UIA-IHF project: reducing hospital operating cost through better design

Introduction

The increasing importance of cost containment in healthcare following the 2008 financial crisis has added constraints to the sector. Moreover, shifting trends in epidemiology (mostly an increase in multi-chronic conditions and an aging population) demand changes in healthcare and service delivery. There is need therefore to accept that hospital designs of the past are no longer appropriate. The challenge is to be ahead of the curve while avoiding major mistakes with regard to anticipating future needs.

The current pace of change in healthcare makes it difficult to reconcile extended periods of time between design and completion, which can still take up to 10 years even in advanced European countries. However, innovation allows for shortened construction times, which should enable designers to think progressively and take advantage of the opportunity. The first step to accelerate the full construction cycle is to re-evaluate the various procedures and stages of decision-making. Rather than prioritizing administrative procedures, decision-making steps should progress with an emphasis on the opportunity cost of delays.

There is increased emphasis on providing greater attention to economic impact in the building process. Economic development is rapidly progressing and its impact must be better taken into consideration during the design and the construction process. Well managed finances can contribute to reduced costs.

For these reasons in June 2014 was organized in Florence a first operational meeting about this topic between the International Hospital Federation (IHF) and the International Union of Architects-Public Health Group (UIA-PHG) planned to identify possible synergies in the development of knowledge, technical and operational products for the benefit of both Institution's members.

The objective was to work together on an issue of interest for both operators responsible for the design of hospitals and for those in charge of their management. For a first initiative, the decision was made to focus attention on the topic of "containing the costs of healthcare facilities through hospital design." This topic is of global relevance in all geographical areas and in all socio-economic and cultural contexts. In light of the interest generated by this subject matter, both organizations believe that collaboration is the most effective strategy to pursue.

To reflect a global perspective, the topic has been analyzed broadly, from the most technologically advanced countries to emerging and developing countries. This will help to determine the constants and variables affecting decision making in hospital design when reducing investment and operating costs is the main priority for the facility.

The expected final product is the establishment of an "open database" of various experiences and management applications, for obtaining a series of "guidelines and recommendations" to steer hospital design towards containing the cost of initial investment as well as expenditure during Use, Management and Maintenance of the Facilities.

The workshop participants shared their experience and expertise to identify critical domains to explore for cost reduction, and formulate "recommendations" on the way forwards with this project.

IHF representatives were asked to highlight which components of the costs of management and maintenance mostly affect design choices and what type of saving are viable.

PHG representatives were asked to highlight what precautions are required today and adopted in the development of design proposal in order to achieve the objectives of cost containment, with particular attention to utilization costs.

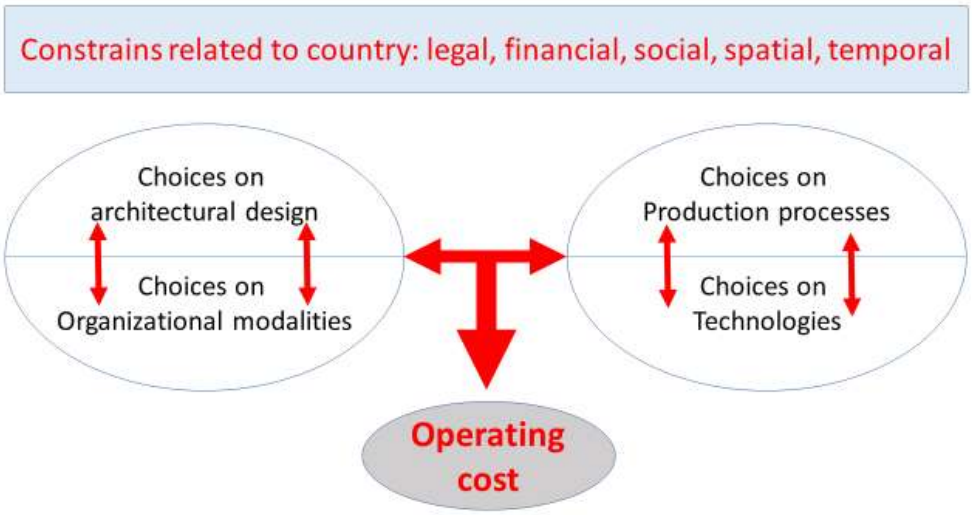
Both were asked to take into account the different contextual conditions that may affect their approaches on cost containment.

