

INAR 413 BUILDING ECONOMICS
LECTURE 01
INTRODUCTION TO BUILDING ECONOMICS – THE CONTEXT

From “*Building Economics for Architects*” by Thorbjørn Mann

“... The attitude of architects toward issues related to the economics of building at times seems somewhat ambivalent*. Most professionals agree that economic factors are quite important; in fact that they often influence design decisions more than any other single factor and should be well understood by the designer. On the other hand, in the prestigious journals where the profession represents its work to itself and the world, in discussions of architectural theory, and in the curricula of Schools of Architecture, one finds little concern for the issue. It seems tainted or even “dirty”. Architects who manage to design building that work out well economically for their clients run the risk of being considered “hacks” by their colleagues... Are the economic issues of building unworthy of the architect’s creative effort?”

ambivalent: Simultaneously experiencing or expressing opposing or contradictory feelings, beliefs, or motivations.

WHAT IS YOUR OPINION ON THIS REMARK*?

remark: The expression, in speech or writing, of something remarked or noticed; the mention of that which is worthy of attention or notice; hence, also, a casual observation, comment, or statement; as, a pertinent remark.

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- Buildings are expensive. Decisions about investments in buildings usually involve the largest single-item expenditures most people have to deal with during their life time, even if they are merely renting an apartment.
- Expressed in terms of income, an average suburban house costs up to several times an individual wage earner's annual salary. Spread out over time as monthly mortgage payments, it can require anywhere from a quarter to one-half of the monthly family income.

WHAT IS THE SITUATION IN TURKEY?

DO YOU HAVE FRIENDS WHO PAY MORTGAGE FOR THEIR HOME?

WHAT IS THE AVERAGE COST OF AN OVERALL INTERIOR DESIGN PROJECT FOR A RESIDENTIAL UNIT (APARTMENT FLAT, SUBURBAN HOUSE, LUXURY VILLA) IN ANKARA?

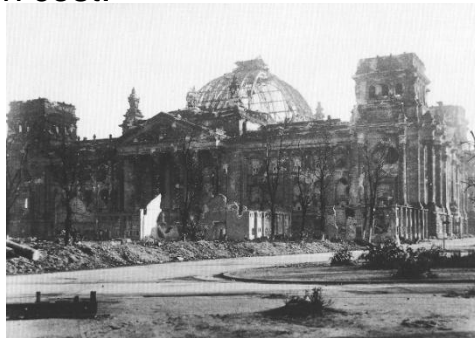


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- The initial costs of a building, however, appears quite insignificant when compared with the costs incurred to operate and maintain a building over its lifetime. For a 20 year period, these costs can amount to three or four times the initial cost of construction.
- Even more impressive is the difference between initial cost and long-term salary expenditures needed for carrying out the work in a building, for example of a manufacturing firm. The amount spent on salaries of people working in a building over twenty years can be up to fifty times, or more, of the initial construction cost.



Reichstag 1894

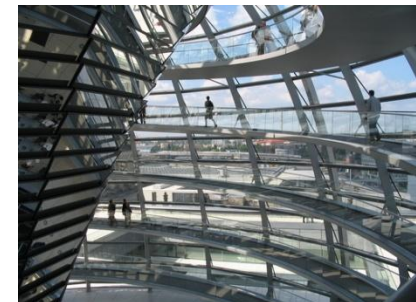


Reichstag 1945



Reichstag 1999

Reichstag: The seat of the German Parliament in Berlin
Renovation by Norman Foster



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The Challenge to the Interior Architect

- One might argue: “Why even look at these issues? The interior architect cannot do anything about them anyway.” Most of the significant factors do seem to be under someone else’s control.
- For example, the interior architect often is under pressure to speed up the delivery of the project, and thus cut the time spent on designing and other tasks to the minimum.
- The client’s argument is that “time is money”, every day that the building cannot be occupied is costing money in interest for loans and lost rental income.



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- Imagine the following situation: It is the crucial meeting between the client and the interior architect to negotiate the contract for a large building project. The negotiation is almost complete. The client gets ready to sign the contract and as one of the last points, attempts to get an agreement on the delivery date for the preliminary design:

Client: I expect the preliminary drawings Monday after next – is that OK with you?

