Business Requirements Document

Rent Calculation Tool for PHA Occupancy Specialists

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Introduction

Purpose

This Business Requirements Document (BRD) provides a foundation for the Department of Housing and Urban Development's (HUD's) Real Estate Assessment Center (REAC) to develop an interactive rent calculation tool. REAC's goal in developing this tool is to reduce errors in the computation of tenant rent caused by inaccurate application of the rent calculation rules. REAC's motivating metaphor is to create a "TurboTax" like tool to be used by Public Housing Authorities' (PHAs) staff, specifically their occupancy specialists[1]. Given the time constraints of this project, the team developed the sections of a BRD that are most relevant for this tool[2]. This BRD is intended to be used by REAC and its software developers.

The team also created a companion document to the BRD titled Executive Considerations. That document elaborates on several fundamental challenges that REAC will likely face when creating an occupancy specialist-oriented rent calculation tool, and presents alternative approaches to cope with these challenges.

REAC's goal is to develop a rent calculation tool that will reduce errors in the rent calculation process. Their plan is to develop the tool internally and distribute it to PHAs free of charge.

In order to reduce rent calculation errors, the tool will need to fulfill the following objectives:

1. Be "technically correct"

The tool should accurately implement the rent calculation regulations (Chapter 5: Determining Income & Calculating Rent from *Occupancy Requirements of Subsidized Multifamily Housing Programs*, hereafter referred to as *HUD Chapter 5*)[3].

[1] The TurboTax metaphor was used by REAC in their proposal for this systems project. See Appendix B for a discussion of how REAC's tool will borrow from the TurboTax metaphor.

[2] This BRD does not include Document Revision History, Data Requirements, Regulatory Requirements; parts of Functional Requirements, including Operational Environment, User Interface, Security Requirements, Availability Requirements, Performance Requirements and Scalability Requirements.

[3] Determining Income & Calculating Rent." Chapter 5. Occupancy Requirements of Subsidized Multifamily Housing Programs, 2013 ed. United States Department of Housing and Urban Development. Web. <http://portal.hud.gov/hudportal/HUD?src=/program_offices/administration/hudclips/handbooks/hsgh/4350.3>

2. Be accepted by end users

The tool should be user friendly for the end users: occupancy specialists. In order to gain acceptance, the tool will also have to be accepted by PHA management. More details on potential PHA adoption of a rent calculation tool can be found in Appendix D.

3. Interface seamlessly with current software suites

Some PHAs use software suites that include various modules to support their operations, including rent calculations (see Appendix C for more information on existing PHA software). REAC's rent calculation tool should be able to interface smoothly with these software suites.

4. Have longevity

The tool should be able to be used over many years, so it will need to be upgraded and kept up to date according to regulatory changes.

Background

The HUD Public Housing Program combined with the Housing Choice Voucher Program (HCV or PHA-administered Section 8) serves 3.3 million households.[4] Tenant rent in these programs is based on a tenant's income. In rough terms, tenants pay 30% of their projected future income, which is broadly defined to encompass income from assets, child support, and the like, not just wage income. The governing regulations are quite complex; they are described in *HUD Chapter 5*, which runs to 80 pages.[5]

Sometimes there are errors in these rent calculations, meaning that the tenant pays too much, the tenant pays too little, or back at the eligibility determination stage, a tenant is deemed ineligible when they were in fact eligible or vice versa. There are several different (and not necessarily fully compatible) ways of defining or categorizing these errors:

- HUD identified 3 major types of errors in the rent calculation process in their proposal for this BRD: (1) errors in income and rent determination made by program

[4] HUD Real Estate Assessment Center's Proposal to CMU Heinz College Systems Synthesis Project

[5] Determining Income & Calculating Rent." Chapter 5. *Occupancy Requirements of Subsidized Multifamily Housing Programs*, 2013 ed. United States Department of Housing and Urban Development. Web. <http://portal.hud.gov/hudportal/HUD?src=/program_offices/administration/hudclips/handbooks/hsgh/4350.3>

administrators, (2) errors due to tenants' misreporting their income, and (3) errors in billing assistance payments. [6]

- The 2001 HUD Quality Control for Rental Assistance Subsidies Determinations Study divided errors into three categories: (1) rent errors, namely erroneous payments including both overpayments and underpayments. (2) Administrative errors, namely procedural mistakes, such as arithmetic errors and consistency errors. (3) Component errors, namely errors in the components used to determine tenant rent, such as misreported income. [7]

The main purpose of the tool described in this document is to address the first type of errors defined by HUD in their proposal for this BRD: income and rent determination errors. However, by helping occupancy specialists accurately implement the regulations, the tool may also reduce errors from tenants misreporting their income (assuming income was misreported mistakenly rather than intentionally).

Naturally, it is difficult to determine the quantity of errors because known errors can be corrected. To estimate the size of the problem, HUD REAC asked ICF International, the consulting firm that supports HUD's oversight of its IT infrastructure, to conduct quality control studies in 2000 and in 2003 through 2011. In the most recent iteration of the study (FY 2011), ICF selected 600 housing units under the Public Housing, HCV, and other programs as a sample, and calculated what it calls "quality control rent" for each household in the sample. ICF uses the term "quality control rent" to denote the rent that they calculated by performing retrospective rent calculations (using historical income data from various sources as well as interviews with tenants).[8] ICF calculated errors by subtracting their quality control rent from the rent tenants actually paid (found in Form 50058 or 50059).[9][10]

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[6] Quality Control for Rental Assistance Subsidy Determinations – Executive Summary to the Report for FY 2011, prepared by ICF International, Calverton, MD 20705. Sep 28, 2012 pp. 1 <http://www.huduser.org/portal/qc_rental_asst_subsidies_2011/FY2011HUDQCExecutiveSummary.pdf>

[7] "Rental Housing Integrity Improvement Project (RHIIP) Initiative FAQs." United States Department of Housing and Urban Development. Web. <http://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/programs/ph/rhiip/faq_rhiip>

[8] Quality Control for Rental Assistance Subsidy Determinations – Executive Summary to the Report for FY 2011, prepared by ICF International, Calverton, MD 20705. Sep 28, 2012 pp. 2 <http://www.huduser.org/portal/qc_rental_asst_subsidies_2011/FY2011HUDQCExecutiveSummary.pdf>

[9] Other programs include Owner-administered Section 8, Section 202 PRAC, Section 811 PRAC, Section 202/162 PAC.

[10] ICF reports the difference between quality control rent and actual rent as "errors", but perhaps a better term would be "discrepancies". That difference will only equal the error if ICF's quality control rent is completely accurate. Without further research into ICF's methodology, we cannot provide a complete critique of their error calculation, but the distinction between discrepancies and errors could provide important insight into the typology of rent calculation errors.

The most recent iteration of the ICF study found that in FY 2011, gross erroneous payments totaled $697.9 million: with rent underpayments of $468.6 million (up from $362 million in FY 2010), and over payments of $229.3 million (down from 288 million in FY 2010). The annual net erroneous payments totaled $239.3 million.[11] As Figure 1 illustrates, the gross erroneous payments as estimated by ICF have been reduced substantially since 2000, but the rate of decline has slowed since 2004.

Figure 1.

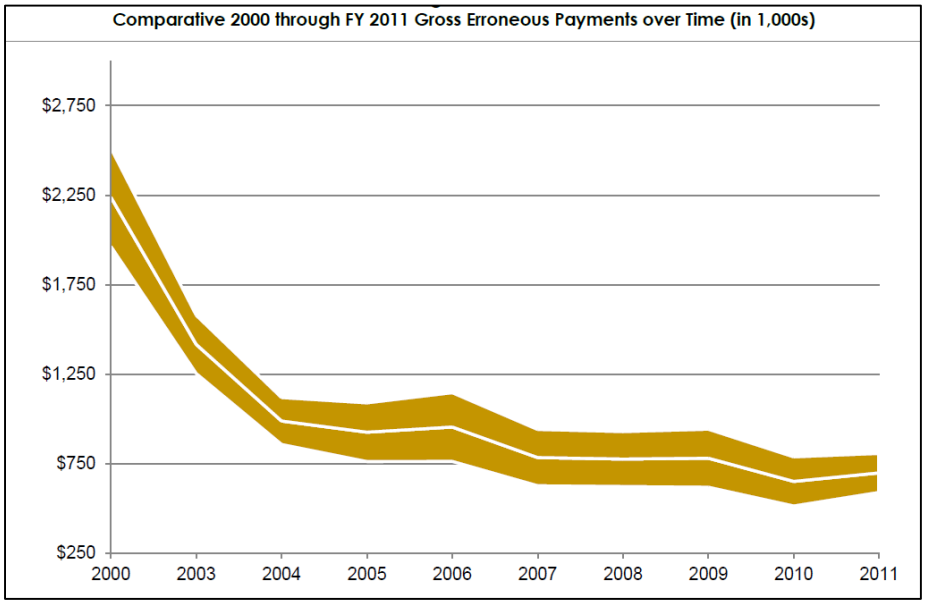


Figure taken from Quality Control for Rental Assistance Subsidy Determinations, pp. 5
Prepared by ICF International, September 2012[12]

Because rent calculation errors may result in both over- and underpayment, identifying and eliminating rent calculation errors will not necessarily lead to budget savings for HUD. Instead, the goal of reducing rent calculation errors is to ensure that tenants receive the appropriate level of benefits according to their eligibility.

