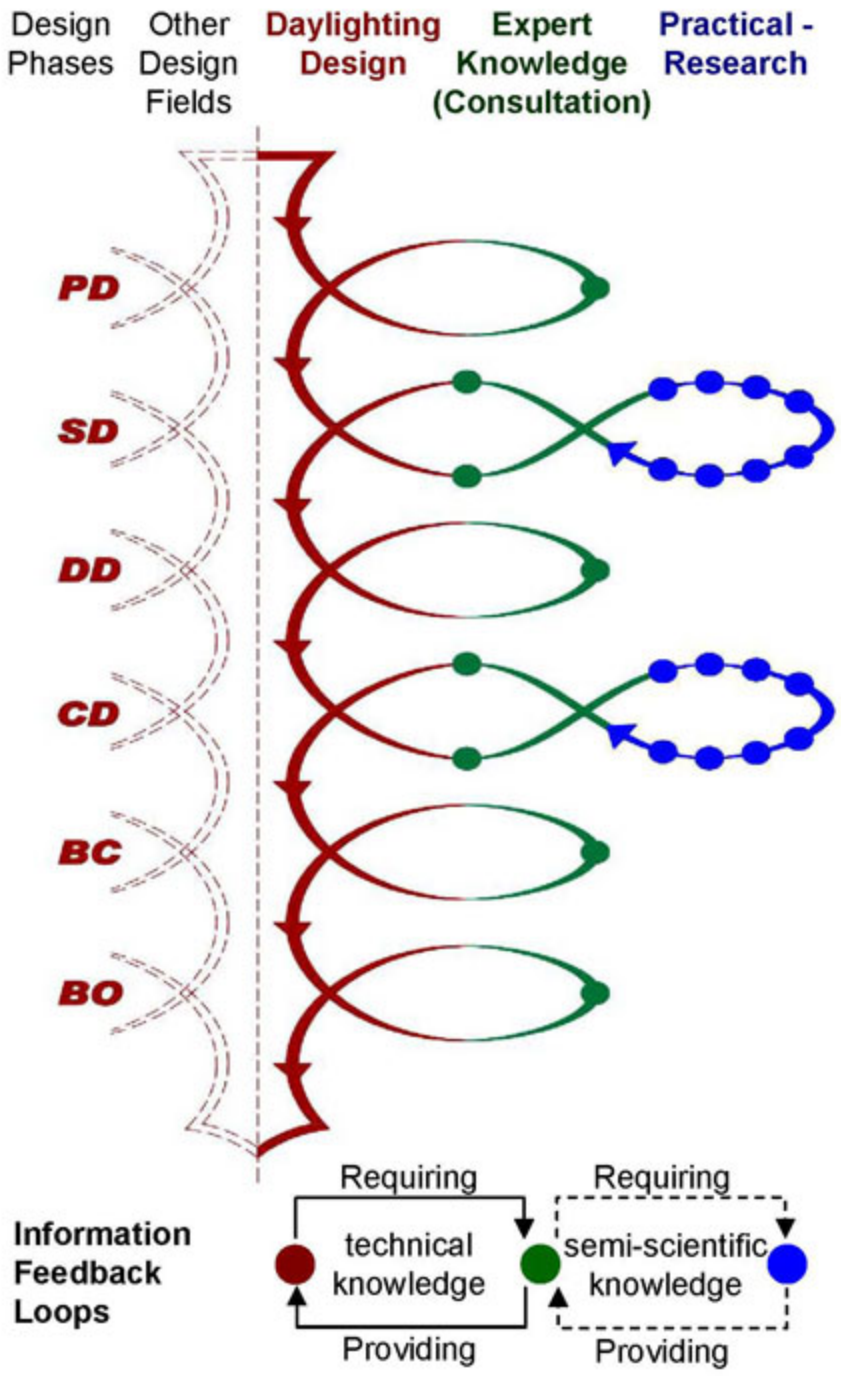
Three other views of the design process—both with a focus on lighting design—are shown on the next page. Although different in the details, a key similarity is that both clearly show that the design process starts with a grounding in context (needs, budget, desires) before the advent of concept generation. Put another way, it is critical to understand exactly what the problem trying to be solved is before suggesting problem solutions.