Interior Architect: Sure. We can get you the schematics ready by that date, and you know you will get a professional solution that meets the state of the art expectations. But let me make you a calculation: In the typical project of this kind, about a quarter of our time and fee is spent on what we call “critical design time.” That is where the important design decisions are made that will determine the

project’s ultimate success – architecturally, functionally, economically. That is where our firm has earned its reputation for bringing projects that compare favorably with other projects. But every solution, no matter how good can still be improved; for example with respect to economic performance. So let us assume that we could further reduce the initial cost of your project by only 1% without reduction in the quality.



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I.A.: That would be 10.000 TL off your 1 million TL project. But we would have to spend a little more time on it – especially in the important schematic design phase. Interested?

Client: Mm.

I.A.: Would you be willing to let us spend, say, 5.000 TL more on critical design time to achieve this? Over the delivery time of the building say a year, that would be a 2:1 ratio of savings in initial cost to the investment of the added design fee.

Client: Not bad, but...

I.A.: At a total interior architect's fee of say, 8% for the building, which is now going to cost 990.000 TL, that would be roughly 79.000 TL plus 5.000 TL = 84.000 TL, which would be about an 8,5% fee. In terms of time, the added effort and cost would be equivalent to about one month in critical design time; two weeks if we put two people on it.

Client: Well, I don't Know...

I.A.: There is more. If your building requires a roughly 4 million TL in operating, maintenance, energy and other running costs, over 20 years, one more month of critical design time could result in a 1% reduction of those costs, this would represent a savings-to-investment ratio of 8:1 (40.000:5.000). At the same terms as above (aiming at a savings-investment ratio of 2:1), you should be willing to let us spend 20.000 TL more on design time, for a total fee of around 10%. But what if we could actually do it for about the same 5.000 TL as above, or one more designer month. That would give you a return of 40.000 TL on an investment of 5.000 TL, which represents an annual return in savings of 2.000 TL – that is 40% annually. Which of your stocks gives you that kind of return?

Client: Now you are talking. How...

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I.A.: Wait; it could get even better. What if we looked at your actual operation and managed to develop a layout that would save you 1% on personnel cost over 20 years? How much do you spend per year on salaries? 50 people in that size building, at an average annual salary of, say, 20 million TL over 20 years. One percent of that is a savings of 200.000 TL, or 10.000 TL a year. So, still on the same deal as for the initial cost (2:1 savings ratio), you should be willing to let us spend up to 100.000 TL more on design costs and still make 100.000 TL in savings.

Client: Wait a minute...

I.A.: Ok, so what if we could do that for the same 5.000 TL? You would be looking at a return of 200.000 TL on 5.000 TL investment over 20 years, or 10.000 TL each year. That is an annual return rate of 200%.



Client: That all sound too good to be true. Can you show me what kind of things you would do, or where have you done that in a past project? Can you guarantee the result? Why can't you come up with a better solution right away? Didn't you just argue that "good design is just as cheap as bad design" when you tried to snatch the commission away from your competitors? Besides, you forgot to consider that each month of delay is going to cost me some 7.000 TL in interest alone...

I.A.: Well, uh, ah...

Client: Have the schematics ready Monday after next. OK?

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- Do we as interior architects have good, convincing answers to these questions?
- Clients, especially corporate and government clients, increasingly expect architects to be able to answer them. As they, and their advisors, become more sophisticated in analyzing their financial situation, they expect the interior architects to follow suit.
- They know that information as well as analytical methods and tools – computers, programmable calculators, spreadsheet programs, data services – are increasingly available even to the smallest firms: they expect interior architects to use them. We are running out of excuses for not doing so...

