Assessment of the Potential for Application of Gamification in Community Association Reserve Study Education

Abstract.

Today, in the US, 29% of the housing stock is comprised of units within a community association, and it is estimated that by 2040, the community association housing model will be the most common form of housing. Similarly, there is a growing trend of state legislation mandating that community associations have reserve studies, and or, establish reserve funds for capital improvement projects. However, in most instances, community members are only exposed to or learn about reserve planning from their property manager or the reserve specialist contracted to perform the reserve study, and this exposure or teaching may be inadequate or discontinuous, thus rendering community members unable to fully participate in the reserve planning process. In light of these trends and existing deficits in knowledge, the issue of effective reserve planning education for community association members is growing in eminence. A well-crafted tool that incorporated gamification elements with relatable situational conditions and rules, and challenges aligned with the learning objectives, will be an effective tool for engaging laymen and teaching them about the complexities of this subject matter. This paper seeks to explore the potential for utilizing gamification in the context of education of community members about community association reserves by analyzing successful applications of gamification in education and urban planning.

Key words: reserve planning, reserve study, gamification, community association, community education

Introduction

Community Associations in the US. The Foundation for Community Association Research (FCAR) estimates that in 2023 30% of the US population lived in community associations, and in 2023 there were approximately between 365,000 community associations, with approximately 28.2million housing units and 75.5 million residents. Community Associations are a legal entity that facilitates the preserving, maintaining and enhancing of homes and property communally (Community Association Institute (CAI), 2017). For the community association to effectively achieve the aforementioned goals, it must be able to enter into contractual agreements, to raise capital in the market, and take on the role of plaintiff and defendant in courts as a legal entity, and therefore community associations are registered as such in appropriate state registers. According to the CAI (2017), community associations are characterized by three core elements: (i) mandatory or automatic membership upon purchase of property (that is, membership is not voluntary); (ii) all owners are governed by binding legal documents; and (iii) there are mandatory lien-based economic charges or assessments that are imposed on each owner for the operation and maintenance of the community association. In the US, there are three main types of community associations – homeowner associations (HOAs), condominium associations, and housing co-operatives.

The number of community associations has been steadily increasing in the last half a century as illustrated in Figure 1. During that period, there was a brief decline in the number of housing units from 2015 to 2017 (Table 1), but otherwise there had been a steady increase in the number of units available. Despite the decrease in the number of units during this period, the number of residents has never had a decrease in the last half a century. In fact, after 2017 there was a jump in the number of residents.

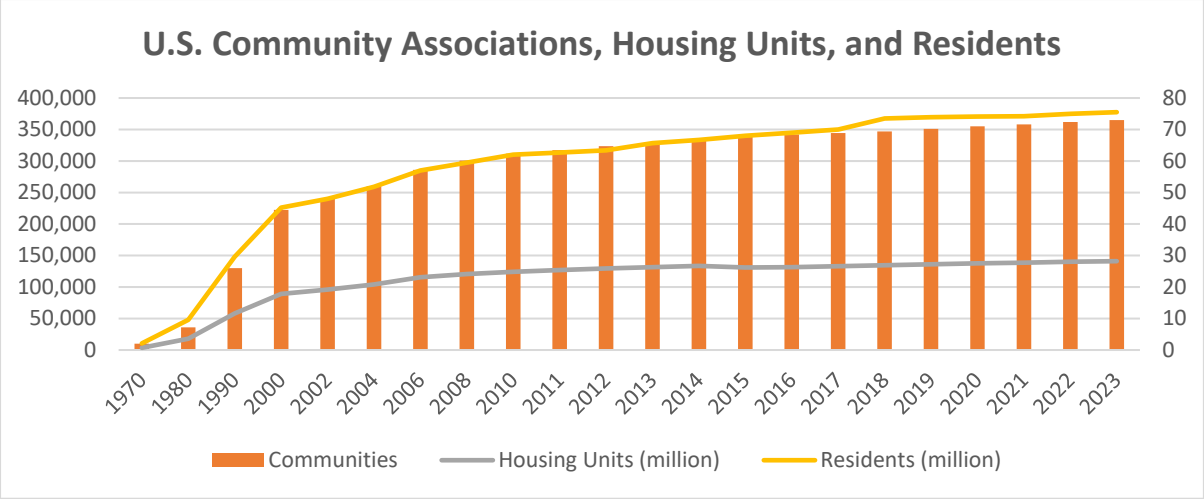

Figure 1: Graph of US Community Associations, Housing Units and Residents. Source: https://foundation.caionline.org/wp-content/uploads/2024/01/2023StatsReviewDigital-002.pdf