The lighting design process as diagrammed by Electric Filament, a lighting design firm in the United Kingdom. “Design brief” is English English for program. Source: https://electricfilament.co.uk/info-post/our-design-process/



The role of the design process in the Plan of Work for acquisition of a lighting system as diagrammed by Lighting for Health. Steps 0 (interesting numbering) and 1 represent pre-design. Source: http://lightinghealth.dns-systems.net/lighting-design-service/lighting-design-process/



A diagram of the daylighting design process, from the firm Research & EcoDesign, that emphasizes iterations throughout the various phase of the system/building acquisition process. Abbreviations are as seen above, with BC being building construction and BO being building operation. Source: http://recod.net/practical-research/

Why OPR?

Owner's project requirements (OPR) consist of a written statement of those design issues, design intents, and design criteria that—if appropriately and skillfully engaged on a project—will lead to a successful project from the owner's perspective. There are a couple of great quotes that help illustrate the importance of the pre-design phase, the development of program, and the development of OPR. Ideally, these will provide a sense of why having clear design objectives is important to success. If not, I'll translate—designing without objectives will rarely (if ever) lead to the right answer to a problem.

First: *the un-aimed arrow never misses* (anonymous).

Second: *if you don't know where you are going, any road will get you there* (Lewis Carroll).

Third: *if you don't know where you are going, you'll end up someplace else* (Yogi Berra).

A Practical Example

The following is from an online article by Christopher Cuttle. The title should explain why it seems appropriate to share with you at this time. Don't get locked into the nuts-and-bolt details; consider the big-picture message about objectives. Source:
https://www.ies.org/fires/the-lighting-design-objectives-lidos-procedure/

The Lighting Design Objectives (LiDOs) Procedure

Probably the world's most often referenced indoor lighting standard is the European Standard *EN 12464-1 Indoor Work Places*, which defines the purpose of lighting as "to enable people to perform visual tasks efficiently and accurately," for which the prime criteria are: "a maintained illuminance over the task area on the reference surface, which may be horizontal, vertical of inclined," and "the task area shall be illuminated as uniformly as possible."

The mid-years of the last century saw the emergence of architectural lighting design as a professional practice with objectives that reject virtually everything that lighting standards such as *EN 12464-1* aim to achieve, including the use of illumination metrics to specify lighting objectives. Since then lighting design software has been developed that enables designers not only to visualise onscreen how lighting may affect the appearance of a chosen architectural space, but more generally, how it influences the appearance of people's surroundings. The lighting profession is now divided between practitioners who use illumination metrics to achieve reliable and efficient compliance with lighting standards, and those who apply lighting to influence the appearance of people's surroundings and who shun the use of illumination metrics, which they see as inhibiting their creativity and their scope to "think outside the box."

It is proposed here that there is scope for an innovative procedure that combines components from both sides of this division. Lighting's role in influencing the appearance of people's surroundings provides a sensible basis for determining the overall illumination quantity to be provided, where *surroundings* is taken to include all visible surfaces and objects within the space. The appearance of details, which may include anything that deserves attention (including visual tasks), may be crucially affected by illumination distribution within the space, and managing illumination quantity and distribution within an enclosed space calls for competent

application of illumination metrics. Application of such a procedure should support the achievement of any set of lighting design objectives without inhibiting innovative design options – as the imposition of the uniformity criterion does.

The Lighting Design Objectives (LiDOs) Procedure (henceforth referred to as 'the procedure') is based on the proposition that the prime purpose of indoor lighting is *to satisfy (or better, to exceed) people's expectations for how lighting may influence the appearance of their surroundings*, where surroundings are taken to include room surfaces, furnishings, objects of interest, visual tasks and other people – in fact, all the things that people respond to visually in their environment. This definition of purpose places emphasis upon providing illumination for its influence on appearance rather than on performance, but this should not be seen as denigrating lighting's role in providing for visibility. While ambient illumination is crucial for creating settings that engage people in the activities associated with the spaces they occupy, it is the identification of target surfaces for selective lighting that expresses the design intention. If task visibility is the intention, then visual tasks become the target surfaces. This different notion of the purpose of lighting requires a novel procedure with newly defined lighting objectives.

People's assessments of how lighting influences the appearance of their surroundings are characterised by three human response relationships:

- *Perceived brightness of illumination* (PBI) is the perception of overall brightness of illumination within a room, and assessments of PBI may be rated on a category scale ranging from 'very dim' to 'very bright.' These assessments relate to ambient illumination specified by MRSE and may be described as non-located illumination mode perceptions (Cuttle, 2004).
- *Perceived adequacy of illumination* (PAI) specifies minimum ambient illumination levels (MRSE) rated as 'adequate' for categories of human activities. The PAI value for a given activity category is specified by a 95 percent 'yes' response to whether locations typical for that category appear to be adequately lit.
- *Visual emphasis* refers to assessments of the visual impact of direct flux on target surfaces and may be rated on a category scale ranging from 'absent' to 'emphatic.' Visual emphasis ratings relate to target/ambient illumination ratio (TAIR) values and may be used to specify a broad range of lighting design objectives.