Inside Interior Architect's Head

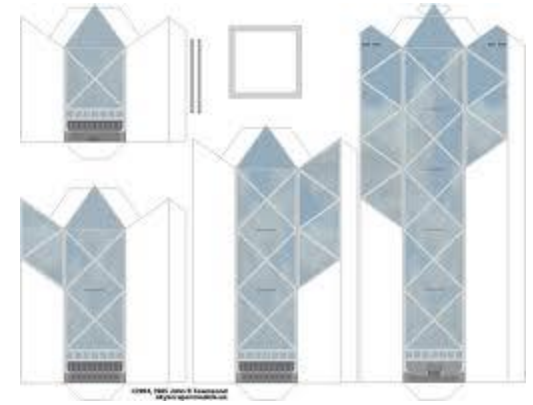
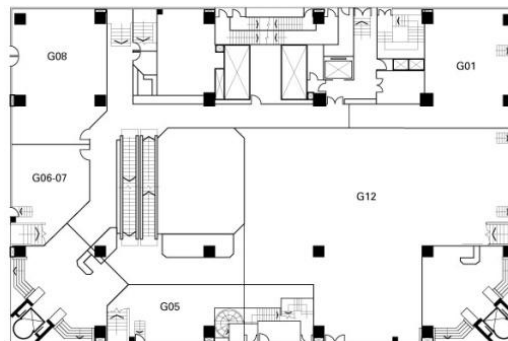


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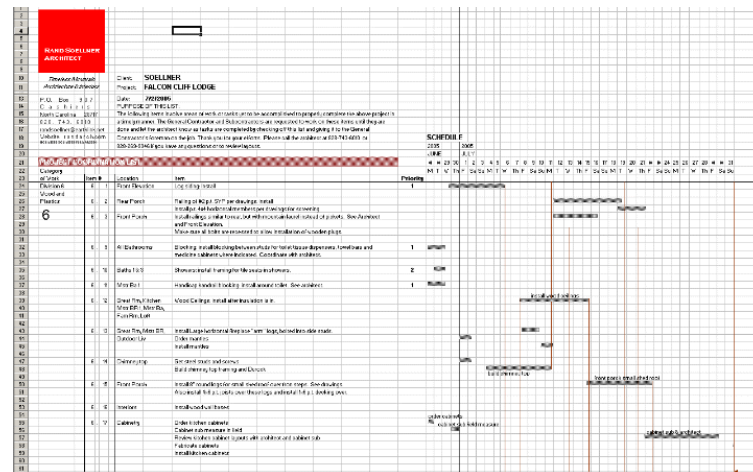
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- The trouble is that we have rarely looked at our tasks that way, and that is why we would have trouble answering the client's next-to-last question. Backed into the corner, a common reaction on the part of some interior architects is to let the client negotiate their commission down even further. (they do not like to talk about this)
- A number of years ago I (Thorbjoern Mann) was teaching a design class in a Far Eastern city. The project was a large downtown office building, using the site and program of an actual project of this kind. The architect came in to talk to the students, who had spent the first weeks studying efficient access and service core configurations, massing, and similar issues.
- It was amazing to watch the students' astonishment when the architect casually mentioned that the client had had a team of five financial feasibility advisors work on the project for many months before the architect was involved. None of the advisors was an architect. They gave him a program with the complete service core, number of floors, and outside dimensions worked out in considerable detail, leaving the architect essentially to design a skin around the building.



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- The message was clear: The client, a major international corporation, did not seem to have sufficient confidence in architects' ability to advise on these crucial feasibility considerations even to make an architect part of this team.
- Was this just an isolated incident? The result of some disappointing cost overruns in previous projects? An indication of a general attitude toward architects? A realistic assessment of the (lack of) competence of architects? Many architects would disagree especially with the last judgment—some no doubt quite vehemently, and some even with good justification. But even if the client's attitude were different, how many architects live up to the expectation of reliably carrying out such feasibility analyses, or are competent members of teams such as the one above?



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- My (Thorbjørn Mann) own architectural education hardly mentioned these issues. As a graduate entering the profession after my first degree, I would have been quite lost had anyone asked me to estimate the cost, let alone the feasibility or financial performance, of a building. I suspect that many graduates of schools of architecture today, even practicing architects, are in a similar situation. It does not have to be this way. In spite of sometimes confusing jargon, and some fierce-looking mathematical equations, it is quite possible to grasp the basics and to make building economics just one more of the many balls the architect has to keep juggling, and even to turn it into an advantage.
- Architects like to see themselves as problem-solvers. The economic questions of buildings always are a major part of the client's problem. We cannot afford to ignore a part of the problem the client often considers is the most critical one—even if we ourselves are more concerned with other facets such as aesthetics, user needs, environmental response, or image. Including economic factors in our range of design concerns will not compromise our designs; it will make us better designers. What it takes is, first, a change of attitude.

