

## CSE230 HDIS Final Exam Handout

The Home Design and Improvement System, HDIS, is intended to integrate and unify all activities related to construction and improvements of homes. Constructing a new home or renovating an existing home can require a high number of interactions with numerous individuals, companies, and stores. The purpose of HDIS is to utilize computing technology in a positive way to enhance, facilitate, and promote this activity. To do so, there is a requirement for interactions with the following individuals and services:

- Suppliers of construction and improvement goods, e.g., lumber yards, hardware stores, plumbing, electrical, and lighting supply stores, garden centers, flooring and furniture stores, etc.
- Contractors of construction services, e.g., general, electrical, plumbing, paving, foundation, security, landscape, etc.
- Architects for new home and improvement design that includes cost estimation and high-tech display capabilities. In this situation, HDIS may need to be integrated with available software systems that already provide these capabilities.
- Interior designers for lighting, furniture, wallpaper and window treatments, carpets and rugs, other flooring (tile, hardwood), etc.
- Landscape designers for all outside flowers, shrubs, trees, walkways, fences, pools, etc.
- Financial institutions for new home mortgages and home equity/improvement loans. In this case, HDIS will likely interact with commercial systems.
- Home owners to allow them to track all aspects of their project and if desired to function as the general contractor for managing and scheduling all of the construction work.

Some of the previous individuals and services (like architects and financial institutions) will also need to support interactions with existing commercial software.

To support the functional and operational requirements of HDIS, there must be a number of databases that must be present:

- **House Plan Database:** Contains the blueprints and construction supply lists for thousands of different homes. The construction supply list is helpful in ordering all of the materials that are needed to build or renovate a home. The blueprints are also needed for landscape and lighting designs, which also have associated materials (plants and light fixtures).

- **Supplier Databases:** These are databases that contain a list of the materials or items that are available (including pricing information) at each of the suppliers. For example, a lumber yard supplier database would contain the different types of dimensional lumber, windows and doors, nailing, roofing materials, etc. This database is essentially the backend of information that would sit behind any of the major e-tailing sites such as: <http://www.lowes.com> and <http://willards.doitbest.com/DoItBest/home.aspx> for many different types of building materials, <http://www.ctlighting.com/ctligh/> for indoor and outdoor lighting fixtures, and <http://www.syn-marproducts.com/> for countertops, etc.
- **Schedule Database:** Needed to allow the entire project to be tracked, to insure that goods are delivered when needed and contractors work is allocated correctly. For example, on a new home, the plumbers and electricians must finish their work, and have that work be inspected, before the plasters can begin to work on the inside walls. There is a set order to constructing a house after the lot and blueprints have been approved that must be followed, e.g.: clear land, grade land, excavate for the foundation, frame and pour foundation, framing of floors, walls, etc., windows, roofing, siding, rough electrical, rough plumbing, drywall, wall and door molding, painting, flooring, kitchen cabinets, baseboard molding, painting, final electrical, final plumbing, appliances install, etc. This order often changes slightly depending on certain factors.
- **Accounting Database:** Since many homeowners have a construction loan or a home equity loan with a dedicated checkbook, such a database would allow a homeowner to track both incoming (from loans) and outgoing funds. The outgoing funds pay for both goods and services.
- **Contractor/Designer Database:** Contains information on all of the available contractors and designers in a particular area (county or state). This may also have web links to the particular contractor, and also to the various state and local agencies involved in the construction process: <http://www.ct.gov/dcp/site/default.asp> for the CT Department of Consumer Protection which lets you obtain information on contractors and links to individual building departments for each town, e.g., <http://www.mansfieldct.org/town/departments/building/index.php>
- **Financial Database:** Contains information on all of the financial institutions that lend money in a particular area (county or state). The up-to-date interest rates for different loan options would also be stored.

These database are critical for supporting and promoting the sharing and exchange of information among the many individuals that require access to HDIS. Clearly, there is a great deal of interaction among the data in each database. Note also that these are logically describing the information in each repository; the details of some of these databases will be the subject of future project design and development.

All of the previous individuals and services will require specialized user interfaces to handle the information and processing that is required. Some possible interfaces include:

- **Contractor Interface:** Allows a contractor to view house plans and submit bids for the jobs. To do so, this interface will also have to interact with supplier databases so that cost estimation can occur.

- **Architectural Interface:** Allows the house plans to be electronically accessed and viewed. The viewing may occur via another system that is geared towards architectural design. Some emerging systems in this field allow users to walkthrough the house in a simulated three-dimensional mode.
- **Landscape Interface:** Similar to Architectural Interface for landscape design.
- **Schedule, Supplier, and Funding Interfaces:** Separate interfaces to support the: scheduling of goods and services, the access to supplier data including pricing, and an electronic means to submit a loan application.
- **Home Owner Interface:** The home owner interface must contain many of the features of all of the different interfaces, particularly for those situations where a homeowner is acting as his/her own general contractor. This interface would have web links to various sites of interest (building materials, financial institutions, etc.) to allow the home owner to manage all aspects of the construction process.

Remember, this is not an exhaustive list of all user interfaces for HDIS. Over the course of the semester, this information will be augmented and extended with different project requirements.