Current System Environment

Regarding rent calculation, the Public Housing and HCV programs can be divided into two phases: application, which spans from applicants' initial contact with the PHAs to their

[11] Quality Control for Rental Assistance Subsidy Determinations – Executive Summary to the Report for FY 2011, prepared by ICF International, Calverton, MD 20705. Sep 28, 2012 pp. 4
<http://www.huduser.org/portal/qc_rental_asst_subsidies_2011/FY2011HUDQCExecutiveSummary.pdf>

[12] Quality Control for Rental Assistance Subsidy Determinations – Executive Summary to the Report for FY 2011, prepared by ICF International, Calverton, MD 20705. Sep 28, 2012 pp. 5
<http://www.huduser.org/portal/qc_rental_asst_subsidies_2011/FY2011HUDQCExecutiveSummary.pdf>

receipt of benefits from the programs; and re-certification, which includes annual scheduled recertification using the Enterprise Income Verification (EIV) system and additional recertification when their income changes (see the context-level flowchart in Appendix A for details). Rent calculation is an important task executed by PHAs, but it is not their only form of involvement. PHA responsibilities in Public Housing and HCV programs include: "managing waiting lists; determining an applicant's eligibility for the program; ensuring housing is safe, decent, and sanitary; calculating a participant's income and rent; conducting program termination or eviction actions".[13]

PHAs already use a variety of software tools, often in the form of integrated software suites, with modules not only for rent calculation, but also for wait list management, screening processes, and payroll management. Examples of the software companies that provide software suites for PHAs include Emphasys, Tenmast, and Horizon.[14] Appendix C describes six software providers that serve PHAs. These companies provide extensive customization, customer service, and training. In our discussions with local PHA staff, we found that customization and customer support were highly valued by PHA managers. Whether REAC decides to compete with these software companies, or create a tool that will be used in conjunction with the universe of alternative PHA software suites, it is important to understand the current industry environment. More insights, including a discussion of the fundamental challenges that pre-existing software companies pose to REAC's tool, are included in the companion *Executive Considerations* document.

In addition to fitting within the current industry context, it will also be important to persuade PHA managers to adopt the rent calculation tool. Appendix D contains information gleaned from discussions with local PHA managers and staff, as well as management at Pittsburgh's HUD office[15]. In general, PHA managers felt that there were few rent calculation errors, so it was not worth their time to focus on these errors[1617]. Instead, the managers explained that workload was their biggest concern and that they would seriously consider adopting a tool that could reduce occupancy specialist workload. The PHA managers also expressed interest in a tool that tenants could use from home, as it would reduce occupancy specialist workload. PHAs

[13] PHA 101: A Guide for CoC's - Understanding PHA Programs and Policies, made by HUD on August 26, 2013. pp. 7 <http://usich.gov/resources/uploads/asset_library/PHA_101_Webinar.pdf>

[15] Molinaro-Thompson, Jacqueline. Personal Interview. November 15, 2013. HUD Pittsburgh Field Office. Pittsburgh, PA.

[16] Livadas, Nannette. Personal Interview. September 24, 2013. Mercer County PHA. Sharon, PA.

[17] Sanetsky-Kish, Sharon. Personal Interview. October 22, 2013. Pittsburgh PHA. Pittsburgh, PA.

theorized that freeing occupancy specialists' time would allow them to reduce rent calculation errors by affording the occupancy specialists more time with tenants whom they have identified as error prone. Thus the PHA goal of reducing occupancy specialist workload may align with REAC's goal of reducing errors as PHAs will be more likely to accept and implement a tool perceived to reduce occupancy specialists' burden. Because PHAs have full authority to decide which tool to use, it is important for REAC to consider the PHA perspective when developing its rent calculation tool.

Stakeholders

HUD and HUD's Real Estate Assessment Center (REAC)

REAC is the anticipated developer and promoter of this rent calculation tool, but not its user. REAC's role (as understood by this team) is to design, develop, and financially support the tool. Additionally, based on the analysis underpinning this document, REAC may need to both promote the tool's use among PHAs to ensure adoption and conduct market research and outreach to current software vendors.

PHA Management

PHA Management is arguably the key stakeholder inasmuch as they are the ones who will decide whether REAC's new tool is adopted and used. Usually BRDs are created for the organization that will use the software, but that is not the situation here. PHAs are separate organizations that are largely independent of HUD when it comes to software acquisition decisions. In particular, HUD does not have the discretion to choose a calculation tool for PHAs, nor can it set criteria for tool selection. Rather, PHAs assume the role of the customer, while HUD plays the role of the software vendor, albeit one that plans not to charge for its product (and so is more like Google than Quicken in that respect). So, HUD has to think in terms of strategies for gaining market share among PHAs because it is up to the managers of the over 4,000 PHAs across the country to decide whether or not to adopt REAC's calculation tool[18].

PHA occupancy specialists

[18] PHA 101: A Guide for CoC's - Understanding PHA Programs and Policies, made by HUD on August 26, 2013. pp. 4 <http://usich.gov/resources/uploads/asset_library/PHA_101_Webinar.pdf>

Occupancy specialists at PHAs are the intended end users of the new rent calculation tool. Occupancy specialists typically have a high school education and have significant job experience because the job turnover rates at PHAs are low.

REAC has used the "TurboTax" metaphor to describe a rent calculation tool. An appealing feature of "TurboTax" is that it simplifies a complicated set of regulations by guiding the user through a series of questions, providing additional information along the way. A rent calculation tool that follows this model would benefit occupancy specialists, who would be the users of the tool.

Tenants

Tenants provide household and income information that is reviewed and transcribed by occupancy specialists as part of the rent calculation process. Even though they are not the primary users of the tool, tenants will still benefit from the tool; increasing the accuracy of rent calculations will help ensure that housing assistance is allocated fairly among eligible applicants.

Software vendors selling to PHAs

The companies now selling software suites to PHAs are not stakeholders per se, but they are interested parties who may react to the arrival of REAC's tool, hopefully (but not necessarily) in a cooperative fashion.[19] Many of these companies' software suites contain modules to assist PHAs with various processes, including calculating rent. It is possible that these vendors will react to the presence of a government-developed, free software tool being created in their product space, and REAC's tool needs to be designed with the future actions of these vendors in mind. The work described in this document does *not* include any attempt to anticipate the vendors' strategic or competitive response, although such an analysis should be done before a new rent calculation tool is built.

Assumptions and Limitations

1. Rent calculation errors are significant in housing assistance programs.

[19] While all of the PHAs interviewed for this project used a software suite, the Pittsburgh HUD office indicated that not all PHAs can afford software suites (per interview with Jacqueline Molinaro-Thompson on November 15, 2013).

2. The regulations in *HUD Chapter 5* are correct and complete. This BRD is only useful to the extent that the underpinning regulations are constant and relevant; regulatory changes could render this BRD (and the tool it describes) obsolete.

3. HUD's budget is sufficient to cover the cost of developing the tool and distributing the tool free of charge.

4. The information used to create Appendix D: PHA Perspectives is based on conversations with staff and management at only four PHAs and one Regional HUD office. Furthermore, all of these interviews took place in western Pennsylvania. It is possible that the preferences that these PHAs expressed are not universal. As a result, the information presented in this report should not be taken as an accurate reflection of nationwide PHA preferences, but is an important demonstration of the valuable insights that REAC could generate from further research.

5. As with the PHA interviews, the information underpinning Appendix C: Industry Analysis is only based on what could be gleaned from conversations with local PHAs and web searches. This information does not represent the full scope of the PHA software industry, but instead provides a brief introduction into the types of companies that fill the industry space.

6. This Heinz systems team performed a variety of quality control measures on the foundation level flowchart (attached in an interactive PDF document), but not enough to warrant the document's uncritical use as the framework for the final rent calculation tool. The foundational level flowchart is a series of flowcharts developed according to the rent calculation regulations (*HUD Chapter 5*). It depicts the logic flow of the rent calculation process and defines the primary function of the rent calculation tool. Please see Appendix B for a more in-depth explanation of the foundation level flowchart. The timeframe of this project was less than four months and the team was unfamiliar with the *HUD Chapter 5* regulations before beginning this project. Hence, additional checking and quality control steps are warranted. Please see Appendix B for the next steps that this team recommends REAC take before the flowchart is converted into code in a final rent calculation tool.

Functional Requirements

This section explains several key functional requirements that a rent calculation tool should include under two possible scenarios: 1) PHAs do not currently use software in their rent calculations, or 2) PHAs currently use software suites that include rent calculation functionality. The two scenarios share many functional requirements, but differ in the ways that the tool will need to store information from rent calculations. This section concludes with a use case analysis that shows how the tool will function from the perspective of the end-user.

As shown in the foundational-level flowchart (attached in an interactive PDF document), tenant rent is based on factors including income, expenses, and household composition. The calculation tool must be compatible with the current regulations and must calculate the correct tenant rent.

In order to determine how the rent calculation tool will fit in current PHA processes, the team consulted a local PHA manager: Sharon Sanetsky-Kish, manager of the Pittsburgh PHA[20]. Below is a visualization of the process that she described:

It is not until the third step in the diagram above that the occupancy specialist would use the REAC tool to input necessary information and calculate rent; the first two steps are done with paper and pencil. Because tenants are typically not in the room when occupancy specialists calculate rent, the occupancy specialists would only have the information previously provided by tenants to reference when using the tool. This raises concerns about the tool's ability to elicit responses from tenants. Further discussion of the current rent calculation process (and recommendations for potential changes to the process) can be found in the accompanying *Executive Considerations* document.

