Invited Commentary on the paper
Architects or builders; scaffolding or duck tape? **by Russell Beale**

Architects *and* builders; scaffolding *and* duck tape

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ABSTRACT
In his paper "Architects or Builders; scaffolding or duck tape?" (in this volume) Russell Beale states that we might not educate the students right for the challenges of HCI that are to come. The paper asks for the right way, a strict architectural view, or a view with the focus on the practical work at a lower level.

In this commentary I will argue the intention of question itself rather than if there is a single correct answer, since my feeling is that the paper addresses a both classic and important issue, but reaches a somewhat unsatisfactory conclusion.

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H5.m Information Interfaces and presentation (e.g. HCI). J.4. Computer Applications: Social and Behavioural Sciences.

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Complex systems, Usability, Education, Complexity, Conceptual Model

1. THE CHOICES IN FOCUS
The title of the original paper, "Architects or Builders; scaffolding or duck tape?" suggests that the area of human-computer interaction (HCI) is posed in front of a major bifurcation, and that there are essentially just one possible way to continue the development of HCI (education). Even if the message in the article is slightly less drastic, there are nevertheless some points I consider worth further commenting.

Just to start the discussion I think it might be a good thing to state my personal answer to the (two) question(s) in the title: "Architects or builders; scaffolding or duck tape?" The answer to this question is very simple: "Yes!". I will try to motivate this simple answer in the following pages, focusing on the two chosen metaphors and the perspectives on the issue, that they bring to my mind.

1.1 Architects or builders?
If we start to look at HCI both as a research and as an educational topic, the issue of either specialization or interleaving of human-computer interaction into other areas has always been a hot potato. The question whether human-computer interaction should be a self-containing subject, or a subject that should be taught in relation to those subjects that are affected by good or bad human interaction. This is not a new issue, and I don't think it is an issue that has a definite answer. Or rather, in my view, the answer is that we need to take both perspectives.

In a normal construction project, there are both architects and builders represented at different points, and they have different tasks within the project, especially when it comes to problem solving (which in my opinion is very close to what human-computer interaction is all about).

The architects are creating blueprints for construction and manufacturing, for example of buildings. Their problem solving consists of finding solutions in a planning phase, as how to arrange doors and elevators, e.g. to provide the best accessibility to all the visitors, regardless of their needs or how to make a construction that is stable, in spite of non-perfect conditions. The architects need to have knowledge that allows them to design houses in a type of task is in some sense proactive, in that it is intended to prevent problems from appearing. This work is done to guarantee that it will be possible to make the construction without expensive late changes. Without good architects it will not be possible to build good houses, or the houses will need to be redesigned at later stages in the process when the need for changes will be apparent. At that point of time the changes will often also be either expensive, or unsatisfactory or both.

The builders are constructing the buildings according to the blueprints. When the blueprints are wrong or difficult to understand the builder may be in trouble implementing them. However, a well-educated builder knows how to rectify mistakes and errors in the blue prints, since he or she is supposed to be a problem solver in the field. If there are misfits or construction errors the builders are the first instance of problem detection and problem solving. If they cannot fix the problem immediately it has to go back to the architects or engineers to solve.

If we move this metaphoric discussion back to human-computer architecture, the architects are more like the HCI specialists, that are well educated in the fundamentals of HCI, and who can lay the foundation for software production with a solid knowledge about human factors issues. Their task is to work proactively to assure that the software will not suffer from the deficiencies that will make it difficult to use in the

end. They will lay the foundation of the interaction, and also provide architectural solutions to develop the software properly.

The builders are more like professional software developers with a good additional education within HCI. The builders may not see the whole picture of HCI problems within the system but they have a sufficient education to enable them to discover immediate usability problems, and maybe even correct them on the "programming floor". If they cannot solve the problems, they can of course refer them back to the architect/HCI specialist.