WHAT DO YOU THINK?



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What is Building Economics?

- Once we have accepted the challenge of finding out more about building economics, a reasonable first step is to ask what it is?
- Can we define the field?
- How does it relate to other fields that also carry the label of “economics”?

Engineering economics

Urban economics

Energy economics

Environmental economics

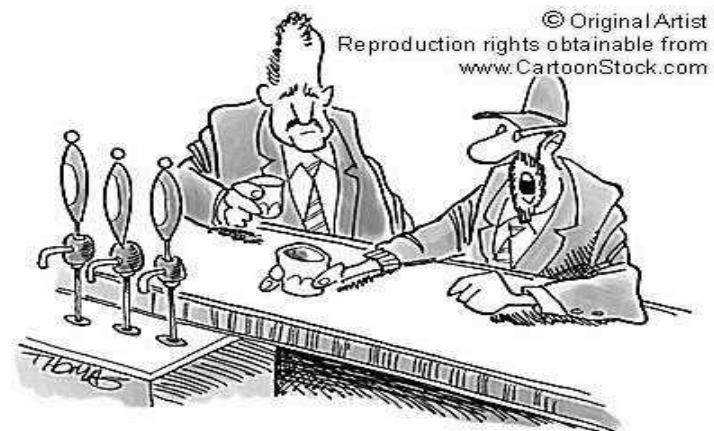


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What is Building Economics?

- Most of these are concerned with what, in general economic theory, would be called microeconomic analysis (The study of how individual actors in the economic realm make economic plans and decisions) as opposed to macroeconomics (the study of laws governing the economy as a whole)

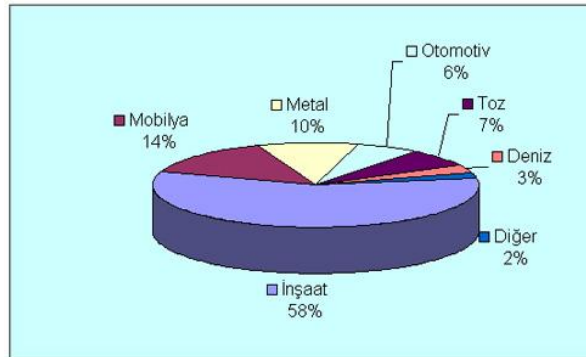
WHERE DO YOU THINK BUILDING ECONOMICS STAND IN ECONOMIC SCALE?
MICROECONOMICS OR MACROECONOMICS?



"The difference between Micro and Macro economics is this:
Macro is what you owe, and Micro is what you're paid."

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- Several important directions can be established in building economics. For one, given the importance of building industry in any national economy, there are important macroeconomic issues that must be studied and would properly fall under the label of building economics:
- What are the relationships between the construction-related segments of the economy and other fields, and general economic conditions such as those that are influenced by the decisions made by the government or the central bank?
- How can and should areas of vital national importance such as housing be influenced and kept healthy?



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- At the other end of the spectrum are the concerns of the practitioners involved with actual and specific building projects, studying construction estimating, construction management, project management, construction financing, and real estate financing. The economics of the various production processes, including transportation processes, would constitute another complex area in building economics. All these fields are further divided into areas of concern by building type; the economics of housing, for example, are quite different from the economics of commercial projects such as office buildings, shopping centers, or industrial buildings.
- Building economics issues, even for specific projects, look quite different to the various actors involved. The economic decisions for the owner of a building project are embedded in a range of economic choices going far beyond the building itself, in a way that is of little or no concern to either interior architect or contractor once the decision has been made to go ahead with a building.