In more operational terms, recommendations and discussion specifically focused on:

- Actions to be taken to contain investment costs through design decisions
- Actions to be taken to contain operation and management costs
- Actions to be taken to maintain, update and transform hospital facilities.

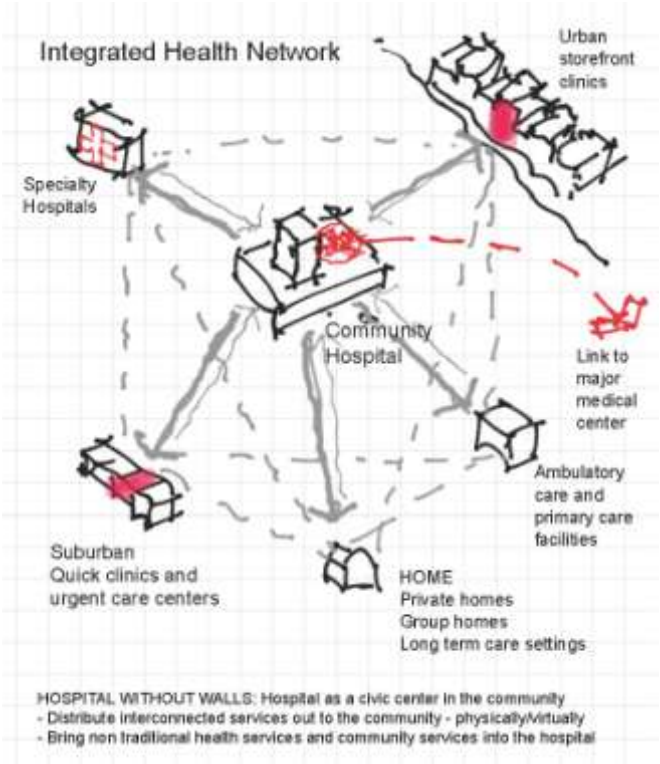
Potential actions also had to take into account in different socio-economic contexts and major variances in the way health systems are set up in different countries.

Given the primary objective of developing operational recommendations, the delegates were also asked to identify "personalities" (experts) with the skills, knowledge, and personal experience necessary to develop "wisdom" in the form of rules of thumb. These rules could ultimately enrich the culture and knowledge of hospital designers and managers.



Factors to consider in hospital costs

A hospital is first and foremost a public building, facilitating participation with community life. However, it must also act as a well-functioning and well-designed machine in order to ensure optimal delivery of healthcare. The design process should always place emphasis on continued dialogue with key stakeholders: health workers at all levels, patients and their families, and the administrative team. All stakeholders should be aware of the cost of any option put forward.



An important aspect of cost containment is the relationship between the hospital and other healthcare facilities. It is important to reflect on the appropriate role of the hospital within the overarching health system. Cost containment cannot be viewed solely from the perspective of a single hospital's operating cost, but rather from the perspective of the overall system.

Also social costs cannot be considered separately from public health options (especially with regard to the aging population).

Healthcare and social care have different stakeholders, but the distribution of role and responsibilities between these two is shifting, and both can have different scope according to countries. It is important to recognize the specific cultural context, as it frequently dictates users' expectations. Projects should consequently consider people-centered integrated care options, as supported by the World Health Organization.

Although efforts are made to predict future needs by accessing the most recent information, current acceleration and anticipated advancement in healthcare may be impacted by future innovations. Responses to needs should therefore be effective for a limited time span, with depreciation being calculated over at 5 to 7 year period.

Commissioning cost should be carried throughout all design phases and should aim to minimize costs. A special attention should be made to energy optimization. In such a process, the concept of cost for users and the community, as well as client costs, should be emphasized.