[20] Sanetsky-Kish, Sharon. Personal Interview. October 22, 2013. Pittsburgh PHA. Pittsburgh, PA.

There are two main scenarios in which the calculation tool will be used. In both, the rent calculation tool will prompt the occupancy specialist with a sequence of guiding questions (just as TurboTax does). The guiding questions are displayed in the foundation level flowchart as decision nodes (diamonds). Please see Appendix B for a more detailed explanation of the foundation level flowchart.

The error rate of rent calculations is expected to drop as the quality of inputted information is improved, since occupancy specialist should have a better understanding of what information to provide in each section as a result of the guiding questions. However, the business process identified above limits the value added in this regard, since tenants will not generally be present when the tool is used (and its prompts are given).

Apart from improving inputs, it is also possible that guiding questions will improve the speed of rent calculations: if occupancy specialists are guided through the rules in a clear manner, they will be able to complete rent calculations faster.

These guiding questions are universally required, but there are additional functional requirements that are specific to each scenario.

Scenario 1

PHAs that currently do not use a software suite to assist in rent calculations:

It is likely that PHAs in this category do not have a database to store the applicants'/tenants' data from rent calculations. The rent calculation tool will be the primary tool used by the occupancy specialists to calculate rent. Therefore, the REAC tool needs to provide the functionality to either store all of the relevant information (i.e. inputs and calculation results), or export all of the data in a way that is easily stored and maintained by PHAs.

Scenario

PHAs that currently use software suites to manage housing assistance programs, including the rent calculation process:

These PHAs already have a system to input and store the information needed for rent calculations. It is likely that they will want to continue to use their current software suites for tasks other than rent calculation. As a result, a REAC rent calculation tool would need to be compatible with the existing software in order to effectively replace its rent calculation functionality. In this case, the rent calculation tool should be able to interact with the various

software suites and, in particular, the REAC tool and these other software suites must be able to communicate data back and forth.

The textbox on the following page presents a summary of the key insights that this team generated when developing both the functional and non-functional requirements. More detailed information for tool development can be found in the essential use case and nonfunctional requirements sections below the textbox.

Key Requirements

Not Just a Calculator

The tool must include functionality beyond that of a traditional calculator, regardless of the scenario. It must have the capability to retain information over time. For example, the regulations mandate that any asset that has been disposed of for less than fair market value within the last two years must be considered as an asset in the rent calculation.[1] The rent calculation tool must be able to keep track of this two year time period to ensure that the asset is considered for the proper amount of time. In other words, the rent calculation tool will need to "remember" that a tenant reported disposing of an asset for less than fair market value for every recertification that is performed over the subsequent two years. In scenario 1, this would be accomplished through communication with a proprietary database; in scenario 2, the tool would send and receive information to and from an existing software suite.

Provide Information Outside the Logic Flow

HUD Chapter 5 regulations include additional information that supports the logic of the rules. This information is integral to understanding the rules, but is not captured within the logic of the regulations. For example, there is a distinction between the way that revocable and non-revocable trusts are treated in the regulations, but logic of the regulations simply asks the occupancy specialist to report which kind of trust the tenant owns.[1] Explaining the distinction between the two types of trusts is not part of the logic of the rule, but it is necessary information for an occupancy specialist to understand if they are to accurately apply the rule. As a result, the foundation level flowchart includes notes containing additional information whenever possible. A successful rent calculation tool will need to communicate these notes to an occupancy specialist.

Include Practical Examples for Complicated Calculations

The *HUD Chapter 5* regulations include examples that clarify complex calculation procedures. Examples show the correct implementation of complicated rules, whereas the aforementioned notes include critical information outside of the logic flow of the regulations. A rent calculation tool should incorporate examples to help occupancy specialists avoid errors when implementing these complex rent calculation rules.

See Appendix B for further discussion of the reasoning behind these functional requirements.

Actor Profiles Specification

Occupancy specialists are the anticipated users of this tool. They will use the rent calculation tool by entering information provided by applicants during certifications (or tenants during recertifications). The tool will then return the calculated tenant rent together with any intermediary calculation results.

Essential Use Cases

This section of the BRD depicts the Business Requirements in the form of essential use cases. The primary purpose of the use case analysis is to explain the required system behavior from the perspective of the end-user. A use case contains a description of the flow of events which are the "interaction between actors and the system"[21]. The use cases included in this section follow the three necessary steps for calculating rent: determining annual income, determining relevant deductions, and finally calculating rent (which includes annual income less deductions, along with any program-specific adjustments).

The rent calculation tool must be able to support the business process defined in the use case analysis without bias to technology and implementation.

Specifically, this use case analysis communicates:[22]

- system requirements
- how the system is to be used
- the roles a user plays in the system
- how the system responds to user inputs
- what the user receives from the system

As discussed above, the main function of the rent calculation tool will be the same for both scenarios. Because the aforementioned scenarios are not different enough to warrant separate use cases, Scenario 1 is treated as the "normal course" of the use cases, while Scenario 2 is considered the "alternative course" within the same use cases.

[21] Shacklette, J. Mark. "Use Case Analysis Purpose and Implementation." The University of Chicago. Department of Computer Science, 22 Mar. 2008. Web. <http://people.cs.uchicago.edu/~mark/51023/Ucstyleg.html>.

[22] Shacklette, J. Mark. "Use Case Analysis Purpose and Implementation." The University of Chicago. Department of Computer Science, 22 Mar. 2008. Web. <http://people.cs.uchicago.edu/~mark/51023/Ucstyleg.html>.

Use Case Field Name	Definition
Use Case ID	1
Use Case Name	Determine Annual Income
Actor	Occupancy Specialists in Public Housing Authorities
Description	This use case describes the process to input raw household information and get the correct income to be used in the calculation of tenant rent. ● Input to the system: The user will type the information into the forms and answer the guiding questions (shown as diamonds in the foundation-level flowchart). ● Expected output: ● income of adults ● income from dependents ● income from absent family members ● income from permanently confined family members ● income from scholarships or grants ● income from child support ● income from regular cash contributions and gifts ● income from a business ● income from periodic social security payments ● income from public assistance in as-paid localities ● income from long-term care insurance programs ● income from service stipends ● income from assets
Preconditions	● The raw income information is provided by applicants. ● The database containing time-specific information will be queried for information from past rent calculations.[23]
Post conditions	● The annual income will be determined and forwarded to the next module to calculate the rent deduction amount.
Normal Course	● The user fills in the required fields. ● The user answers the questions the tool asks; the questions will follow the logic flow demonstrated in the foundation level flowchart. Which questions are presented to the user will be dependent on the answers provided by the user in the previous questions.

[23] Further explanation for this requirement can be found in Appendix B.

	● The user consults system help when questions about the process arise. The system help will include further clarification of the complex terms/concepts and examples to demonstrate the proper application of the regulations. ● While the user fills in the information, the system will automatically check the validity of the inputted information. If the information provided in a field is invalid, the system will generate a warning message and give specific instructions for the user to update the input. ● The user can view the intermediary result.
Alternative Courses	None
Exceptions	In some instances, the user will not be able to provide all of the required information the system needs to calculate rent, (e.g. the user might need to return to the tenant to ask for further clarification). In this case, the user can save the previously inputted information and resume the rent calculation process later.
Frequency of Use	High This use case will happen whenever a new applicant is accepted or a tenant needs to be recertified.
Business Rules	Chapter 5: Determining Income & Calculating Rent from *Occupancy Requirements of Subsidized Multifamily Housing Programs*
Special Requirements	• The system should have an auto-save function to prevent accidental loss of information. • The notes in the foundational level flowchart which are not part of the logic flow need to be included, as they are necessary to accurately implement the rent calculation rules.[24]

Use Case Field Name	**Definition**
Use Case ID	2
Use Case Name	Determine Deductions
Actor	Occupancy Specialists in Public Housing Authorities
Description	This use case describes the process to determine deductions. ● Input to the system: The user will answer the questions the tool asks and

[24] Further explanation for this requirement can be found in Appendix B.

	fill in the information as needed. The questions are included in the foundational level flowchart's "Deductions" section (denoted with diamonds).
	● Expected output:
	  ● Deduction eligibility
	  ● Deduction amount for each eligible deduction
	  ● Adjusted income (income less deductions)

Preconditions	● The annual income of the tenant has been determined. ● The database containing time-specific information will be queried for information from past rent calculations.
Post conditions	● The adjusted income (annual income less deductions) will be forwarded to the next module to calculate final tenant rent.
Normal Course	● The user fills in the required fields. ● The user answers the questions the tool asks; the questions will follow the logic flow demonstrated in the foundation level flowchart. Which questions are presented to the user will be dependent on the answers provided by the user in the previous questions. ● The user consults system help when questions about the process arise. The system help will include further clarification of the complex terms in the regulations associated with the deduction determination process and straightforward examples demonstrating the process. ● While the user fills in the information, the system will automatically check the validity of the inputted information. If the information provided in a field is invalid, the system will generate a warning message and give specific instructions for the user to update the input. ● The user can view the intermediary result.
Alternative Courses	None
Exceptions	In some instances, the user will not be able to provide all of the required information the system needs to calculate rent, (e.g. the user might need come back to tenant to ask for further clarification). In this case, the user can save the previously inputted information and resume the rent calculation process later.
Frequency of Use	High This use case will happen whenever a new applicant is accepted or a tenant needs to be recertified.
Business Rules	Chapter 5: Determining Income & Calculating Rent from *Occupancy Requirements of Subsidized Multifamily Housing Programs*
Special Requirements	• The system should have an auto-save function to prevent accidental loss of information. • The notes in the foundational level flowchart are not part of the logic flow

	but need to be included, as they are necessary to accurately implement the rent calculation rules.