Year	Communities	Housing Units (million)	Residents (million)
1970	10,000	0.7	2.1
1980	36,000	3.6	9.6
1990	130,000	11.6	29.6
2000	222,500	17.8	45.2
2002	240,000	19.2	48.0
2004	260,000	20.8	51.8
2006	286,000	23.1	57.0
2008	300,800	24.1	59.5
2010	311,600	24.8	62.0
2011	317,200	25.4	62.7
2012	323,600	25.9	63.4
2013	328,500	26.3	65.7
2014	333,600	26.7	66.7
2015	338,000	26.2	68.0
2016	342,000	26.3	69.0
2017	344,500	26.6	70.0
2018	347,000	26.9	73.5
2019	351,000	27.2	73.9
2020	355,000	27.5	74.1
2021	358,000	27.7	74.2
2022	362,000	28.0	75.0
2023	365,000	28.2	75.5

Table 1. US Community Associations, Housing Units and Residents. Source: https://foundation.caionline.org/wp-content/uploads/2024/01/2023StatsReviewDigital-002.pdf

Of these figures, homeowner associations account for about 58 - 63% of the totals, condominiums account for 35 – 40%, and cooperatives account for 2 - 4% of the totals (CAI, 2023). Furthermore, a tally of the figures in Table 2 reveals that approximately 45 million persons currently reside in states which either require reserve studies or reserve funds for community associations. This figure represents 13% of the population of the US. Additionally, approximately $17 billion is collected annually in reserve funds

in these same states. As mentioned before, community associations represent a significant portion of the overall housing stock in the US – 30%. The CAI (2022) anticipates that by 2040, the community association housing model will be the most common form of housing. With the ever-increasing prevalence of the community association housing model, and with more and more states legislating the commissioning of reserve studies by community associations, and additionally, the establishment of reserve funds by community associations, it is imperative the members of community associations, the property owners themselves, have a firm grasp on the function of the instrument and various mechanisms that can be applied to fund reserves. Furthermore, the insurance market related to community associations is becoming stricter, and insurers are seeking more assurances from community associations that they have preventative and proactive maintenance plans in place to avoid community disasters. Considering this trend of community associations becoming more common as a housing modality, increasing demands for communities to maintain their properties under normal conditions, as well as be resilient against the ever-increasing frequency and intensity of climate events, the issue of effective reserve planning is growing in eminence. This paper explores using gamification as a modality to educate community association interest holders about reserve planning.

States which require Reserve Study	States which require reserve funds	Number of Associations	Rounded Estimated Number of Residents in Associations	Reserves (total funds collected annually)
California		50,700	14,401,000	$4,919,000,000
Colorado		11,300	2,497,000	$981,000,000
	Connecticut	5,100	468,000	$182,000,000
Delaware	**Delaware**	1,500	100,000	**$40,000,000**
Florida	**Florida**	**49,800**	**9,524,000**	**$3,814,000,000**
Hawaii	**Hawaii**	1,500	294,000	**$100,000,000**
	Illinois	19,550	3,900,000	$1,497,000,000
Maryland	**Maryland**	**7,100**	**1,062,000**	**$399,000,000**
	Massachusetts	11,500	1,676,000	$646,000,000
	Michigan	8,650	1,439,000	$574,000,000
	Minnesota	7,950	1,556,000	$609,000,000
Nevada	**Nevada**	**3,700**	**551,000**	**$208,000,000**
	Ohio	8,750	1,654,000	$670,000,000
Oregon	**Oregon**	**4,100**	**580,000**	**$230,000,000**
Utah		3,650	644,000	$205,000,000
Virginia		9,100	2,050,000	$790,000,000
Wash. State		10,850	2,453,000	$942,000,000
	TOTAL	214,800	44,849,000	$16,806,000,000

Table 2: States which require reserve studies and states which require reserve funds. Source: 2023 U.S. National and State Statistical Review. https://foundation.caionline.org/wp-content/uploads/2024/01/2023StatsReviewDigital-002.pdf

The paper first sets the context by defining community associations in the US context and presenting data of trends in the housing market. Next, is an overview of what is a reserve study and its relevance and prevalence to the US housing market. This is followed by a section on the various models for community engagement, as the research is seeking to explore the potential for utilizing gamification as a model for community education on the topic of reserve studies and reserve planning.

What is a reserve study? As with many other kinds of investment, community associations require an operating and maintenance budget. Additionally, funding will be needed for capital improvement projects, to ensure the continued quality, safety and security of life within the community. A reserve

study is an evaluation of the physical components and maintenance needs of a property or community, such as a condominium, homeowner association, or commercial building. According to the American Reserve Professionals Association (APRA)(n.d.), a reserve study "is a budgeting tool intended to aid the directors of Community Associations or other entities responsible for maintaining residential property, retail property, special districts or any other physical plant/property for the future repair, replacement, and restoration of major components of the common areas during the Economic Life of a property."