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- Finally, the economics of the process of planning and designing buildings could be seen as a legitimate subfield of building economics that still is waiting for a systematic treatment, even though many people have been concerned with this issue in practice.
- This survey shows that building economics is far from a well-defined area of study, and that it would probably be counterproductive to insist on a concise definition, which would either exclude some of the concerns mentioned or else turn out so broad and general as to be of little practical value. It should be understood that this course is limited to a particular perspective — that of the interior architect who tries to get a better grasp of the economic implications of his or her architectural design decisions, and tries to understand how these implications affect others involved in building projects.



u16172462 fotosearch.com



dreamstime.com

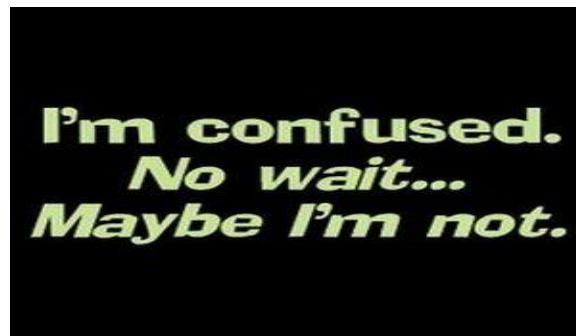
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The Main Aspects of Recurring Building Economics Problems

- There are many different decision and design problems in the realm of building economics, depending on what is known, assumed, or given in a specific situation, and what answers must be found in that situation.
- First is the level at which the decisions are made. The situation that comes to mind most often is that of the individual decision-makers for a specific project trying to arrive at the best decisions for that project—such as the interior architect trying to design a specific building to best serve the interests of the project client.
- Building economics issues also include the concerns of specific groups involved in the building process within society or the overall economy, with the aim of safeguarding the interests of those groups and maintaining or improving their economic position relative to other parties. This can take two main directions: seeking to maintain or improve the context conditions within which the group operates; or trying to help members of the group become more competitive and effective by developing better methods and techniques for doing its work, providing better information and the analysis tools needed to turn that information into better decisions.
- Finally, there is the level of governmental or societal policymaking, which is concerned with the overall effectiveness of the entire system of building planning, design, production, operation, and maintenance, and the proper balance among all its parties and components.

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- The total number of possible combinations and thus problem types arising from this brief survey is very large; and not all combinations are necessarily meaningful. The following list includes some typical building economics problems that often are encountered:
 1. Given a solution proposal and established budget, is the proposal within the budget?
 2. Given several solution proposals, which will have the lowest initial cost?
 3. Given several solution proposals, which will have the best performance (measured in terms of both costs and benefits)?
 4. Given the program, site, and context conditions, find the best possible (optimal) solution.
 5. Given the program and performance expectations (cost and other measures), which of several proposed sites is most preferable?



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	BASE SOLUTION	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4
Personnel needed	200	200	200	200	198
Space per person	150	150	150	150	150
Net Leasable area	30000	30000	30000	30000	29700
Net to Gross Ratio	0.8	0.81	0.8	0.8	0.8
Total Floor Area	37500	37037	37500	37500	37125
Construction Price	50	50	50	50	50
Initial Building Cost	\$1,875,000	\$1,851,852	\$1,875,000	\$1,875,000	\$1,856,250
DESIGN COST 2.50%	\$46,875	\$46,296	\$46,875	\$46,875	\$46,406
Financing LVR	0.8	0.8	0.8	0.8	0.8
LOAN	\$1,500,000	\$1,481,481	\$1,500,000	\$1,500,000	\$1,485,000
Interest rate	10.00%	10.00%	10.00%	9.50%	10.00%
Mortgage term	20	20	20	20	20
Debt service	\$176,189	\$174,014	\$176,189	\$170,215	\$174,428
Total loan payment	\$3,523,789	\$3,480,285	\$3,523,789	\$3,404,301	\$3,488,551
Financing cost	\$2,023,789	\$1,980,285	\$2,023,789	\$1,904,301	\$1,988,551
Oper., maint, R&R rate	\$8	\$8	\$7.50	\$8	\$8
Annual Operat., maint., r&r.	\$300,000	\$296,296	\$281,250	\$300,000	\$297,000
Total OMR	\$6,000,000	\$5,925,926	\$5,625,000	\$6,000,000	\$5,940,000
Total Initial, Financing and OMR	\$9,898,789	\$9,758,063	\$9,523,789	\$9,779,301	\$9,784,801
Savings		\$140,726	\$375,000	\$119,488	\$113,988
		1.42%	3.84%	1.25%	1.17%
		Reduction in total 20 -year initial and operating cost by improving NGR will justify up to 303.97% increase in critical design cost	Reduction in total 20 -year initial and operating cost by red. operating cost will justify up to 800.00% increase in critical design cost	Reduction in total 20 -year initial and operating cost by reducing MINT will justify up to 254.91% increase in critical design cost	Reduction in total 20 -year initial and operating cost by reducing program requ. will justify up to 245.63% increase in critical design cost