Use Case Field Name	**Definition**
Use Case ID	3
Use Case Name	Calculate Rent for Different Programs
Actor	Occupancy Specialists in Public Housing Authorities
Description	This use case describes the process to determine final tenant rent based on the program-specific rules. ● Input to the system: ● The user must specify the program to which the tenant applied. ● The user will answer the questions the tool asks and fill in the Information as needed. The questions are included in the foundation level flowchart Rent Calculation section. ● Expected output: ● Tenant Rent ● Assistance Payment ● Intermediate calculation from each part in the rent calculation section. • Including the intermediate calculation result will help the users return and check if needed. • In the foundation level flowchart "Calculate the Tenant Rent" section, there are seven decision nodes in diamond each corresponding to one part, such as Section 8, Rent Supplement Program, etc. The final output should include the calculation result of each of these parts. ● The intermediate result of all the previous steps: Income Determination and Deduction Determination.
Preconditions	● The adjusted income of the tenant has been determined. ● The database containing time-specific information will be queried for information from past rent calculations. ● The user knows to which public housing programs the tenant has applied.
Post conditions	● The tenant rent is calculated. ● A final report containing the necessary details of the rent calculation will be ready to view and export. ● Time-specific information from the rent calculation will be communicated with an outside database.

Normal Course	● The user fills in the required fields ● The user answers the questions the tool asks; the questions will follow the logic flow demonstrated in the foundation level flowchart. Which questions are presented to the user will be dependent on the answers provided by the user in the previous questions. ● The user consults system help when questions about the process arise. The system help will include further clarification of the complex terms in the regulations associated with the deduction determination process and straightforward examples demonstrating the process. ● While the user fills in the information, the system will automatically check the validity of the inputted information. If the information provided in a field is invalid, the system will generate a warning message and give specific instructions for the user to update the input. ● The user will be presented with the output: final tenant rent. ● The final report including all the tenant/applicant information and rent information is prepared and ready to export.
Alternative Courses	If this rent calculation tool is embedded as part of another software suite, the final result will be converted into a format that is compatible with the software suite and ready to export.
Exceptions	In some instances, the user will not be able to provide all of the required information the system needs to calculate rent, (e.g. the user might need come back to tenant to ask for further clarification). In this case, the user can save the previously inputted information and resume the rent calculation process later.
Frequency of Use	High This use case will happen whenever a new applicant is accepted or a tenant needs to be recertified.
Business Rules	Chapter 5: Determining Income & Calculating Rent from *Occupancy Requirements of Subsidized Multifamily Housing Programs*
Special Requirements	• The system should have an auto-save function to prevent accidental loss of information. • The notes in the foundational level flowchart which are not part of the logic flow need to be included, as they are necessary to accurately implement the rent calculation rules.

Non-Functional Requirements

Usability Requirements

The rent calculation tool should be user-friendly and should reduce occupancy specialists' workload. A tool that satisfies these two objectives is more likely (all else equal) to be adopted by PHA managers and used by occupancy specialists.

1. Instructions

One aspect of ease-of-use is ease-of-learning. REAC may wish to offer printed or video tutorials that guide occupancy specialists through the tool. PHA software vendors often go beyond that, offering training programs and onsite consultation ("house calls"). It may not be practical for REAC to meet that standard, but it gives a sense of the level of support some PHA staff have come to expect and, hence, why some instructional tutorials or other learning aids may be valuable in ensuring that the rent calculation tool gains acceptance.

2. Privacy

The tool could be based on a private cloud server to ensure security of the tenant information as well as create flexibility when accessing the tool. First, the rent calculation tool deals with personal and sensitive information, so security is critical. Second, occupancy specialists may move from one PHA office to another and a private cloud would allow occupancy specialists to access the tool from different PHAs through a web browser.

3. Ease of Use and Accessibility

The tool should be designed to accommodate the needs of the end users (occupancy specialists), including considerations about their educational level. The level of language used in the tool should be simple enough that it is easily understood by users with a high school education, since that seems to be the level of educational attainment of many occupancy specialists.

System Help Requirements

1. Clarifying explanations of terms and references

Some terms in the regulations are complex and may be difficult for an occupancy specialist to understand. For example, the regulations require that income from annuities be included in annual income[25]. In order to correctly forecast future income from an annuity, occupancy specialists need to understand how variable, fixed, and hybrid annuities generate income differently. In cases like this, the tool should include clarifications that are readily accessible. For example, the tool could list each type of annuity with a link to a pop-up window with easy-to-understand explanation of each annuity category. Please see Appendix B for more information about the ways that REAC could make additional information available as part of the rent calculation tool.

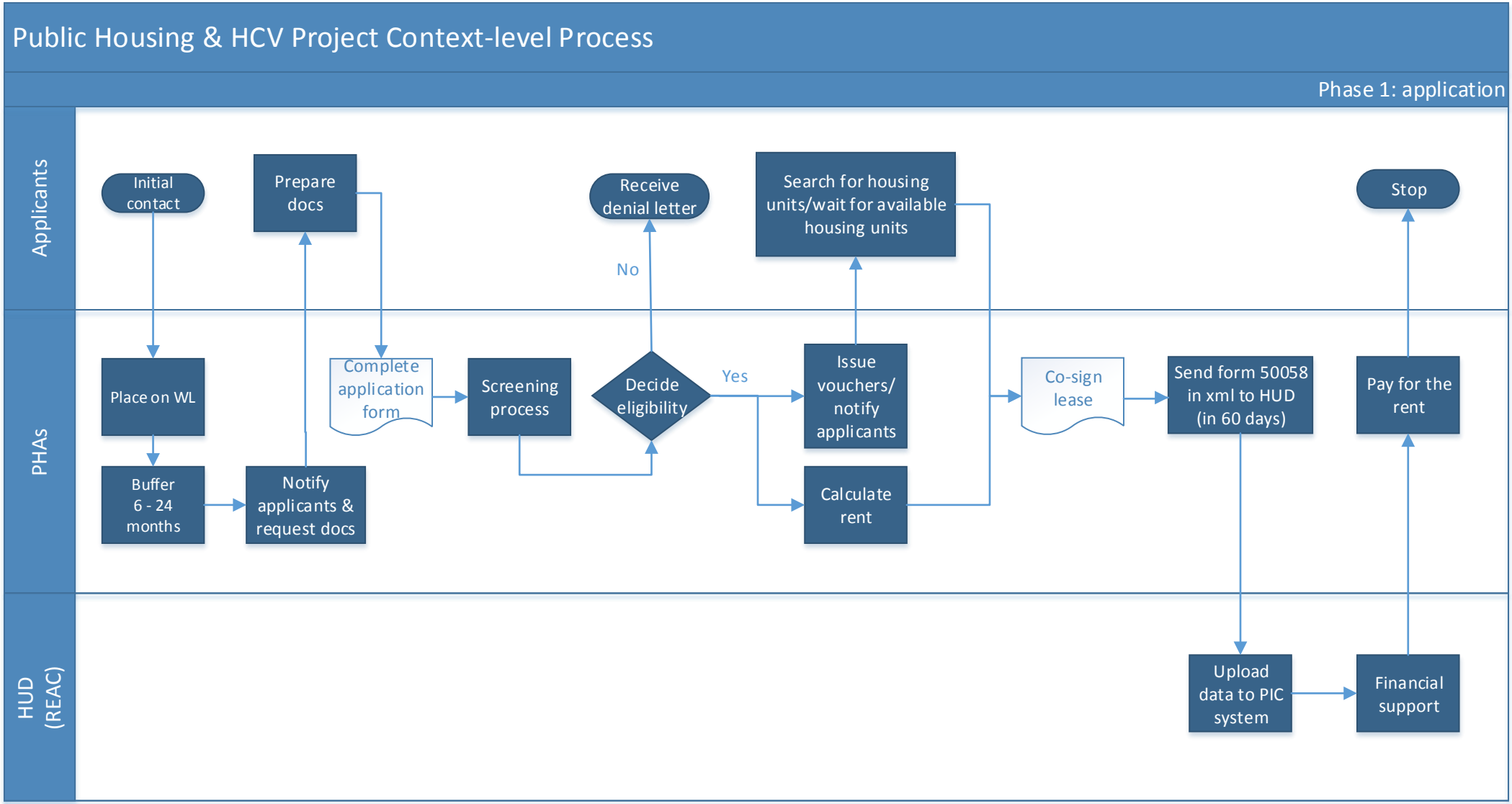
2. Practical examples for complicated calculations