The purpose of a reserve study is to determine the expected lifespan of the property's major components, such as roofs, HVAC systems, elevators, parking lots, and other structural and mechanical elements, and estimate the cost of replacing or repairing them when they reach the end of their useful life. This information is used to develop a long-term funding plan for the property's reserve fund, which is a savings account set aside for future repairs and replacement of major components. The reserve study helps property managers and owners to make informed financial decisions and avoid unexpected expenses.

The reserve study is typically done by a reserve analyst or a reserve specialist who is a professional with expertise in engineering, architecture or construction. There are two components of a reserve study—a physical analysis and a financial analysis. During the physical analysis (Figure 2), the reserve analyst examines the physical status and repair/replacement cost of the association's major common area components such as exterior walls, retaining walls, sidewalks, roofs, etc. The analyst compiles a component inventory, a qualitative (and also possibly quantitative) condition assessment, and life and valuation estimates. Alongside the physical analysis is the financial analysis (Figure 3) which assesses only the association's reserve balance or fund status (measured in cash or as percent funded). This then forms the basis of the recommendation(s) for appropriate reserve contribution rates (funding plan) (Figure 4). The funding plan presents recommendations based on one of the following goals: full funding[1]; threshold funding[2]; statutory funding[3]; or baseline funding[4]. In addition to these goals, the funding plan should have sufficient funds when required by the association, maintain a stable contribution rate over the years, maintain evenly distributed contributions over the years, and be fiscally responsible by incorporating reasonable considerations for inflation and interest. Typically, reserve studies are conducted every three to five years.

[1] Fully Funded - Setting a Reserve Funding goal of attaining and maintaining Reserves at or near 100% funded. https://www.apra-usa.com/APRA-Standards

[2] Threshold Funding - Establishing a Reserve Funding goal of keeping the Reserve Balance above a specified dollar or Percent Funded amount. Depending on the threshold this may be more or less conservative than "Fully Funded". Ibid.

[3] Statutory Funding - Establishing a Reserve Funding Goal of setting aside the specific minimum amount of funds required by applicable statutes. Ibid.

[4] Baseline Funding - Establishing a Reserve Funding goal of keeping the Reserve cash balance above zero. Ibid.

Line Item	Total Quantity	Per Phase Quantity	Units	Reserve Component Inventory	Estimated 1st Year of Event	Life Analysis, Years Useful	Remaining	Costs, $ Unit (2019)	Per Phase (2019)	Total (2019)	30-Year Total (Inflated)	RUL = 0 FY2019	1 2020	2 2021	3 2022
				Exterior Building Elements											
1.020	40	**40**	Each	Awnings, Canvas and Frame	2029	10 to 15	10	1,500.00	60,000	60,000	**195,492**				
1.060	33,300	**33,300**	Square Feet	Balconies, Concrete, Repairs and Waterproof Coating Applications	2023	8 to 12	4	15.00	499,500	499,500	**2,262,199**				
1.100	5,550	**5,550**	Linear Feet	Balconies, Railings, Metal, Paint Finishes and Capital Repairs	2020	6 to 8	1	9.50	52,725	52,725	**334,199**		54,201		
1.105	5,550	**5,550**	Linear Feet	Balconies, Railings, Metal, Replacement	2034	to 50	15	80.00	444,000	444,000	**671,861**				
1.140	160	**32**	Each	Chimney Caps, Metal, Phased	2021	to 25	2 to 22	400.00	12,800	64,000	**117,833**			13,527	
1.240	17,400	**1,740**	Linear Feet	Gutters and Downspouts, Aluminum, Phased	2027	15 to 20	8 to 17	8.50	14,790	147,900	**308,386**				
1.400	197,730	**19,773**	Square Feet	Roofs (Replace with Thermoplastic), Phased	2027	15 to 20	8 to 17	10.00	197,730	1,977,300	**4,122,863**				
1.820	278,500	**139,250**	Square Feet	Walls, Masonry, Inspection, Repairs and Paint Finishes, Phased	2022	8 to 12	3 to 8	1.80	250,650	501,300	**2,372,012**				272,300
1.865	1	**1**	Allowance	Walls, Siding, Wood, Paint Finishes and Partial Replacements	2023	8 to 10	4	26,800.00	26,800	26,800	**121,375**				
1.980	40	**40**	Each	Windows and Doors, Entrance System	2025	45 to 55	6	14,000.00	560,000	560,000	**660,917**				
				Interior Building Elements											
2.200	720	**720**	Square Yards	Floor Coverings, Carpet, 2015 (Incl. Rubber Stair Treads)	2025	8 to 12	6	108.00	77,760	77,760	**372,167**				
2.201	1,200	**600**	Square Yards	Floor Coverings, Carpet, Remaining (Incl. Rubber Stair Treads)	2019	8 to 12	0 to 1	108.00	64,800	129,600	**681,302**	64,800	66,614		
2.560	330	**110**	Each	Light Fixtures, Phased	2024	to 25	5 to 21	80.00	8,800	26,400	**58,021**				
2.700	40	**40**	Each	Mailbox Stations	2028	to 35	9	1,600.00	64,000	64,000	**82,057**				
2.800	29,100	**14,550**	Square Feet	Paint Finishes, Phased	2020	8 to 12	1 to 6	1.20	17,460	34,920	**156,353**		17,949		