Universal cost factors

The "design development process" can directly or indirectly influence a variety of "cost" categories within investment and operational costs, namely:

- Technical costs/fees
- Building costs (cost of land, construction cost value, transformations and adaptive reuse costs, demolition costs)
- Infrastructure costs
- In-use costs (cost of staff, energy costs, safety and security costs, management and maintenance costs)
- Disposal costs
- Social costs
- Sustainability costs
- Hidden costs

Technical costs/fees and building costs are influenced by standard procedural cost (professional fees plus time/type of contract and procurement procedures) and by actual costs of the physical quantities deployed (cost of materials).

Although appropriate use of BIM for example can help to reduce costs and time, the extent to which this may be feasible has not been determined. The cost of these items will also be minimized if the client has a very clear concept of the expected outcomes of the project, as well as an understanding of how to optimize its operations. Policy based on "standardized costs" tend to define the maximum cost compatible with each service, in order to keep expenditures within the fixed budget.

Demolition costs are strongly influenced by construction techniques and therefore by the design solutions implemented during the life cycle assessment cost. This dimension is often ignored, with its cost being passed on to the next generation of decision-makers. However, decisions must be made on the relative importance of facilitating potential demolition at low costs; this includes any future modalities, the cost of recycling rubble, and the cost of demolition so as to minimize external disturbance.

Adaptive re-use cost is related to the degree of resilience and flexibility of the hospital as conceived in the initial project solution. To a certain extent, there is potential conflict between ensuring resilience and allowing for greater flexibility, namely: determining which areas of the facility require greater design resilience, and which areas require more flexibility for potential changes, implementing appropriate solutions for each of these areas.

Infrastructure costs for mobility include both the initial investment for the construction of roads, tram & rail lines, car parking, and so forth, as well as the cost of transportation for users. Such costs are usually associated with planning–stage decisions related to site choice and the level of existing infrastructure. The key concern here is between direct project costs and both short and long term "silent" costs for the community. To respond to this issue, it is critical to have both clarity on mobility policies and reliable assessment tools to aid the decision-making process in terms of economic implications. It is likely that an effective balance between cost-benefit for investors and for end users will result from a compromise.

In-use service costs are responsible for the largest percentage of the global cost of a hospital. Such in-use costs have the greatest impact on a hospital's global cost and are highly dependent on design-related decisions, thus they require the utmost attention. In order to provide appropriate responses to the challenge of in-use service cost reduction, it is necessary to better understand what kind of planning decisions affect them. This will allow attention to be focused on the most critical steps.

Management costs relate to the costs generated by general services, which includes food, laundry, information technology, drug distribution, warehouse management, sterilization, cleaning, and waste disposal. These activities do not fall under the "core" functions of the hospital, but are essential for its efficiency. The containment of these costs is determined by both design solutions and by management policy. The initial decision is whether to maintain in-house services versus outsourcing services. Once the in-house or outsourcing decision is made, it is important to explore in-depth which design decisions affect management cost, and how management policies can be introduced in a way that interacts with design solutions.

The maintenance project has become an integral part of the design process; correct estimates of costs and times, in conjunction with the strict implementation of operations, play a key role in

cost containment. The key issue to address in this instance is preventing increasing costs while ensuring that optimal performance is maintained throughout the life cycle of the building.

Disposal costs include total and/or partial demolition, removal and/or recycling of resulting materials with particular reference to the procedures for reduction of environmental impact (noise, powders, disturbances to the operating activities and functions of the hospital facilities).

The *social costs* are the most difficult to determine, as the extent of what is included as part of the social cost is subject to many different interpretations. The value of the factors resulting in the social cost can vary significantly between countries as well as over time. Decision-makers should be made aware of the social context and of its specific aspects.