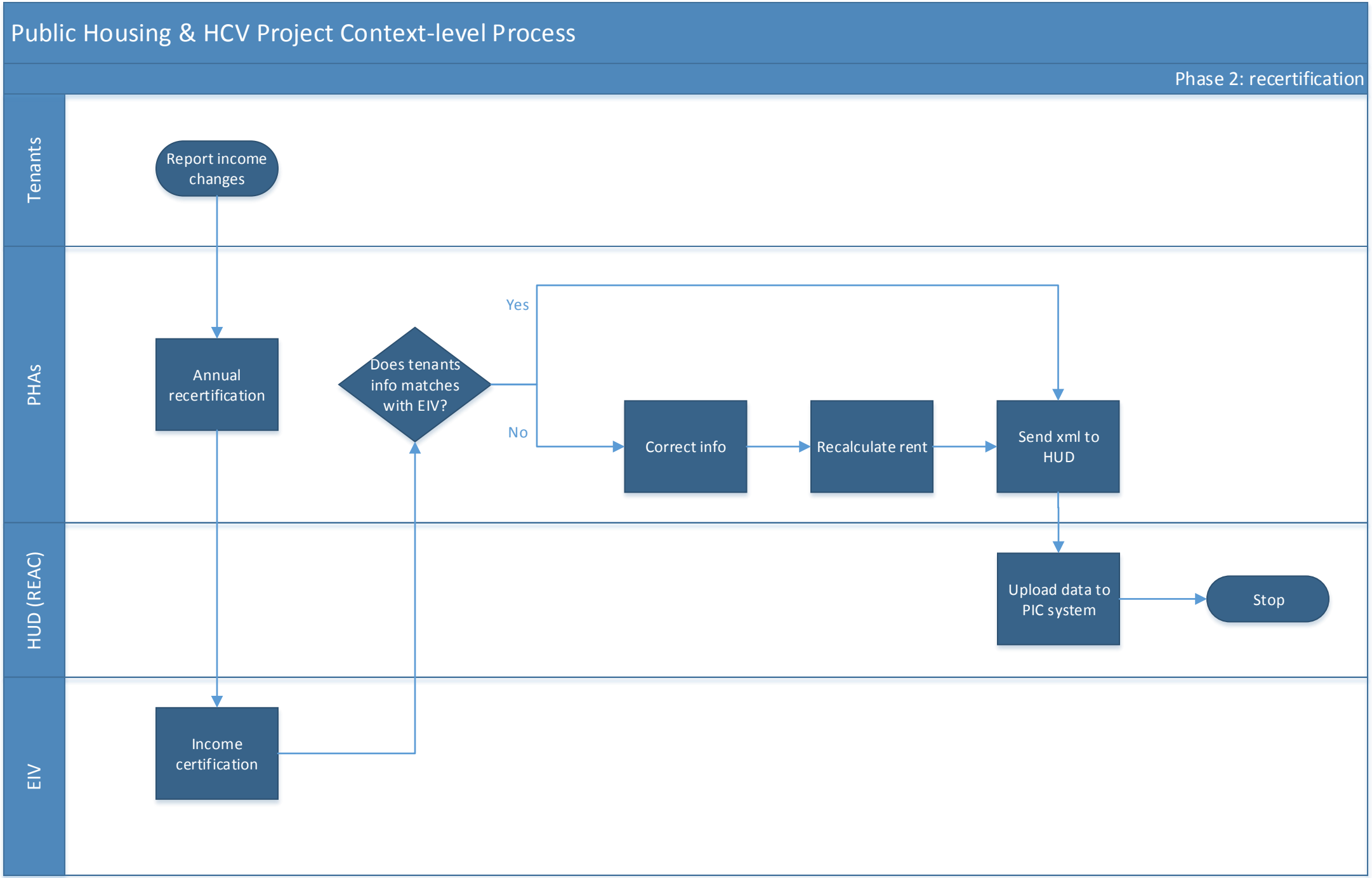
The Chapter 5 regulations include many examples that clarify complex calculation procedures by showing the correct application of the regulations. This rent calculation tool should incorporate examples in order to ensure that occupancy specialist understand how to proceed at each step of the rent calculation process. Further details about the need for practical examples can be found in Appendix B.

3. Technical support

When deciding to what degree it will provide technical support, REAC should recognize that some software vendors provide products to PHAs with a high level of customer support. It might be infeasible for REAC to provide real-time support (e.g. online chat or a phone line), but users should at least be provided with an email address or another method of communication to submit inquiries and receive technical assistance. For examples of the ways and extent to which software companies currently provide customer support, please see Appendix C.

[25] Determining Income & Calculating Rent." Chapter 5. *Occupancy Requirements of Subsidized Multifamily Housing Programs*, 2013 ed. United States Department of Housing and Urban Development. Web. pp. 5-31 http://portal.hud.gov/hudportal/HUD?src=/program_offices/administration/hudclips/handbooks/hsgh/4350.3


Public Housing & HCV Project Context-level Process
Phase 1: application
Applicants
PHAs
HUD (REAC)
Initial contact
Prepare docs
Receive denial letter
Search for housing units/wait for available housing units
Stop
No
Place on WL
Complete application form
Screening process
Decide eligibility
Yes
Issue vouchers/ notify applicants
Co-sign lease
Send form 50058 in xml to HUD (in 60 days)
Pay for the rent
Buffer 6 - 24 months
Notify applicants & request docs
Calculate rent
Upload data to PIC system
Financial support


Public Housing & HCV Project Context-level Process
Phase 2: recertification
Tenants
PHAs
HUD (REAC)
EIV
Report income changes
Annual recertification
Does tenants info matches with EIV?
Yes
No
Correct info
Recalculate rent
Send xml to HUD
Upload data to PIC system
Stop
Income certification

Appendix A: Context-level Flowchart

The flowchart in the next page shows an overview of the complete process that a PHA goes through with a tenant from initial contact to providing benefits in the Public Housing and HCV programs. The rent calculation tool described in this BRD pertains only to the process titled "Calculate Rent". The foundation level flowchart (explained in Appendix B and attached in an interactive PDF document) is the complete mapping of the sub-processes within the "Calculate Rent" process.

Appendix B: Foundation Level Flowchart

An Explanation of the Foundation Level Flowchart

The foundation level flowchart shows the complete rent calculation procedure as it is outlined in *HUD Chapter 5*[26]. As a result, much of the information in the flowchart mirrors the exact wording of the regulations. The goal of the foundation level flowchart is to aid in the faithful implementation of the rent calculation rules by showing the explicit steps that a tool will need to take during the rent calculation process.

HUD Chapter 5 includes a section on verification that falls outside the scope of the actual rent calculation. The verification process involves occupancy specialist contacting various third parties to confirm tenants' reported income. By nature, this process requires the occupancy specialist to make many subjective decisions, so it may not lend itself to a rent calculation tool that provides guiding questions that proceed through the regulations in a structured fashion. The foundation level flowchart maps the logic flow of the verification regulations, but REAC will need to consider in what capacity (if at all) it wishes to integrate this into its rent calculation tool.

The *HUD Chapter 5* regulations are based on a series of processes and sub-processes, so it was difficult to visually present the foundation level flowchart in a static way; the full flow chart if printed would consist of 46 individual flowcharts that represent the processes and sub-processes of the regulations. Given the number of sub-process, it was necessary to find a way to link each step such that the tiered logic flow of the regulations was clear. The attached PDF document (titled "Interactive Foundation Level Flowchart") contains the foundation level flowchart in an interactive form: one navigates the document by clicking on processes that link to any relevant sub-process(es).

The flowchart follows the following conventions:

- Square boxes denote processes
- Double-lined square boxes denote sub-processes
- Diamonds denote decisions
- Ovals denote start and end points
- Circles denote navigation buttons to return to the previous screen

[26] Determining Income & Calculating Rent." Chapter 5. Occupancy Requirements of Subsidized Multifamily Housing Programs, 2013 ed. United States Department of Housing and Urban Development. Web. <http://portal.hud.gov/hudportal/HUD?src=/program_offices/administration/hudclips/handbooks/hsgh/4350.3>

The foundation level flowchart was designed as the framework for a rent calculation tool that follows the model of "TurboTax", in that it will provide a series of guiding questions to lead occupancy specialists through the regulations. The guiding questions will follow the logic model of the foundation level flowchart: the tool will ask the occupancy specialists the questions that appear in the decision nodes in order to progress through the logic of the regulations.

Insights from the Creation of the Foundation Level Flowchart

While constructing the foundation level flowchart, it became apparent that a rent calculation tool would benefit from several features that go beyond merely mapping the logic flow of the rent calculation process in order to reduce errors. Certainly, a rent calculation tool must accurately follow the logic of *HUD Chapter 5*, but this alone will not guarantee that the tool will reduce errors. First, occupancy specialists may benefit from the inclusion of additional information in the form of notes and examples. Second, a rent calculation tool must have functionality beyond that of a calculator, such as the ability to keep track of time and decisions from previous rent calculations. The following sections will describe these additional features in greater detail.

Additional Information

Notes

Along with the logical flow of the rent calculation process, *HUD Chapter 5* also includes many pieces of information that are not part of this logical flow. Instead, these sections give additional information that may be essential to the accurate implementation of the rent calculation rules. For example, the regulations require that occupancy specialists treat revocable and non-revocable trusts differently when calculating income from assets[27]. In this case, it is important for occupancy specialists (and tenants) to understand the difference between the two types of trusts in order to accurately implement the rule, even though this distinction falls outside of the logic of the rule (i.e. there are no guiding questions in the regulations that help determine what kind of trust the tenant is reporting). The foundation level flowchart includes these pieces of additional information as notes.