FIGURE 1-2. Possible increase in critical design time justified by savings.

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Materials, Labour, Physical Capital

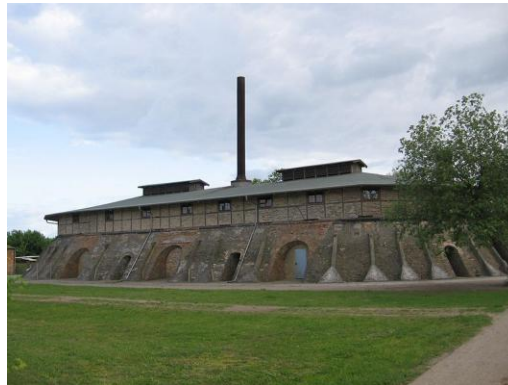
□ Innovation

- The driving force behind product innovation is the constant search by companies to retain or increase their market share., enabling them to grow, survive and to enhance profitability.
- To be successfull they must produce something cheaper or better to offer an attractive combination of cost and quality with alternative materials.
- What interior architects have to attempt is to keep up with the innovations, constantly estimating their relative cost and values in particaular uses.

Intermittent Kiln



Hoffman Kiln



Tunnel Kiln



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Materials, Labour, Physical Capital

- **Economies of Scale**
- Why do economies of scale exist? The reason is sometimes purely mathematical and physical.
- Delivering more bricks to construction sites using larger vehicles will reduce the cost of delivery per brick, simply because the cost of the driver's time and the cost of fuel remain relatively constant while the number of the bricks delivered increases.
- The most significant driving force behind economies of scale is innovation. New methods are often introduced precisely because they allow more output to be produced at a lower average cost. Complex and sophisticated machinery will cost more than the simpler early versions they replace but their output capacity will be so much higher that the capital costs per unit will fall.



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- **Competition**
- The most important effect of the combination of technical innovation and scale is on the structure of the industry itself and through that on the nature of competition.
- The need for expensive capital equipment to exploit the innovation and the existence of scale economies will tend to lead to production becoming increasingly dominated by large firms.
- Small producers may be neither afford the new equipment or compete on price using traditional techniques. They may well be driven out of business or taken over by large companies.