Figure 2. Sample excerpt from a reserve study showing reserve expenditures

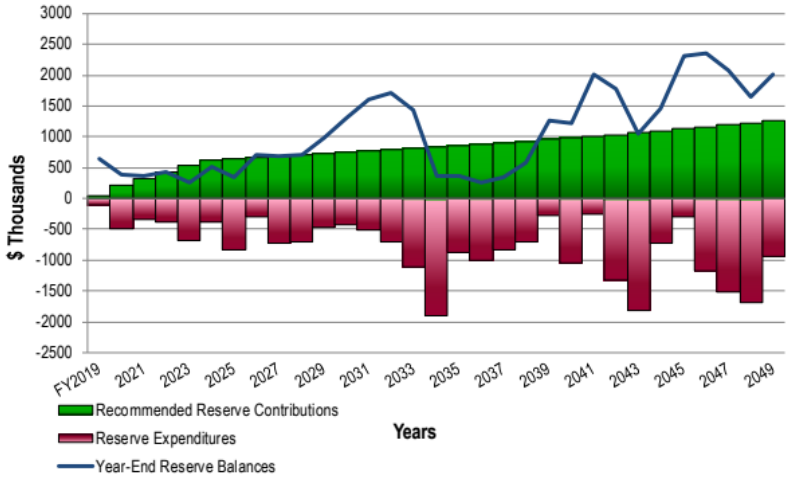

Figure 3. Sample recommended reserve funding graph

Individual Reserve Budgets & Cash Flows for the Next 30 Years

		FY2019	2020	2021	2022	2023	2024	2025
	Reserves at Beginning of Year (Note 1)	698,000	648,589	386,390	372,657	422,020	266,558	514,136
	Total Recommended Reserve Contributions (Note 2)	**50,000**	**222,000**	**324,000**	**426,000**	**528,000**	**630,000**	**647,600**
Plus	**Estimated Interest Earned, During Year (Note 3)**	6,144	11,261	8,259	8,646	7,492	8,494	9,253
Less	**Anticipated Expenditures, By Year**	(105,555)	(495,460)	(345,992)	(385,283)	(690,954)	(390,916)	(834,667)
	Anticipated Reserves at Year End	$648,589	$386,390	$372,657	$422,020	$266,558	$514,136	$336,322
	Predicted Reserves based on 2019 funding level of: $120,000	648,589	283,268	61,022	(205,837)	(787,600)		

Figure 4. Sample reserve funding plan

The Gamification Model.

Gamification has penetrated many facets of modern-day life and has become normalized through seamless integration with the tools we use everyday. Perhaps one of the earliest examples of gamification was the loyalty programs of airlines which offered "rewards" to customers who performed desirable behaviors, namely, they were repeat customers of the airline. Since then, innumerous other

merchants and service providers have developed loyalty programs, and to enhance the experience many now utilize mobile phones as the interface for the dashboard which visualizes customers' gains/rewards.

Ever increasingly, gamification is integrated into our lives, to the point that it has become an inconspicuous mode of user interaction. According to Deterding et al. (2011), gamification is the use of game design elements in non-game contexts whereby the application of game design principles, mechanics, and aesthetics to non-game circumstances, with the aim of enhancing engagement, motivation, and/or behavior change is underlined. They emphasize that gamification can entail a range of elements, and that the effectiveness of gamification depends on how well these elements are designed and implemented. Features of games such as social interaction and collaboration; challenges and quests; storytelling and narrative; points and scoring; levels and progression; badges and achievements; leaderboards and rankings; rewards and incentives; feedback and progress tracking contribute to the effectiveness of gamification (Rahman et al., 2018, Schöbel et al., 2020).

Methodological Approach

The methodological approach for this assessment consisted of four key activities:

1. Review of applications of gamification in education and urban planning and identifying how various elements of gamification are articulated in these applications.
2. Informal interview with CAI members via the CAI online member forum.
3. Review of existing reserve planning software and platforms and an examination of their feasibility as tools for teaching about reserve planning and its process.
4. Review of existing reserve study analyst training curriculum and identification of relevant elements/topics that can be incorporated into the curriculum that could be taught to community members through a gamification model.