Some categories of notes' subject matter are: definitions, references to other parts of the regulations, references to external information, and more in-depth explanations of rules. This

[27] Determining Income & Calculating Rent." Chapter 5. *Occupancy Requirements of Subsidized Multifamily Housing Programs*, 2013 ed. United States Department of Housing and Urban Development. Web. pp. 5-27: 5-30 http://portal.hud.gov/hudportal/HUD?src=/program_offices/administration/hudclips/handbooks/hsgh/4350.3

team relied heavily on the information contained in these notes when creating the foundation level flowchart. As a result, REAC should include these notes to provide clarity to occupancy specialists during rent calculations.

Examples

Another way to clarify the regulations for occupancy specialists is to include examples in the rent calculation tool. Apart from clarifying pieces of information (included in the flowchart as notes), *HUD Chapter 5* also contains many clarifying examples. While notes communicate additional information outside of the simple logic flow of a rule, examples are most useful when they show easily-made errors or "pitfalls". In other words, examples do not provide the occupancy specialist with new information, but rather illustrate hypothetical situations in which the implementation of the rules is ambiguous or difficult. As with notes, examples add needed clarity to complicated rules and were integral while creating the foundation level flowchart. Including examples in the rent calculation tool would aid occupancy specialists during rent calculations.

Implementation

There are many different ways to add notes and examples into a rent calculation tool. One way would be to provide an "additional information" button that an occupancy specialist could select to get more information whenever a step is unclear. The downside of this option, however, is that occupancy specialists may not take the extra step of clicking on the button in order to read the explanatory note. Alternatively, REAC could include every piece of additional information directly to the screens of the rent calculation tool. This, however, may result in a tool that is visually cluttered and unwieldy. REAC may want to consider researching which implementation strategy (or what mix of the two strategies) will work best for PHAs by performing an experiment or using focus groups to elicit the preferences of occupancy specialists.

Additional Functionality

This team's initial understanding of a rent calculation tool was that it would be a "calculator", but after modeling the *HUD Chapter 5* regulations it is clear that a tool will need additional functionality. Specifically, the tool will need to be able to store and share information between rent calculation episodes (certifications and recertifications) that occur over time. This functionality is beyond the scope of a calculator, but is necessary to ensure that the tool assists in a technically correct implementation of the rent calculation rules.

One reason that a tool will need to include this communicative ability is that the regulations contain time-specific rules. For example, tenants are penalized for two years after they dispose of assets for less than their fair market value[28]. In this case, a rent calculation tool would need to keep track of this time factor to ensure that the penalty is assessed for exactly two years.

Another example of this cross-time functionality arises in the deduction process. For certain deductions, tenants can either elect to receive one large deduction or a series of smaller deductions over time (for an example, see the Disability Assistance Expense Deduction in the foundation level flowchart).[29] The rent calculation tool will need to preserve a tenant's decision in order to ensure that the tenant does not make a contradictory decision on a future recertification. For example, a tool would need to recall that a tenant chose to receive a one-time deduction in a previous recertification in order to ensure that the tenant cannot elect to receive a series of smaller deductions in a later recertification.

There are several ways to include this functionality in a rent calculation tool. One way would be to create an external database for the tool to store relevant information. When a tenant returns for a subsequent recertification, the tool would query the database and find the necessary information. While this is appealing, it would require that REAC create and support a database that is usable and accepted by PHAs. Alternatively, a tool could communicate this information with a PHAs existing software. This would remove the burden of creating a proprietary database from REAC. Unfortunately, there are many different types of software used by PHAs, so this would require that the REAC tool be designed to support interactions with many different types of PHA software, which is also much more complicated than just producing a calculator. Regardless of which method REAC chooses to implement this functionality, it is important to keep in mind a rent calculation tool will need to be much more than a calculator.

Recommendations for Further Quality Control Steps

While we have spent significant effort ensuring the accuracy of the foundation level flowchart, we suggest that REAC perform additional quality control measures before any coding is done based on the flowchart. The team conducted five full rounds of quality control measures (including editing with an eye for both logic and formatting errors) on the foundation level

[28] Determining Income & Calculating Rent." Chapter 5. *Occupancy Requirements of Subsidized Multifamily Housing Programs*, 2013 ed. United States Department of Housing and Urban Development. Web. pp. 5-36: 5-38 http://portal.hud.gov/hudportal/HUD?src=/program_offices/administration/hudclips/handbooks/hsgh/4350.3

[29] Determining Income & Calculating Rent." Chapter 5. *Occupancy Requirements of Subsidized Multifamily Housing Programs*, 2013 ed. United States Department of Housing and Urban Development. Web. pp. 5-42: 5-44

flowchart, but we would have preferred to continue with additional quality control. We were unable to perform these additional measures due to time constraints. We also would like to note that we were unfamiliar with *HUD Chapter 5* before this project. As such, we would recommend that an individual or team with more in-depth expertise and experience with the regulations review our flowchart to ensure its accuracy.

We request that REAC take the above steps in order to ensure that a tool based on the foundation level flowchart is technically correct; however, we also recommend that REAC perform quality control measures that look beyond technical correctness. We mentioned in the Functional Requirements section that a rent calculation tool will need to include notes in order communicate all of the relevant information in *HUD Chapter 5* to occupancy specialists. The notes we have included in the flowchart were taken directly from *HUD Chapter 5*. REAC should consider adding notes beyond those found in the regulations to provide further clarity with complicated definitions, terms, and concepts. Furthermore, we recommend that REAC provide examples in the rent calculation tool whenever possible for the benefit of occupancy specialists. Examples were excluded from our foundation level flowchart.

To determine which notes and examples to include in the rent calculation tool, we recommend that REAC consider using surveys and focus groups to learn more about the preferences of occupancy specialists. In the later stages of the tool's development, REAC may also want to consider putting the tool through user testing. We expect that gaining a better understanding of occupancy specialists' preferences would help REAC create a tool that is both technically correct and meets the perceived needs of occupancy specialists (thus, is actually adopted).

In summary, we have taken some measures to ensure the accuracy of our foundation level flowchart, but we recommend that REAC take additional measures before using the foundation level flowchart as the basis of a rent calculation tool. Furthermore, REAC should consider using input from occupancy specialists in the form of surveys, focus groups, and user testing throughout the process of creating the rent calculation tool.

Appendix C: Industry Analysis

Existing Software Companies

This appendix describes six software packages that were identified through site visits, meeting notes and web searches: Tenmast Software, Emphasys Software, Horizon Information Systems, Unit 4 Business Software, Hampden Technologies, and HAPPY Software. The information in this report is based on company websites and conversations with customer service representatives. The team was not able to actually use any of the software packages, so it is entirely possible that the descriptions in this section will be slanted toward the positive and may omit problems to which the companies did not wish to draw attention.

The team was also able to talk with several PHA managers who had experience with Horizon and Tenmast. The managers' opinions on these two software suites are contained in text boxes throughout the report. For more information from our discussions with PHA management and staff, please see Appendix D: PHA Perspectives.

Table 1 provides a brief summary of each software company and their differentiating characteristics. Longer prose descriptions of the firms follow, but the key observation from this section is that current software companies who work with PHAs provide a high level of customer service. Or, perhaps more accurately, the companies that do focus on customer service appear to be gaining market share at the expense of those that do not.

Dimensions of this customer service ethic include: (1) being willing to customize the software to a particular PHAs needs, (2) sending customer support as well as sales representatives out to the PHAs (i.e., making "house calls"), and (3) providing a variety of interactive support services (e.g., Facebook pages), not just traditional static user manuals. In addition, these software vendors host annual user conferences and offer a range of training programs. In short, the character of this corner of the software industry is very different from the high-volume, fixed-price selling of shrink-wrapped software to individual users, as with TurboTax, individual Windows user licenses, or most computer games. These vendors' products are more like enterprise resource planning (ERP) systems, and they enjoy a commensurate level of individualized customer support.

That market reality may raise PHAs expectations of the type of support they "should" receive from REAC if the PHA decides to use REAC-produced software. And, if that conjecture is correct, then REAC's investment in the rent calculation tool may not be just one-and-done software development; it might effectively obligate REAC to devote a nontrivial number of staff to ongoing support of this software tool.

The fact that software vendors customize their software also raises challenges for the REAC tool. As discussed in the BRD, the REAC tool will likely need to pass data back and forth with these vendors' software suites. If there were just six vendors each selling one product, that would require creating data exchange protocols and compatibility with six systems. But there are not just six products; to some extent these six companies produce six families of products, with potentially as many products as there are PHAs. We would guess that many (perhaps even most) of the customizations would not affect data protocols and, hence, the interface with REACs rent calculation tool. But it is hard to know at this stage how REAC could ascertain the way in which its tool would interface with each customized product or how much effort it would require to issue and maintain different versions of the REAC tool that achieve compatibility with customized versions of the various software suites (and maintain that compatibility as these software suites evolve over time).

Our more general conclusion from this industry analysis is that REAC may benefit from investing in studying existing software companies. The next appendix reaches a similar conclusion about gathering more information from the PHAs who will be using its rent calculation tool. In both cases we made some effort to gather information, but do not believe that effort was sufficient or had reached a point of diminishing returns. In any product development effort, it is important to understand the competition and one's customers.