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□ Modes of Employment

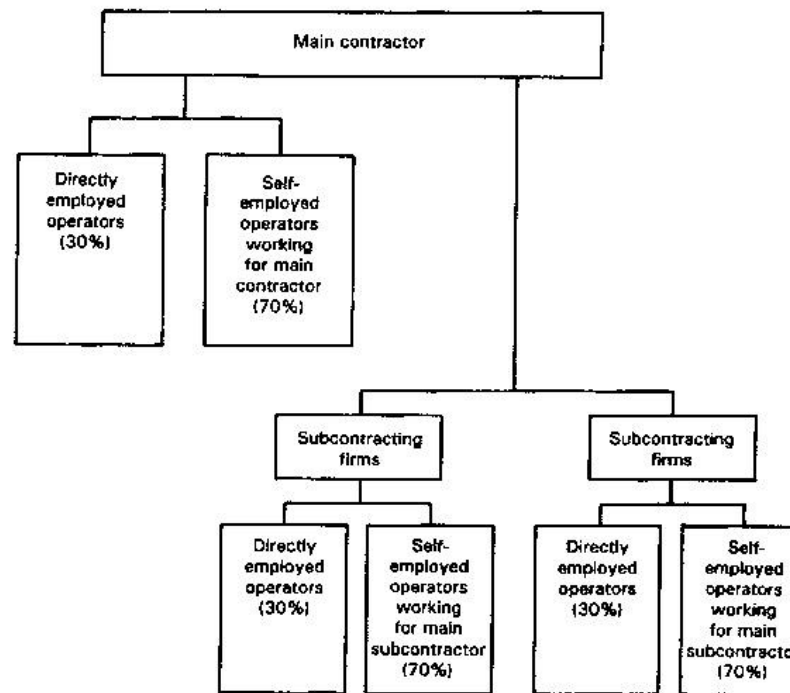


Figure 5.4 Possible organization of site employment (there will of course be normally many more than two subcontractors).

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□ **Using Available Technology**



Nevada, USA
Residential
Development



Saudi Arabia
Water Pipeline
Construction



Namibia, Africa
House
Construction

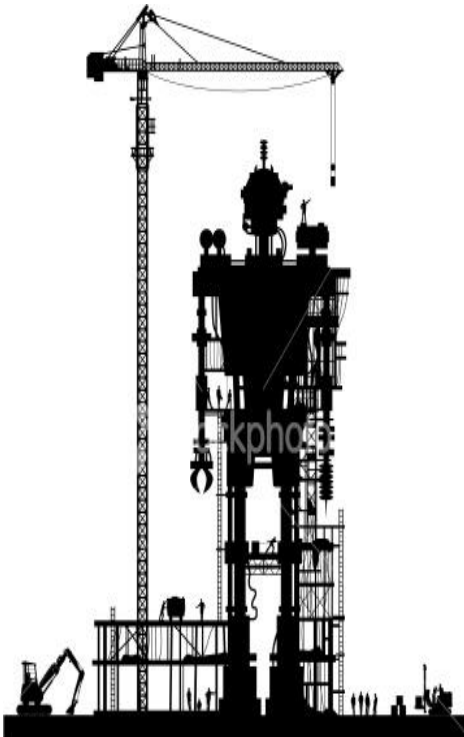


Kenya, Africa
Clean Water Well
Construction

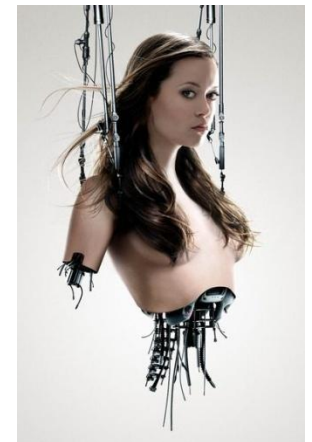
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□ The Future: A Robot Takeover?



GOOD OR BAD?



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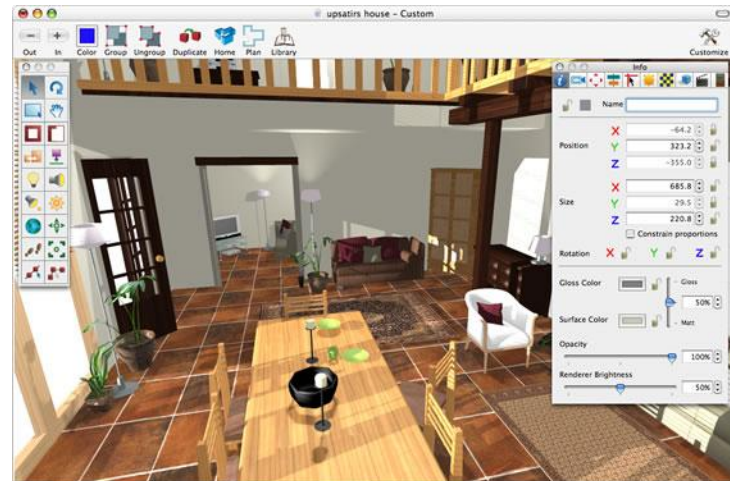
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- The Future: A Robot Takeover?

INTERIOR ARCHITECT OF YEAR 2050?



WHAT IS YOUR OPINION?