During the review of gamification applications in education and urban planning, numerous scholarly papers were examined particularly those that focused on the assessment of various games or gamified applications. This review (Table 3) was instrumental in highlighting which games and applications to focus on for generating the subsequent shortlist that was then examined in depth to identify which gamification elements were present. The results of this review are presented in.

In order to determine if there already existed any programs or tools for educating community members about reserve studies and reserve planning, and whether could be needed or desired, an informal interview of a vast pool of stakeholders was conducted via the CAI online community forum. This group comprised current members of the CAI and included unit owners, community board members, property managers, and service providers/contractors. The questions were posted in the forum in a new thread, and respondents responded directly in the forum. All responses were visible to all users of the forum. Respondents responded over a two-week period.

Next, a review of existing reserve planning software and platforms was conducted. One limitation to this review was that the researcher was unable to gain access to these software and platforms and so was unable to explore through direct utilization. Instead, the assessment comprised a review of the product data websites of these tools.

In the next phase, there was an examination of existing reserve study analyst training programs and their respective curricula. Course descriptions of various courses were perused, and relevant elements identified for incorporation into the prospective curriculum that would form the basis of the reserve planning education tool.

Gamification Applications in Urban Planning and Education

Apart from use in the retail sector, gamification has also gained widespread use in the context of government, governance and education, and more specifically in the engagement of citizens in urban planning processes. Notable examples of government innovation labs that have developed game applications to address some of their respective city's challenges include: Mexico City's Laboratorio Para La Ciudad; Dublin's The Studio; Boston and Philadelphia's Offices of New Urban Mechanics; Copenhagen's MindLab; San Francisco's Office of Innovation; and Singapore's Human Experience Lab. Further, specific examples of research on urban projects which incorporate ludic elements include civic games related to the planning of public spaces in Hamburg, Germany and in Hasselt, Belgium; the Mobile City research group's project called Hackable City; Community PlanIt which was developed by the Engagement Lab at Emerson College in Boston. It is worth noting the overlap between government applications and the urban realm of many of these applications.

Key to this investigation are the instances in which elements of gamification were incorporated into various applications to facilitate learning, engagement and collaboration. Four game applications were examined in terms of the gamification elements incorporated in their design. For this study Cities: Skylines, Community PlanIt, Hurricane Hurry, and FoldIt were examined. The applications were assessed in terms of the aforementioned gamification features. Table 3 summarizes the findings of the assessment.

Table 3. Comparative analysis of various games and their gamification elements

Thematic Area				
	Urban Planning		Financial Management	Bio-engineering
	Cities: Skylines	Community PlanIt	Hurricane Hurry	FoldIt
Synopsis	Cities: Skylines introduces game play elements to simulate creating and maintaining a city and also includes the ability to modify the game to suit your play style as a fine counter balance to the layered and challenging simulation. (Paradox Interactive, n.d.) At theT Department of Real Estate, Planning and Geoinformatics at Aalto University School of Engineering, Haahtela et al. (2015), determined that the Cities could be an effective learning tool if it was modified to address some major shortcomings such as lack of land ownership.	An online platform that utilizes gamification elements to engage community members in the urban planning process, and which aims to make the urban planning process more accessible, enjoyable, and inclusive (Office of New Urban Mechanics, 2017). After a successful pilot in Boston, the tool was then adopted by other US cities.	Developed by the World Bank, this is an interactive role-playing game to help stakeholders confront individual and collective challenges around balancing investments in disaster risk management and financing (Global Facility for Disaster Reduction and Recovery (GFDRR), 2023). The game was initially developed as a board game, but later evolved to a hybrid game with some elements of gameplay hosted online. It was originally used to teach about disaster risk financing to government officials, but now in its latest version, the game is used as an educational tool for young students. The game and subsequent discussion are typically facilitated during a training event on disaster risk financing.	An online application whose original goal is to solve protein-structure prediction problems in AIDS research by utilizing the lowest-energy proteins through online collaboration. It has evolved to target research in protein design to treat diseases, small molecule design to invent new drug compounds, and protein structure solving to map the molecules that drive biology. A key aspect is the platform is that the discoveries made by players are published in peer-reviewed research journals and Foldit players are always credited for their contributions (Center for Game Science, University of Washington), n.d.).
Challenges and Quests:	✓	✓	✓	✓
Points and Scoring:		✓	✓	✓
Levels and Progression:	✓	✓	✓	
Badges and Achievements:		✓	✓	✓
Feedback and Progress Tracking:	✓	✓	✓	✓
Social Interaction and Collaboration:		✓	✓	✓
Storytelling and Narrative:	✓	✓	✓	✓