The specialists and the developers are, just as the architects and the builders, complementary units in the software design process. They are not mutually exclusive; and that is the main point of this section. The question in the title can be answered with a simple yes, we need to educate both "HCI architects" and "HCI builders". They have different roles in the software development process, but both are needed.

Should we then educate architects or builders? In the paper the suggestion is to educate more builders that have a level of knowledge about HCI that is sufficient to deal with upcoming interaction problems in the software engineering projects. I think that this is one important group of HCI people to educate. The other important group is in fact the architects. Architecting the future (in an HCI perspective) in my opinion means to provide the software industry with the knowledge it needs to avoid making the errors in the first place. Thus BOTH architects AND builders are needed in the future of HCI.

1.2 Scaffolding or Duct tape?

The second question in the paper title is a little bit more difficult to answer and potentially, also more interesting. What is the difference between the two metaphorical expressions?

The first term "scaffolding" subsumes the use of a solid framework that will support the needed work to produce usable software and prevent the event of producing unusable solutions. The second term "Using Duct tape" evokes a feeling of "fixing that which is wrong", and this term evokes the feeling of a less qualitative process. And in a general sense, this might also be true. Fixing errors is normally less desired than preventing them.

However, there is a more fundamental interpretation to the statement. This does not only concern the HCI education issue. It also concerns HCI as a research field.

In this perspective, the scaffolding is the fundamental knowledge about HCI; the theories, discussions and reflections that allow for a solid implementation of usable software. This is more or less the essence of the human-centered development. This bulk of knowledge is the base of all user-centered development and we cannot be without it, just as you cannot build a large building without the scaffolding.

The duct tape, on the other hand, is in many cases just as important. It implies a quick fix of an immediate problem. The duct tape within HCI, is the application of HCI knowledge to new areas of application. Whenever we have new interaction technology or conceptually new applications we run the risk that established knowledge is not directly applicable. In this situation the duct tape approach is to make a rapid fix of the problem, which is valid until the fundamental knowledge about the new problem has been incorporated in the core knowledge.

In this perspective, the fundamental HCI knowledge (the scaffolding) is used for the applications where we have intrinsic knowledge, whereas the HCI fix (the duct tape approach) is used for areas where we don't have the basic framework.

In this perspective the teaching can follow two different strategies, that once again are complementing rather than mutually excluding each other . We need to teach the fundamental HCI knowledge in order to handle the basic usability issues in software design. But it is also necessary to provide the students with an approach to HCI that allows them to reapply the knowledge to new areas, where the basic fundamentals are not applicable.

Should we then use scaffolding or duct tape? In the paper it seems that the scaffolding approach is too difficult to use for the education. The duct tape approach is easier and affordable in the education situation of today. However, the scaffolding approach provides the basic knowledge needed, on which it is possible to form a foundation of sound software, designed around well-known principles. The duct tape approach allows us to work on areas that are not completely researched, but hopefully with sound strategies (provided that the duct tape is of good quality, of course). Thus BOTH scaffolding AND duct tape will be useful approaches to education within HCI.

2. Conclusion

What is the main contribution of the paper under discussion? In my opinion the value of this paper is primarily raising once again the discussion on the core education of students within HCI. This issue is important, not in the sense that it needs a single answer, but rather in the sense that the manner of educating needs to be continuously considered and rethought. The questions put in the title are not essentially important as questions, but they provide the four different perspectives on HCI education as described in the two previous sections. These perspectives are what I consider the important contribution of this paper.

One possible conclusion from this discussion is therefore that, as an HCI teacher it is necessary to take a stand on what type of students you want to educate. It is clear that the market is shrinking, as stated in the original paper, so for economical reasons, it might be impossible to educate all kinds of students in the same place. However, we still need to educate all kinds of students, and thus it is evident that each educational institution will need to consider which type of HCI person they want to educate: an architect or a builder, and secondly, which HCI approach they want to favor: scaffolding education or the duct tape approach.