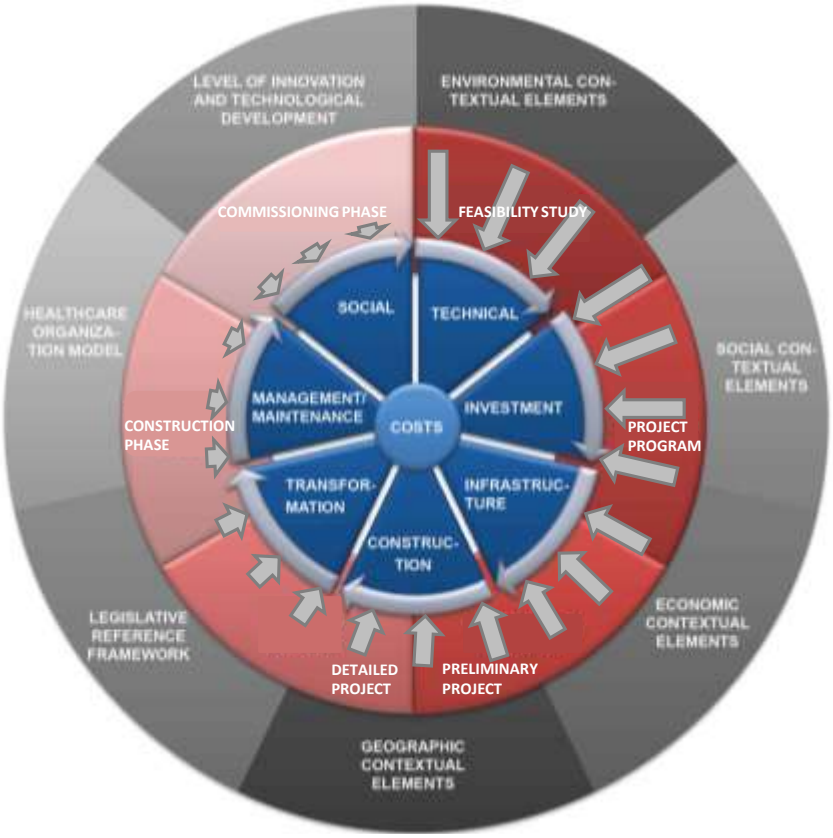
Sustainability costs play an increasingly relevant role in the realization of social interventions. The cost of implementing environmentally sustainable measures is difficult to fully measure, but must be addressed in order to reduce the negative environmental impact of interventions.

Certain measures are increasingly being implemented for positive reasons, such as monitoring of carbon footprint, among others. The cost-benefit of these measures will have to be taken into consideration for a project, along with potential benefits of certain other options that could contribute to greenhouse gas reduction (such as plant-covered roofs, etc.).

Recognising the importance and impact of feasibility studies

The "design development process" includes: pre-programming, feasibility study, project program, project, construction phase, and commissioning phase. For each phase an initial analysis identified possible elements that can influence cost.

Early decisions have a significant effect on the cost of a project. Following this principle, the scope of a feasibility study must extend beyond its specific tasks, addressing the global costs of future facilities to avoid mistakes that can result in major hidden or transferred costs. Every design decision is made with cost consequences in mind, and it is important that not only in-use costs are taken into consideration at the feasibility stage, but also all the other costs detailed above.



Feasibility studies should accordingly include a list that relates items to future costs, and design decisions to costs and benefits. It is also important to clearly identify who will bear the cost: the facility, the user, or the community, and indicate whether the cost comes at the time of operation or at a later stage.