As presented in the examples above, gamification has emerged as a force in many markets, and the market for gamification itself has boomed in the last decade and is projected to continue to grow in the coming decade. Data suggests that as much as 70% of Global 2000 companies (the world's largest 2,000 companies) (as cited by McCormick, 2013) use gamification in their operations, 30% of employees agree that game-based learning is more engaging and 61% of US employees receive training with gamification while at work (this distinction is made from other sources of training that persons may undertake). With the prevalence of gamification across many sectors and contexts, and its utilization to nudge desirable behaviors such as healthier lifestyle activities and education, it is a viable modality for educating community residents on reserve planning.

Existing Reserve Planning Software

There exist a few software applications that community associations can access to conduct their own reserve analysis. The Reserve Analyst (**Figure 5**) application has been in existence for about 20 years. Its strength as a reserve planning tool lies in the level of detail that it accommodates, and in turn can produce more accurate analyses. However, the tool is not very user-friendly, the interface is outdated, and to produce meaningful results, great effort must be put into inputting data to the platform. As a tool for analysis, Reserve Analyst, is proficient. However, for a layman, or a novice who is unfamiliar with the details of reserve planning, this tool will not be effective for learning the fundamentals.

Figure 5. Screenshot of Reserve Analyst© interface(Source : https://www.prasystem.com/)

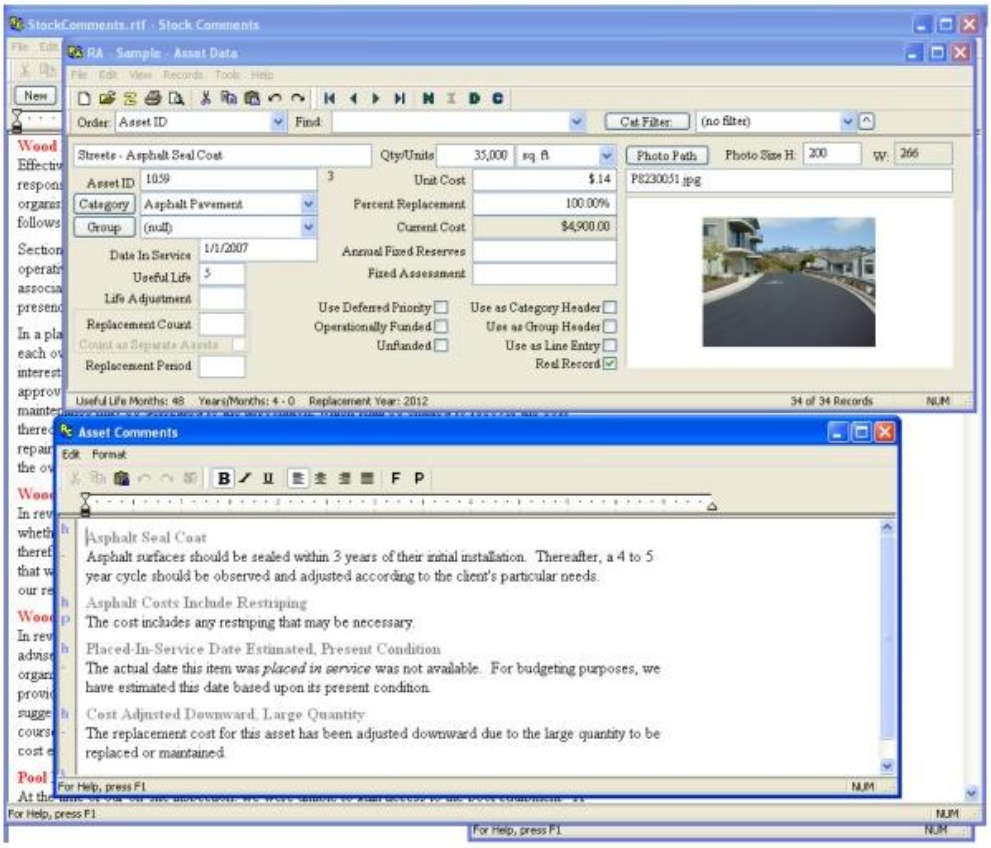

Figure 6. Screenshot of the PRA interface ***(Source : https://www.prasystem.com/)***

Another application available is the Property Reserve Analysis (PRA) () System (Figure 6) which was developed in 1989 to support individuals, HOAs and timeshare/vacation ownership to prepare reserve management plans/studies. This too is another effective tool for carrying out reserve studies and planning analyses, but in terms of being a good tool for exploration of and education on the fundamental concepts and relations of reserve planning it is not appealing, user-friendly or engaging. In summary, these two tools, while proficient for the objectives they are designed to meet, cannot be utilized as tools for education purposes. Apart from these and other tools/applications designed to assist with the execution of reserve studies, there does not exist any tools/applications for education through a process of discovery for persons with little or no knowledge or prior background in working on or understanding reserve studies. Outreach to community association professionals and activists[5] also confirms this finding, and furthermore, several respondents affirmed that such a tool would indeed be useful and desired.