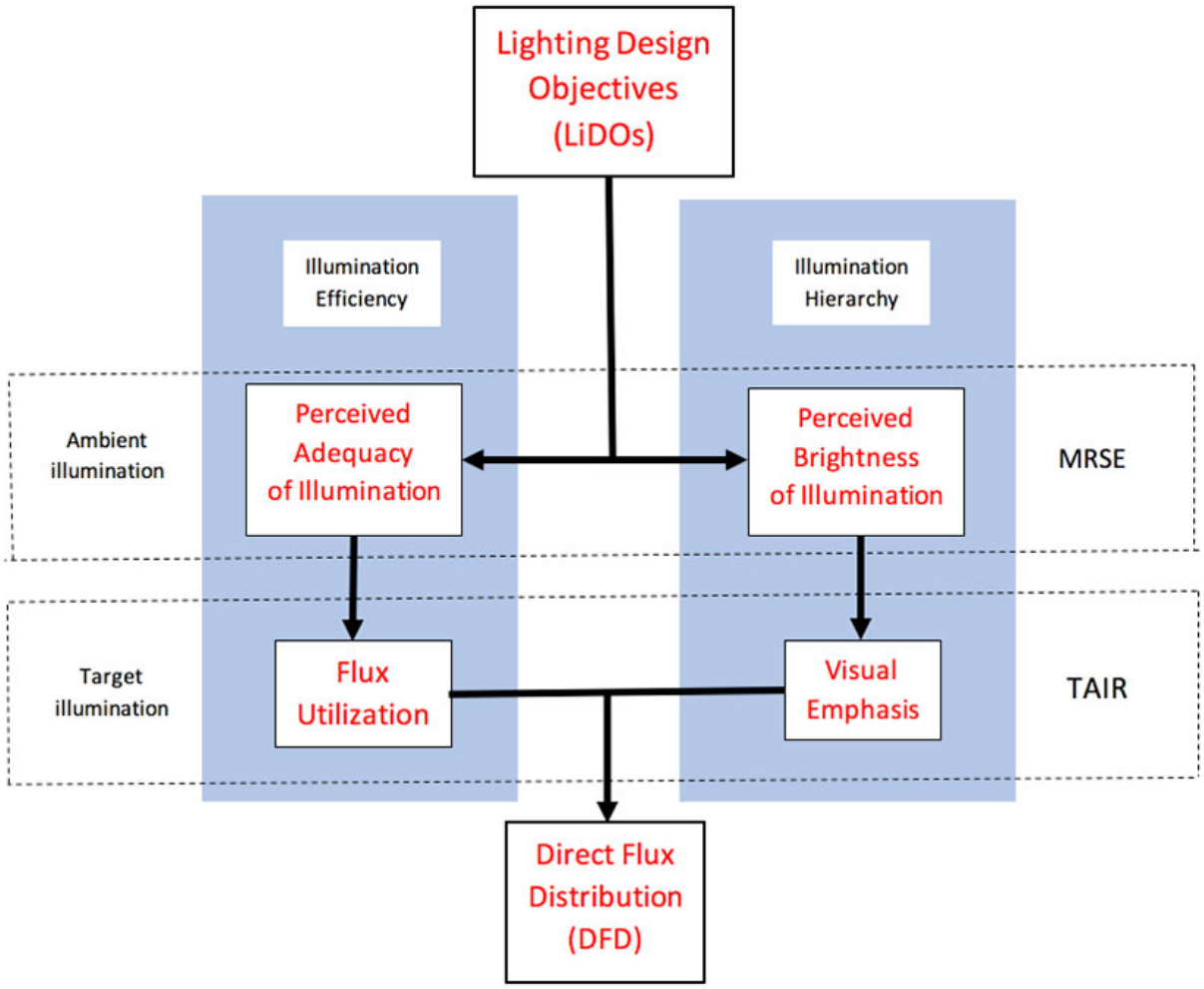


Diagram illustrating the primacy of lighting design objectives. Source: Christopher Cuttle, MA, PhD, FCIBSE, FIESANZ, FIESNA, FSLL