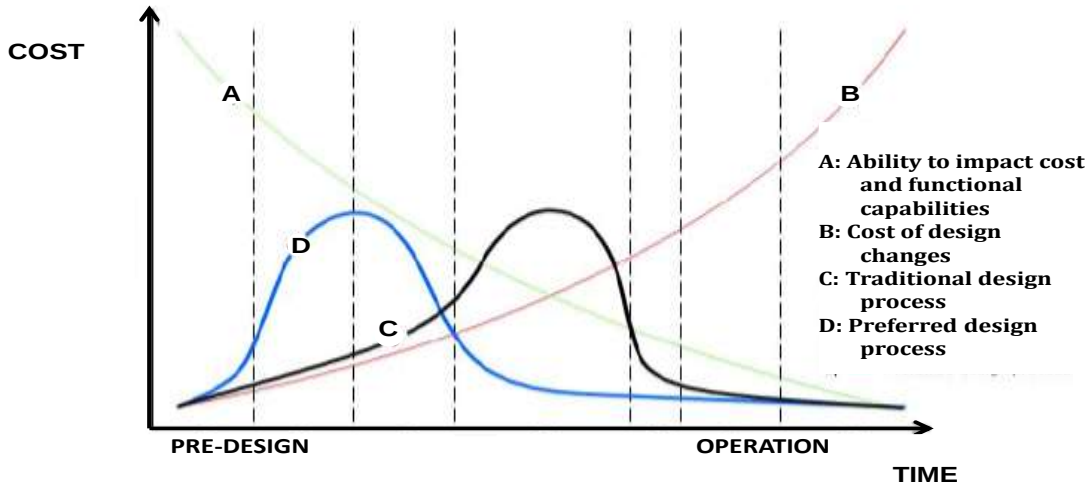
Feasibility and cost evaluation studies conducted during the initial design stage are theoretically standardized to address the same issues in the same way, limiting variation. However, they are often interpreted differently by each stakeholder, which complicates efforts to effectively coordinate.

The cost of feasibility study is usually included in the technical/fee costs, but it is important to understand when the feasibility study should start and what it should include. For this reason, it is advisable to separately identify the cost of the feasibility study, and for developers to allocate sufficient funds, as the outcome often has a major impact on final infrastructure costs.

In all projects there is an inherent tension between capital cost and operating costs, as they are usually funded by different mechanisms and sometimes different stakeholders. The right balance would be to optimize initial capital costs in order to have the greatest possible impact on reducing functional costs. This dilemma highlights the importance of making decisions that concern the full life cycle of a building project and the total impact of the operation in the community. There is need to reverse the trend of limited investments that lead to expensive operating costs.

Resources and technology play a major role here and have a large impact on manpower. However, a significant part of solutions may be found beyond the design process. This is an area where it is necessary to combine the most advanced knowledge from information technology and engineering, including from industries other than healthcare. The design process has to be supportive of technical innovations that can contribute to increasing the productivity of healthcare.

The validity of cost predictions is a major challenge for constructions. Predictive costs often vary significantly with final costs (prediction validity). In a project decisions taken in advance stage are recognized to have a greater impact on cost than early decisions. For this reason, it is very important to include, during the feasibility stage, as many operating information as possible. This requires very clear descriptions of all the expected functions of the facility as well as operating modalities.