A Framework for Gamification of Reserve Study Education

Computer games and other simulations have for many years been used as a teaching method because they offer a comprehensive, but simplified view of the reality to learners who can engage with a hands-on approach to the presented problems. As a teaching method, games are effective because they present competitiveness and can allow the player to see the results of decision-making in real time. So then comes the question of what topics can be incorporated in a game designed for reserve planning education; what are some gamification features that can be employed.

[5] A query was posted on the CAI Members Open Forum in April 2023 and responses from 8 other CAI members were received.

To gain better understanding of the topics taught to persons seeking to become certified Reserve Analysts/Specialist, the curriculum of one such specialized course was examined. It should be noted that there are very few official courses that focus on training and certify Reserve Specialists. In the US, individuals wishing to become a credentialed Professional Reserve Analyst (PRA) must meet the following requirements: (i)belong to an APRA Member Company; (ii) have at least 5 years full-time experience doing reserve studies; and (iii) provide a list of 50 site inspection reserve studies. There is no specific educational requirement. In Canada, the credential of Certified Reserve Planner (CRP) is offered by the Real Estate Institute of Canada (REIC). To obtain this credential one must have 3 Years related industries experience; or 1 Year experience working with a CRP or submit a minimum of 5 depreciation reports AND one must meet the educational requirement of Commercial Property Analysis, Real Estate Finance Basics, Financial Analysis with Excel, Fundamentals of Reserve Fund Planning, and Reserve Fund Planning Guided Case Study. While it is the intention to educate community member about reserve planning, the goal of this learning tool is not to comprehensively teach about reserve planning. Rather the intention is to give laymen / community members / unit owners a better understanding of the elements of reserve studies, and the application of reserve plans towards the execution of capital investment projects.

Therefore, after examining the curriculum of the Reserve Fund Planning Program of the Suader School of Business at the University of British Columbia in Canada, a range of topics were selected as recommended topics to be incorporated into the Reserve Study Education tool. Table 4 highlights the key subject areas from the Reserve Fund Planning Program that should be incorporated into proposed reserve planning education tool.

Overview of Depreciation Reports – Legislative Requirements & Methodology
Legislative Overview
Implications of Reserve Fund Studies for Property Managers and Owners
Reserve Fund Study Principles and Methodology
Identification Common Elements
Lifecycle Assessment
Life Span Analysis
Cost Analysis
Financial Analysis Accounting 101 for Condominiums/Stratas
Project Future Replacement Costs
Project Future Value of Current Reserve Funds
Calculate Current Reserve Fund Contributions Required

Table 4. Key subject areas from Reserve Specialist training program that should be incorporated into proposed reserve planning education tool (Source: https://www.sauder.ubc.ca/programs/real-estate/credit-programs/professional-development/cpd891-fundamentals-reserve-fund-planning)

To complement the topical content of the tool, an appropriate and enticing deployment environment needs to be developed to engage the user. As such, elements of gamification should be incorporated to enhance the user experience as they explore the tool and navigate the virtual landscape. Table 5 highlights potential gamification features and how they could be incorporated into the proposed tool/platform.

Gamification Feature	Proposed incorporation in the application/tool/platform
Social Interaction and Collaboration	Social interaction will occur via the associated forums and leaderboards. Perhaps team collaboration will not be possible among players as each player will engage with a scenario/narrative individually.
Challenges and Quests	Challenges may be bound to simulated temporal cycles similar to the temporal cycles of real life. For instance, some challenges may need to be completed within a simulated one-year or one-month time frame. Challenges may include successfully financing the virtual reserve fund and then executing capital improvement projects in time to avoid disaster.
Storytelling and Narrative	The contextual background of the tool will vary to depict various types of communities and spatial, spatial configurations, climate challenges, etc. Players could be given the opportunity to select certain characteristics of the community that they will play in.
Points and scoring	Scoring could be related to the successful and timely execution of capital reserve projects, while demerits can be allocated for tardy or complete failure to execute projects, non-pre-mitigated damage from natural disaster.
Levels and Progression	Progression should be bound to a temporal scale to emphasize the cyclical nature of property management. For example, Open carparks need to be repaved every 5 years; roofs need to be patched every 5 years, and replaced maybe every 15-20 years; upgrading of main plumbing lines usually calls for phased works over an extended period of time. Similarly, levels can be associated with time. For instance, a newly constructed community will not need to have a lot of money in its fund, nor will it have a lot of capital improvement projects upcoming. This could be considered as one level. While a community that is 10 years old is at another level because of the wear and tear on its elements leading to the need for upkeep or replacement.
Feedback and Progress Tracking	Perhaps this is the most important element to be incorporated into the tool. The ability for the player to experience the impact of their experiences immediately will facilitate learning while utilizing the tool.

