4D Tools Research Needs Punch List:

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WDI

3D Model Tools:
- Fully parametric 3D design tools for AEC industry
Meanwhile, while waiting for the above:
- Navigation through 3D world
- Intuitive interface device (joystick?)
- Creation of control surfaces on existing surfaces (floors, walls, etc.)
- Control surfaces as attributes
- Control areas such as access restrictions, guideways etc.
- Interface of 3D model to independent databases
- Navigation of traditional 2D design information via 3D Model
- Ability to create temporary construction site works – scaffolding, laydown areas, access roads - as whole units or as modular units.
- Ability to “disassemble” or re-group temporary construction site works – scaffolding, laydown areas, access roads
- Improved materials rendering for “look and feel issues
- Improved light rendering

4D specific tools
- Autonomous agent development
  - for construction access, etc
  - for behavior of users
- Multiple window overlays on 3D model
- Visual display of 3D object attributes (as in the info mural)
- Improved definitions of attribute classes e.g. business attributes, schedule, design, etc.
- Interface with business management tools (RFI, change order, scheduling software)
- Create new interface with inventory management and estimating software

Business Tools:
- New design contract for price constrained design
  - Inclusion of key subs in the construction management process
- New role / contract for GC, architects and engineers

IP relationships
Encryption of design data
Who owns designs created in collaborative work relationships?
How long do they own them, etc., etc., etc.