These generally defined user interfaces themselves correspond to a set of various functionality in support of different capabilities that are available in HIDS for homeowners, contractors, etc. This includes:

- **User Interfaces for Suppliers:** Recall that these included suppliers for lumber, hardware, garden materials, furniture, etc. For example, if you choose a plumbing supplier user interface, focus on the choices you need for home buyer (fixtures - sinks, tubs, faucets, etc.), the plumbing contractor (piping and other materials), the well-drilling contractor, and so on. This user interface for plumbing would have different search/display capabilities for home buyers such as: view-all-sinks-by-material (e.g., cast iron, stainless, corian, etc.); view-all-faucets-by-vendor (e.g., Kohler, Delta, Standard, etc.); and so on. Interfaces for other suppliers (lumber, electrical, lighting, etc.) would be similar.
- **Mortgage Processing:** A sub-component of a home owner's interface for HDIS would allow the processing of a mortgage (new construction) or home-improvement loan. This sub-component would allow all of the information associated with this process to be entered and submitted electronically. Such information would include the names, social security numbers, income data, employment history and status, involved property, desired loan, etc. Since mortgage applications are often incomplete or missing information, it is possible that the lending institution may request additional data after the application is submitted and that the home owner would be electronically notified (perhaps by email) regarding acceptance. Thus, this interface is not only for submittal of data but also for the interplay and interactions that might occur over time until all required data is provided.
- **Room Interface:** As defined in Projects 2C and 3B this semester, the Room Interface captures all of the functionality associated with the design of a room. Please see the project descriptions for 2C and 3B for full details. In addition to these capabilities, there would also be other natural additions of functionality to what was prototyped for Room Interface. For instance, there would also be other types of rooms (e.g., media rooms, luxury bathrooms,

offices, etc.) that would need to be supported. In addition, there are also other design activities that need to be supported associated with each room. For instance, costing out various types of flooring (e.g., tile, vinyl carpet, hardwood) on a per square foot basis with allowing for waste (tile/hardwood) or room width (vinyl in 6 or 12 foot widths, carpet in 12 foot widths), or allowing the amount of rolls of wallpaper (single, double) of varying widths to be calculated for rooms based on the perimeter and wall height).

These are higher level, comprehensive capabilities that are provided.

In addition, some of the various capabilities of HDIS are also “logically and physically linked” with one another to represent certain common processes. For example, consider the features of HDIS related to a home’s renovation which includes home equity applications (homeowners), posting blueprints (by homeowners for contractors), submitting “sealed” bids (contractors), and selecting a bid (homeowners), defined as:

- **Home Equity Application:** To finance the renovation, a homeowner will utilize a home equity application to obtain funds via a mortgage on their current primary residence. For an example of these types of on-line applications, see [www.eloan.com](http://www.eloan.com), [www.LendingTree.com](http://www.LendingTree.com), or any other on-line site. This will provide you with an idea of the type of information required and the steps of the process. Pay attention to where security plays a role in this process.
- **Posting Blueprints:** Once a homeowner has acquired approved financing, they can then utilize a capability of HDIS that allows their detailed blueprint to be securely posted in electronic form. The homeowner may also be able to post information on their existing property (e.g., location, house style, materials, siding, etc.) and perhaps even allowed to specify an optional bidding range (minimum and/or maximum). To actually post the blueprint, you may allow for multiple formats (PDF, JPEG, GIF, etc.) to be uploaded. Posted blueprints have a deadline for the bidding process. There may also be a two phase bidding process: preliminary bids to perform a first phase of screening, and then final bids for all accepted preliminary bids; note that this is an option but not required. As part of this process, a homeowner may decide to select a group of general contractors for bidding or have the bidding process be more open (or restricted to a geographical area - bidders from Tolland County). To simplify your design, let us assume that the general contractor will provide a bid for the entire project, which will include framing, electrical, plumbing, drywall, finish carpentry, etc.; essentially submitting a single sealed bid.
- **Bid Submission Process:** The contractor must register with HDIS in order to be able to bid for projects. To register, the contractor must provide certain information (name, address, business name, location, years experience, type of home improvements, license, state, etc.); to assist you in figuring out appropriate registration information for contractors, please see the State of Connecticut site for contractors to apply for licenses at: [http://www.ct.gov/dcp/lib/dcp/pdf/forms/cpfr-13\\_hic\\_application\\_3-28-06.pdf](http://www.ct.gov/dcp/lib/dcp/pdf/forms/cpfr-13_hic_application_3-28-06.pdf) Once registered, a contractor is added to a list of registered contractors, and this information is made available to homeowners for renovation projects. A contractor who is allowed to bid on a renovation project can view the blueprints, securely interact with the homeowner (via a secure chat session or via a secure email) to ask questions and receive clarifications, or can post questions in a public forum (available to all contractors bidding

on the project) with answers supplied by the homeowner also posted for all. The contractor has a deadline to submit the bid (preliminary and/or final), and can do so securely. If preliminary bids are required, there is a second phase of bidding.

- **Bid Selection Process:** The homeowner is able to view all bids (preliminary and/or final bids), interact with contractors, and eventually, at the end of the process, select a winning bid. This winning bid will result in the establishment of a contract between the homeowner and awarded contractor for the renovation process. This requires the ability to link between homeowner information, loan information, blueprint information, and contractor information into what is essentially a renovation project instance.

Collectively, these different processes are linked together to form a path taken by many homeowners that repeat these same set of steps for a home's renovation.

## F. Brooks - Silver Bullet Articles

There is one excellent article on software engineering published by F. Brooks, Jr., "No Silver Bullet: Essence and Accidents of Software Engineering," which was written in 1986, 20 years ago. The article surveys the state-of-the-art (at that time) in regards to areas and approaches and their impact on Software Engineering. The article is available at: <http://www-inst.eecs.berkeley.edu/~maratb/readings/NoSilverBullet.html> There will be one three-part question on the final exam related to this article.