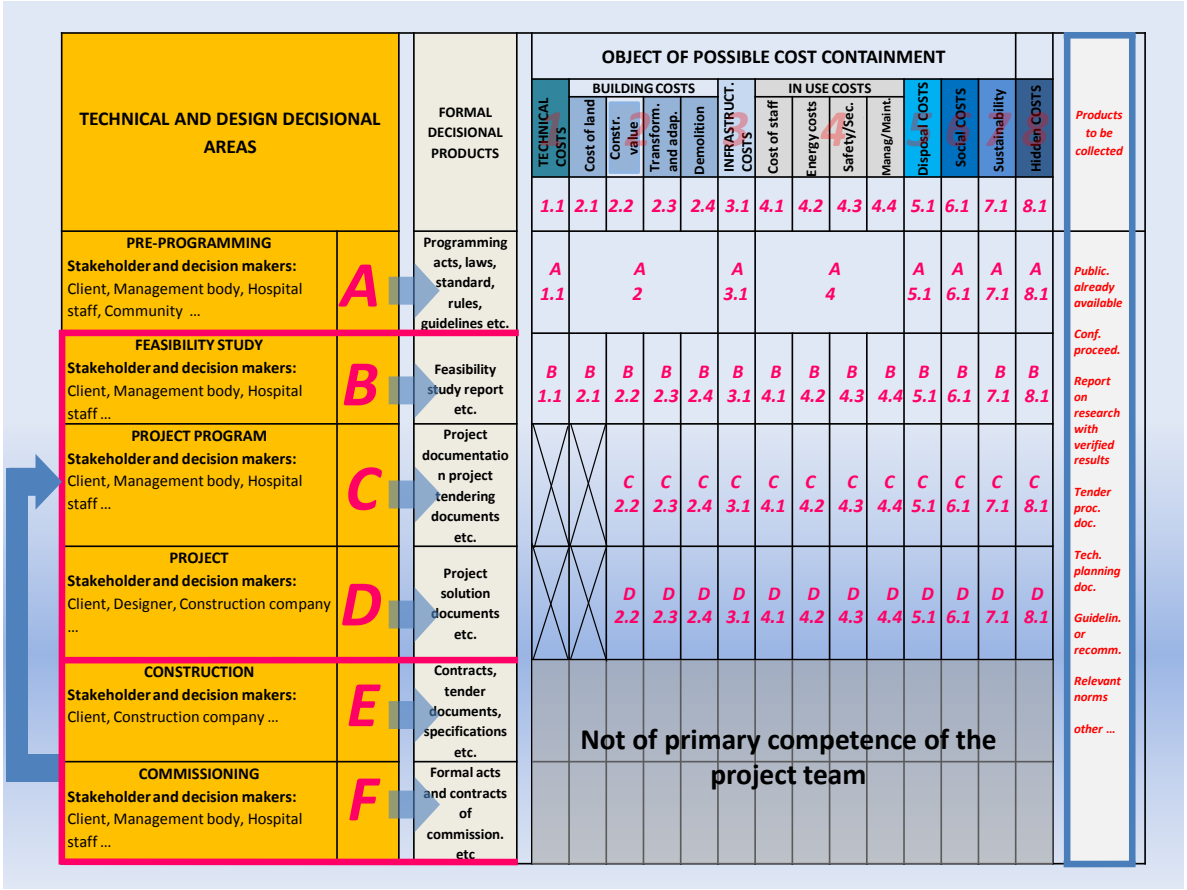


Cost of change over time during project delivery process
Initiation **Occupancy**

The way forward in cost containment

The general aim is more about having a grip on cost control than just seeking cost containment. To this end, it is important to better identify decisions taken at the level of the feasibility study. It is then necessary to highlight relevant information that will enhance decision making with cost/benefit as an underlying component.

Using a matrix can be helpful in covering all of the domains addressed in the previous discussion, as it can ensure that all cost factors are addressed by the most relevant stakeholders at the appropriate stages of project development.



The above matrix is structured to highlight the decisions that mostly affect design choices producing costs and to define the process during which decisions are made. At each step of the process it is necessary to specify the decision's "cost-conditioning" and the relevant decision-makers. In this way, it is possible to formulate recommendations on how to reduce costs through design for each type of decision and for every stage of the project. This matrix will help focus requests for the experts involved in the project to get specific contributions placed in the guidelines.

It will be possible to move through it, filling in informations for each box of the matrix by following the same list of questions like as critical path.

- Identify key stakeholders and all informed parties to be involved in decision making
- Differentiate general interest and short term interest for each of the various stakeholders
- Identify bodies of knowledge that are available
- Differentiate information with regards to stakeholder (initial, basic, advanced and specialized knowledge)

- Provide a big-picture approach encompassing all factors, showcasing as many examples as possible
- Put forward golden rules stemming from reported experiences
- Expected and final outcome should be recommendations customized to contextual factors.

Experts participants to the project are asked to suggest some product (experiences, publications, proceedings of conferences, technical documents positively tested, etc.) and to locate them in a "design decision area", according to the aim of identification of possible actions participating to cost containment.

Synthetic Report form to be used for "product" identified as useful for the project on cost containment by design:

1.1.	**Subject/title of the product**	
1.2.	**Reasons for which the proposed product is considered useful to collecting information on cost containment**	
1.3.	**Brief description of the proposed product highlighting the actions for the costs containment**	
1.4.	**Reference to the possible cost items in the product that are subject of cost containment**	

To further simplify the use of the matrix it is considered more appropriate specifying the "physical products" (documents or graphics) in which technical planning decisions, that affect the cost values, are currently transferred. It can help the experts to orient their research among "documents" useful for the selection of the PRODUCT to suggest.