The software vendors are not "the enemy," in the usual sense of companies competing with each other; both the vendors and REAC share a common objective of serving PHAs, and REAC is not interested in generating profits from this rent calculation tool. Nevertheless, understanding the strengths and weaknesses of the software packages that PHAs currently use, and the strengths and weaknesses of the companies standing behind those packages, would provide a foundation that puts REAC in a better position to ensure widespread adoption of its rent calculation tool.

Table I. Summary of key characteristics of six vendors who provide software to PHAs

Company Name	Name of Product	Company HQ	Age (years)	# of Employees	Only Housing	Services Offered	Comments
Tenmast Software	WinTen 2+	Lexington, KY	29	150+	Yes	Tenant Management, Financial management, accounting, custom reporting, customer service	Offers Tenmast University training program
Emphasys Software	Public Housing Management	Livermore, CA	37	150+	No	Procurement, Payroll, HR, Financial Management, Tenanat Wailists, Inspections Processes, and Customer Service	Tenant waitlist kiosk software packages
Horizon Information Systems	Housing Authority Suite	Johnstown, PA	17	Less than 25	Yes	Waitlist Management, Maintenance, Billing, Inspections, Housing Contracts, Accounting, and Customer Service	Frequent "home visits" to PHAs to customize software, troubleshoot problems, and train occupancy specilaists
Unit4 Business Software	Agresso ERP	Manchester, NH (HQ in Netherlands)	33	150+	No	Accounting, Custom Reporting, Payroll, Tenant Management, and Customer Service	Provides software packages in 24 other countries including the US; Annual user conference
Hampden Technologies	PHAnetwork	Lakeville, MA	30	25-150	No	Accounting, Tenant Management, Payroll, Wait List Management, and Customer Service	Provides iPad/iPhone software packages for mobile inspections and certifications
HAPPY Software	Housing Pro	Saratoga Springs, NY	17	150+	Yes	Custom Reporting, Automated E-mail and Letter Production, Financial Management, Tenant Management, Payroll, Property Management, and Customer Service	Schedule of live demos during trade shows; Create commonly used reports for PHAS. SEMAP, and VMS

Tenmast Software[30]

Tenmast Software is a company that provides software packages, data management services, and public housing training. Founded in 1984, Tenmast is based in Lexington, Kentucky, with an additional office in Ruston, Louisiana. Tenmast has become a leader in public housing software nationwide; over 400 PHAs use its software, including a handful of the PHAs in Pennsylvania.[31]

PHA managers that have used Tenmast explained that they used the software primarily because it offered modules that support many aspects of PHA management. An occupancy specialist at the Mercer County PHA also explained they frequently used the training material in Tenmast University. [3]

The company's software package for PHAs is called WinTen 2+. This suite includes several modules that assist in PHA operations such as: tenant management, financial management, maintenance management, and custom reporting. These modules help PHAs manage Housing

[30]Tenmast Software. Tenmast Software. October 2013. 5 December 2013 <www.tenmast.com>.

[31]Tenmast Software. Tenmast Software. October 2013. 5 December 2013 <www.tenmast.com>.

Choice Vouchers (HCV) and Public Housing tenant information, while also helping with payroll and accounting. The WinTen 2+ modules can either be purchased as a bundle or individually.

Aside from its software suite, Tenmast also provides online training through Tenmast University, which consists of online video tutorials, webinars, and computer-based training. Lessons are followed by learning assessments to measure the knowledge obtained in the online course.

Tenmast promotes its online training program as an effective approach for PHA employees to build and retain knowledge and proficiency in Tenmast programs. Although some training is done onsite by Tenmast representatives (typically during the rollout of the tool), the majority of the training is accessible through the Tenmast University Portal.

Horizon Information Systems[33]

Horizon Information Systems is a software provider based in Johnstown, Pennsylvania. They design products that fulfill the needs of community non-profit organizations, human service agencies, and PHAs. The company focuses on developing business applications and designing software programs that fit its clients' business processes, and providing excellent customer service. A majority of its clients are based in the state of Pennsylvania as they are the service provider of 30 of 83 PHAs in the state. They also serve PHAs in West Virginia and Illinois[34].

Several PHAs in the Pittsburgh area have recently switched from Tenmast to Horizon[78]. The PHA managers explained that they switched to Horizon because the software has all of the functionality of Tenmast, but is much easier to customize and the company offers fast customer service. Nannette Livadas, manager of Mercer County's PHA, also explained that she chose to switch to Horizon in part because they wanted to support a local company. Interestingly, Horizon offers fewer training opportunities than Tenmast, but PHAs were more concerned with customization than training.

As with Tenmast, Horizon provides a series of modules that support many aspects of PHA operations, but Horizon's modules are much more customizable. Rent calculation is among these modules, but is not the focal point of the software suite.

[32] Livadas, Nannette. Personal Interview. September 24, 2013. Mercer County PHA. Sharon, PA.

[33]Horizon Information Systems, Inc. Horizon Information Systems. 2013. 23 November 2013 <http://www.horizon-is.com/>.

[34]Galucci, Dave. Personal Interview. November 9, 2013. Horizon Information Systems. Johnstown, PA.

In terms of customer support, Horizon offers many ways to receive assistance such as help documents and video tutorials. Horizon also maintains a knowledge database where clients can find questions asked by other clients. If a client's question has not already been answered in the database, clients can contact a customer service representative by phone or email.

Emphasys Software[35]

Emphasys Software serves clients in the public housing, housing finance, debt management, and residential real estate industries. The company employs licensed public housing managers in many roles of its PHA Division. Assisting housing agencies through its complete, integrated software products, Emphasys offers its clients workflow analysis, training, and extended software support hours. The Emphasys PHA Division has offices in Petoskey, Michigan and Livermore, California.

Emphasys provides educational services through online training, on-site training, conferences, and live case studies for PHA staff. Consulting services from Emphasys are available to PHAs through a customer service line that can be accessed via telephone, fax, e-mail, and live chat.

Unit4 Business Software[36]

Unit4 is a software company that designs and supports business software and services. Unit4 Business Software serves as the North American branch of Unit4, offering cloud-based software suites to businesses in public, private, non-profit and higher education organizations. As a $624 million dollar business, Unit4 has a broad range of customers in different industries worldwide. It has over 4,230 employees.

Unit4 Business Software targets five types of industries: service organizations, commercial, non-profits and NGOs, public sector, education and research, and travel management. Strictly looking at its public sector offerings, Unit4's Agresso ERP Software is aimed at local governments and PHAs.

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[35]Emphasys Software. PHA Division. Emphasys Public Housing Software. 2013. 23 November 2013. <http://emphasyspha.com/>
Livadas, Nannette. Personal Interview. September 24, 2013. Mercer County PHA. Sharon, PA
Sanetsky-Kish, Sharon. Personal Interview. October 22, 2013. Pittsburgh PHA. Pittsburgh, PA.

[36]Unit4. Unit4 Business Software. 21 November 2013. 11 November 2013 <http://www.unit4software.com/>.

Agresso ERP is marketed to PHAs as a way to adapt to changing HUD regulations and eliminate error prone processes. Like the other organizations listed above, Unit4 Business Software provides clients with the ability to customize its software.

Unit4 provides a large amount of in-person training during software rollout in order to teach the client how to troubleshoot problems themselves. The company also holds an annual user conference for clients to collaborate to learn the creative ways other organizations use their software. Unit4 also provides more conventional customer service options through a 24/7 customer support line including e-mail and chat functionality.

Hampden Technologies[37]

Hampden Technologies is a software company and consulting firm based in Lakeville, Massachusetts that focuses on cloud-based applications for different industries including: public housing, government, industrial manufacturing, retail distribution, energy, construction, and trade associations. It delivers services in systems analysis and design, database design, software development, user-interface design, and end-user training.

In the public housing realm, Hampden Technologies created the PHAnetwork. This public housing software manages all aspects of Public/Indian Housing and Housing Choice Voucher management. The PHAnetwork also provides the ability to perform mobile inspections using an iPad or iPhone. Hampden offers a 24/7 support line with an optional subscription to video training tutorials, an online help desk, and troubleshooting information.

HAPPY Software[38]

Based in Saratoga Springs, New York, HAPPY Software serves housing agencies across the country. "Housing Pro" is the company's software package for Section 8 and Public Housing agencies. This software consists of various modules that include an integrated reporting system to create commonly used reports for PHAs including PHAS, SEMAP, and VMS reports. The software allows PHAs to produce custom form letters and emails to applicants, tenants, and owners in both English and Spanish.

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[37] Hampden Technologies - PHAnetwork. PHAnetwork.com. 2013. 23 November 2013 <ttps://www.phanetwork.net/00Entrance/housing_authority_software.aspx>.

[38]HAPPY Software. HAPPY Software. December 2012. 23 November 2013 <https://www.happysoftware.com/>.

HAPPY Software provides extensive customer support. Clients have access to virtual on-site support with a remote assistance tool, a comprehensive online help system, training webinars, an online portal with documentation and training videos, and phone support in English and Spanish. The company touts the expertise of its support staff which is certified in housing management and has housing authority experience.