Table 5. Proposals for incorporating gamification features in reserve planning education tool

With community association models becoming more and more prominent in the residential housing market, and increasing number of persons will have to navigate the federal, state and local legislation that govern these entities, as well as their respective governing documents such as by-laws, and rules and regulations. Further, there are other forces external to community associations that impact their existence. Today, one of the largest external forces is the insurance market. Across the US, home insurance rates are increasing and the number of providers is diminishing. A 2023 survey of insurance coverage trends in community associations found that 91% of respondents indicated that they had experienced an increase in insurance premiums during the previous or current period, with these increases amounting to between $101 - $500 increase per unit owner per year for a quarter of the respondents. For 9% of respondents the increase per unit owner per year was between $501 - $2000, and for 4% of respondents the increase was more than $2001. Insurance industry experts cited the age of the building as the leading contributing factor to rising premiums and cancellations. One strategy that community associations can employ to help manage the cost of their insurance premium is to demonstrate to insurance providers that the association is diligent with preventative maintenance and has a proactive plan for reducing risks to hazards. Having a reserve plan and actively undertaking recommended maintenance and asset replacement as outlined in the plan not only maintains the quality of life for the residents and protects their assets, but can also serve to help the association negotiate more favorable insurance premiums.

Another factor contributing to increasing insurance premiums are the losses incurred from climate events. Climate change has increased the frequency and intensity of disastrous weather events across the globe in recent years. The National Oceanic and Atmospheric Administration (NOAA) (2024) estimated that in 2023 there were 28 weather and climate disasters each resulting in losses of more than $1 billion. Reserve planning education will help homeowners better understand the various factors that interweave to impact the quality and cost of living in their community. Improving the unit owners and community member's knowledge the inner-workings of a reserve study as the foundation for financial planning for the community association, will improve their ability to engage in deliberations and informed decision making around financial management, assessments and investments in capital improvement projects.

What's more, apart from rising insurance premiums, community associations also have to content with rising inflation. Consumer Price Index (CPI) and Producer Price Index (PPI) for construction material and labor in particular impact construction cost and consumer prices, which in turn impact communities' ability to undertake capital projects as inflation diminishes the purchasing power of reserves faster than the reserve balances can increase from interest accumulated. Oftentimes, associations opt to defer projects when faced with the challenge of inflation. However, industry experts (CAI, 2023) advise that rising inflation ought to motivate the execution of projects, rather than delay them for the potential risks associated with delaying outweigh the current costs (FRAC, 2023).

In a 2015 survey, the FCAR found that only 64% of reserve specialists felt that most community mangers understood the importance of conducting and updating reserve studies, while only 23% felt the same about association board members. Further, the survey revealed that according to reserve specialist the common reasons that some associations are reluctant to conduct reserve studies are that they do not appreciate the long-term cost/benefit, the do not understand its importance, or they have real or perceived financial issues. Gamification can help simplify and increase engagement in the process of learning about reserve studies. It has the potential to simplify complex scenarios and concepts into easier to process.

Conclusion

While there has existed for many years tools which professionals can use to conduct reserve analyses, and while versions of these tools are also available for direct use by property managers and community members, these tools are quite complex and require the input of a lot of data before results can be churned out. There exists a gap in the market for a tool which can serve to educate laymen, non-reserve professionals, who are interested in learning more about reserve planning. The success of Hurricane Hurry in teaching government officials about disaster risk financing demonstrates that game platforms can be used to augment learning experiences. A well-crafted game with a relatable situational conditions and rules, and challenges aligned with the learning objectives will be an effective tool for engaging laymen and teaching them about the complexities of this subject matter. Future opportunities for research include surveying reserve professionals and property manages about their insights on opportunities and challenges for teaching community members about reserve planning. This analysis can then inform the development of a curriculum which would form the basis for developing storylines and virtual environments of the educational tool. Then, a pilot version of the education tool should be developed and deployed to a sample group to assess is usability and success in achieving the intended targets. With careful planning and innovative thinking, this educational tool can be used to enhance community engagement within community associations, and in doing so also improve the quality of life for residents who will be more knowledgeable and more empowered to participate in critical decision-making related to the elements of their common property.

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