- Decisions assumed in the "PRE-PROGRAM Decisional Area" are currently transferred into the formal documents *"programming of the intervention"*, i.e. in the documents that includes all decisions that are taken to operate on the basis of specific analysis of the current situation and exigencies, an initial assessment of the needs and financial resources, etc. They orient and condition almost all the following decisions.

- Decisions assumed in the "FEASIBILITY - STUDY Decisional area" are contained and transferred in the documents of the official *"feasibility study reports"*, i.e. in the documents that include a list that relates items to future costs, and design decisions to costs and benefits. Currently, In such documents is clearly identified who will charge the cost (the facility, the user, or the community), and is indicated whether the cost is sustained at the time of operation or at a later stage.

- Decisions assumed in the "PROJECT-PROGRAM Decisional Area" flow currently into the *"project program documents"*, i.e. in the document that describes all the indications on project data, regulatory constraints, infrastructures issues, sustainability issues etc. …

- Decisions assumed in the "PROJECT Decisional area" are currently represented in the *"design solutions"*, i.e. in the documents describing design features, social and cultural implications etc. …

About the decisions taken in "Construction" and "Commissioning" phases, it is appropriate to make some significant considerations:

- The decision-makers involved in these steps are not exactly the Designers (the referent of our initiative) because they express their decisions mostly in the first four decisional areas (Pre-Program./Feasibility-study/Project program/Project).

- It is hardly documentable the potential effectiveness on cost containment through "decisions" taken during Construction and Commission phase and it looks more appropriate to locate eventual *"good practice experiences"* in the technical documentation of the first four decision areas that are of competence of the designers and that generate the cost implications.

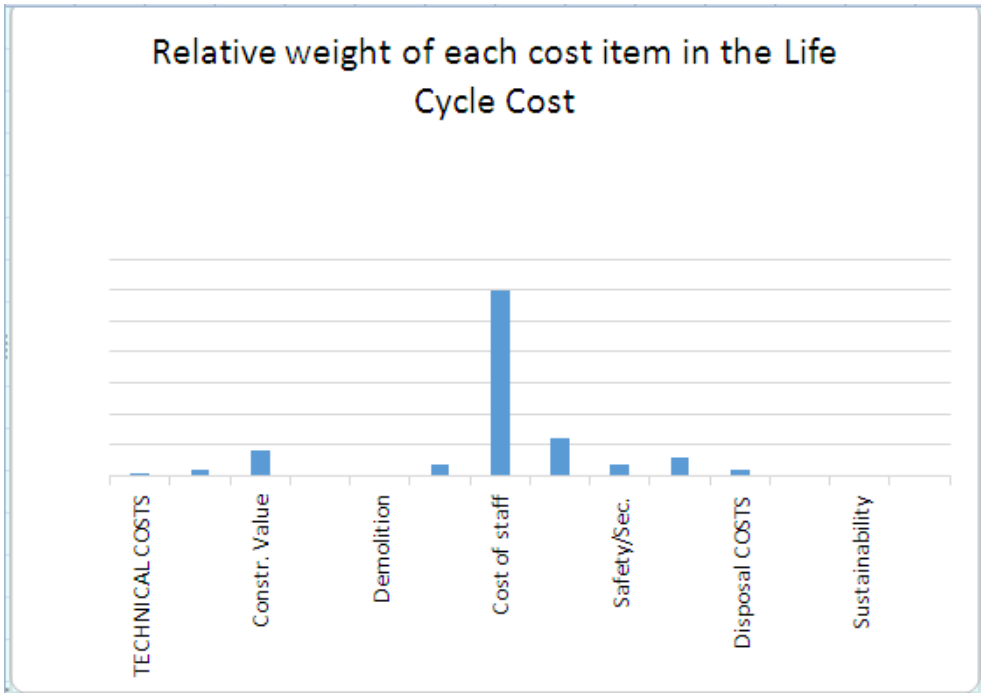
In consequence of this, and to further simplify the matrix, all the cells of the last 2 rows of cells could be cancelled, and any experience of "best practices" in them placeble could be reported in the first 4 rows that are of specific decisional competence of the designers.