Appendix D: PHA Perspective

This appendix presents key insights derived from in-person visits to three PHAs that are located in the vicinity of Carnegie Mellon University —McKeesport, Mercer County, and Pittsburgh—and a call to the Allegheny County PHA. It also draws from an in-person visit to the regional HUD office in Pittsburgh and from six on-site stakeholder meetings that REAC conducted with PHAs about implementing an Online Recertification System (ORS). This document will elaborate on the following insights:

- PHAs consider errors low-priority amidst high workloads
- PHAs believe reducing workload would reduce errors
- PHAs prefer integrated software suites
- Current software already makes the math of rent calculation simple
- Occupancy specialists need to understand how to use the software

Two people with whom we spoke at housing authorities stated that there are "no errors" within the rent calculation process.[39][40] According to PHAs, software suites generally process calculations adequately because built-in calculators simplify the calculations, and modules with tenant information are integrated, helping to keep the information consistent throughout the process. PHAs view rent calculation errors as few in number, but acknowledged that some errors occur due to tenants providing incorrect information, either intentionally or accidentally. PHAs seemed supportive of a tool that would help elicit the correct information from tenants, but were unconvinced that their current tools are computationally inadequate.

We suspect that PHAs are underestimating the true number of errors and overestimating the ability of their current software tools. Specifically, we noted that some of the vendors' rent calculation tools may not ask for all of the information that is logically necessary to implement the *HUD Chapter 5* regulations. For example, when calculating a tenant's income from child support, the tenant needs to not only report income that they intend to actually receive, but also income that they could receive if they took the necessary legal steps[41]. Current software tools may provide a place to enter child support income, but appear not to prompt the user to consider

[39] Livadas, Nannette. Personal Interview. September 24, 2013. Mercer County PHA. Sharon, PA.

[40] Sanetsky-Kish, Sharon. Personal Interview. October 22, 2013. Pittsburgh PHA. Pittsburgh, PA.

[41] "Determining Income & Calculating Rent." Chapter 5. Occupancy Requirements of Subsidized Multifamily Housing Programs, 2013 ed. United States Department of Housing and Urban Development. Web. pp. 5-10 <http://portal.hud.gov/hudportal/HUD?src=/program_offices/administration/hudclips/handbooks/hsgh/4350.3>

child support payments that the tenant could be receiving under different circumstances. The simplified format of current software tools almost certainly excludes information that is necessary to correctly calculate rent, presumably resulting in at least some rent calculation errors.

Nevertheless, as Lee Atwater is reputed to have said: "Perception is reality", or at least marketers know it can be when trying to convince a customer to "buy" a product – even when the product is being given away for free (as REAC plans to do with its rent calculation tool). PHAs are much more concerned with occupancy specialist workload and tenant needs than rent calculation errors. Occupancy specialists are burdened by the large number of recertifications that they must perform. The recertification process is also onerous for tenants because they are often in difficult personal and financial situations.

Currently, PHAs spend a considerable amount of time handling recertifications. The total processing time undoubtedly varies by PHA and tenant type, among other factors; but one of our advisory board members provided the example below, which estimates how long it takes for the Mercer County PHA to process a recertification[42][43].

Public Housing

Interview	45 min
Send Verifications	30 min
Calculate Recertification	45 min
Total Cost	**2 hours**

Section 8

Interview	10-15 min
Send Verifications	20-30 min
Calculate Recertification	30-60 min
Total Cost	**1 hour – 1 hour 45 minutes**

While these calculations show the in-office time needed for each recertification, the total elapsed time often runs to at least 30 days, as the PHAs have to wait for income verifications to be returned.[44] Consequently, PHAs consider reducing occupancy specialists' workload to be a top priority. PHAs note that this workload reduction may even be a way of reducing errors:

[42] Livadas, Nannette, "Online Certification: Proposal," Housing and Urban Development, February 22, 2011.

[43] Livadas, Nannette. Personal Interview. September 24, 2013. Mercer County PHA. Sharon, PA.

[44] Sealand, Jesse. Message to Waslala Miranda. 7 November 2013. Email.

Mercer County's PHA staff stated that they know which individuals are incorrectly reporting their income, but their workload precludes them from investigating these suspected errors.[45]

Nannette Livadas, Manager of the Mercer County PHA and a former HUD employee, proposed a rent calculation tool that tenants could use from home.[46] Livadas' proposal is similar in concept to the Compass program, which is a part of the Pennsylvania welfare system[47]. PHAs expressed interest in a tool for tenant use because they believe such a tool would help save time for both occupancy specialists and tenants.

As discussed in Appendix C, PHAs currently use software suites to help manage everything from rent calculations to accounting. A distinguishing factor PHAs noted that separated their preferred software vendors from others is the way that tenant information is automatically transferred between different parts of the rent calculation process. Figure 1 shows a screenshot of a module within Horizon's software suite. Horizon is a vendor that some PHAs

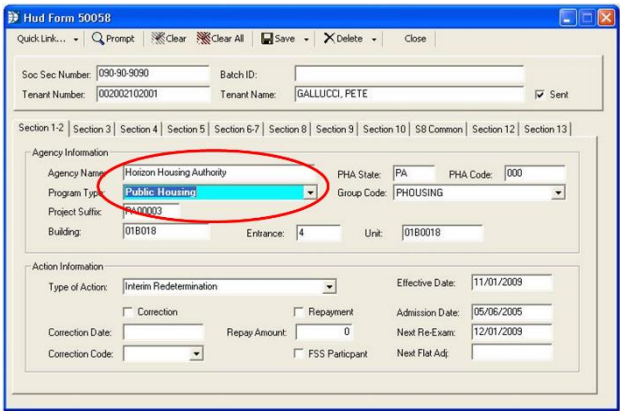

Figure 1

consider to be a good example of a user-friendly software with modules that integrate tenant information.[48] An occupancy specialist can use the drop-down menu (circled in red in Figure 1) to automatically transfer all of a tenant's information from one housing program to another. Occupancy specialists explained that this functionality helped them avoid the transcription errors that would otherwise cause inconsistencies when tenants transfer between programs.

[45] Livadas, Nannette. Personal Interview. September 24, 2013. Mercer County PHA. Sharon, PA.

[46] Livadas, Nannette, "Online Certification: Proposal," Housing and Urban Development, February 22, 2011.

47 See the accompanying Executive Considerations document for more information about Compass.

48 "50058 Processing," Horizon Information Systems, accessed December 5, 2013, http://www.horizon-is.com/housing/50058.asp

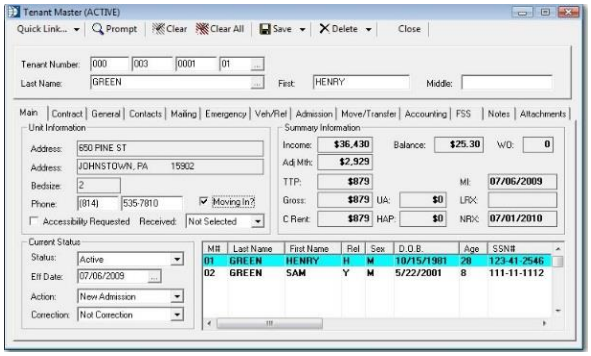

Figure 2

Figures 2 and 3 are screenshots of Horizon's built-in calculators that show a simple data input process.[4950] Figure 2 shows the Advanced Tenant Search, which allows an occupancy specialist to search the software's database to find tenant information. This search functionality helps PHAs identify tenants with characteristics that are generally associated with a higher risk

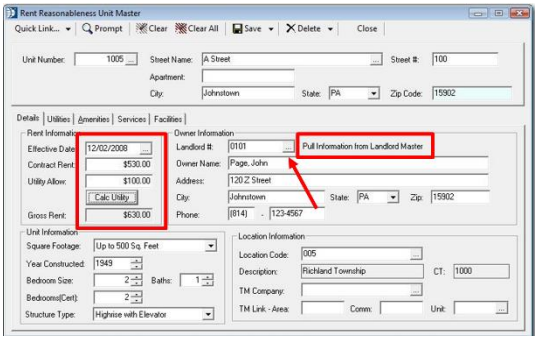

Figure 3

of rent calculation errors, such as larger earned income and household size.[51] Figure 3 shows the Rent Reasonableness module which allows a PHA to calculate the rent of a Section 8 unit. The PHA staff thought that the built-in calculators in this module were especially helpful. In addition to these calculators, some PHAs explained that they double-check calculations by hand. They consider these hand calculations as insurance against HUD audits (some PHAs insist on keeping hard copies of all paperwork for the sole purpose of audit preparedness, despite the fact that HUD rules only require them to keep soft copies of files).[52]

[49] "Tenant Management," Horizon Information Systems, accessed December 5, 2013, http://www.horizon-is.com/housing/TenantManagement.asp

[50] "Section 8 Management," Horizon Information Systems, accessed December 5, 2013, http://www.horizon-is.com/housing/Section8.asp

[51] U.S. Department of Housing and Urban Development, "FY 2012 Agency Financial Report" (Washington, D.C.: HUD) 2012, 195.

[52] Molinaro-Thompson, Jacqueline. Personal Interview. November 15, 2013. HUD Pittsburgh Field Office. Pittsburgh, PA.

While software suites provide some modules to help with the rent calculation process, they often stop short of being useful beyond the basic rent calculation. REAC's concept of a TurboTax-like tool could meet the needs of occupancy specialists in a way that existing software suites fail by presenting the rent calculation process through a sequence of guiding questions.

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