About the hierarchical importance of the weight of the cost items at first it is possible to refer to the 8 general categories represented in the new version of the matrix, asking all experts to suggest, for each category, a percentage weight, compared to 100.

Relative weight of each cost item in the Life Cycle Cost

Insert in the yellow boxes below a relative weight (%) according to your experiences. You have two options: one is to complete only the first line articulated in 8 Cost Items. The second possibilities is to complete only the second line articulated in 14 cost Item, like the exemple below.

1%	11%				4%	83%				2%	N.I.	N.I.	N.I.	option 1
1%	2%	8%	0,5%	0,5%	4%	60%	12%	4%	6%	2%	N.I.	N.I.	N.I.	option 2
TECHNICAL COSTS	Cost of land	Constr. Value	Transform. and adap	Demolition	INFRASTRUCT. COSTS	Cost of staff	Energy costs	Safety/Sec.	Manag./Maint.	Disposal COSTS	Social COSTS	Sustainability	Hidden COSTS	
1.1	2.1	2.2	2.3	2.4	3.1	4.1	4.2	4.3	4.4	5.1	6.1	7.1	8.1	



The conditioning effect that the contextual aspects have on the decisions to be made in each phase and the effects that the policy choices can have on the different cost components aimed at their containment is one of the most important result of the program.

Next steps

The goal of a joint UIA-PHG/IHF project is to share the resulting knowledge with national and international audiences. To achieve this goal, it is necessary to disseminate good practices and to put in place a mechanism for further improvement alongside future developments.

Next steps are:

- to mobilize experiences that can contribute to build a knowledge base of recommendations.

- to further refine the framework and identify gaps for which research may be necessary, and work with Universities to respond to these gaps.

The final objective is to have some deliverables by the end of 2016 and explore possibility of an international conference in 2017. In addition next steps will require more substantive analytic and research back up.

The research group

The project is lead by UIA-PHG and IHF with the technical support of TESIS. These 3 organizations are piloting the project and making all final decisions.

Each participant in this activity is considered as a member of the group. As such each participant will have access to all documents that will be collected and shared in the group.

It is also possible for participants to make reference to the progress made by the group but the specific results from the work of the group will remain under the responsibility of IUA/IHF that will decide on nature of information to disclose publicly or not.

In addition associate partners will be invited. An associate partner has to be an international organization relevant in the field of the project. A MoU will be signed between the associate

partner and the leading group (UIA-PHG/IHF/TESIS). This MoU will indicate the level of involvement and benefits of been an associate member in the initiative. It is expected that associate members will fully participate in the project, will have use of the project outcome, have its logo visible in project documents and will contribute to fundraising by mobilizing sponsors at each stage of the project development.

The other participants of the project will be identified as contributing partners. They will be contributing at no cost to project development and cover all their expenses for participating to activities (in kind contribution). They will be recognized in all project documents. They will have the right to use for their own purpose all documents they have contributed to. Standalone individuals will be recognized and will have a personal use of the documents produced by this project and will also work at no cost for their contribution to the project.

Sponsorship

All have agreed that sponsorship should be open to any industry that is ethically acceptable in the health sector (no tobacco, alcohol or agro-business). The objective would be to find sponsors willing to support all the phases of the project.

This sponsorship could be very relevant for all the industries participating to construction and maintenance/management of healthcare buildings. But it can also be expected that sponsors may come from broader suppliers of hospitals in goods and services. It is also acceptable to have foundations and governments (national or local) that also support the project.

Sponsors will be offered to also contribute to the project if they are interested in. They will have visible recognition on all the project documents and will be allowed to disseminate the public documents coming from the activities they have sponsored. For documents that may be more restricted the information on these documents and modalities to access them can also carry mention of their sponsorship.