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Gaming for Green

Gamification Strategies for Sustainability

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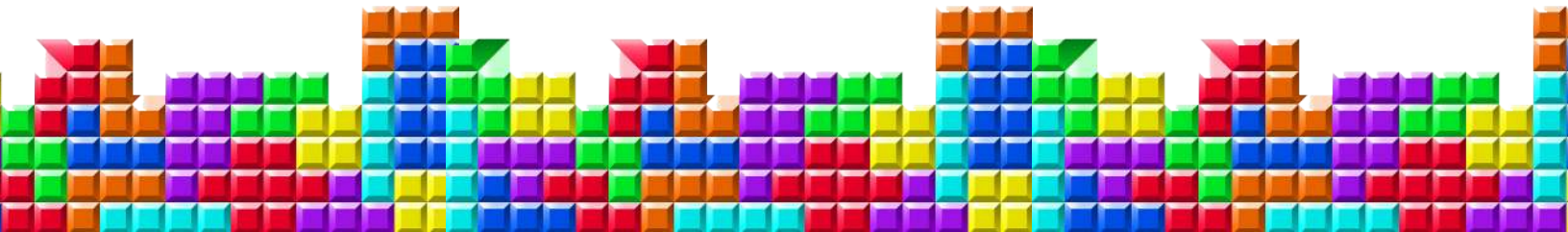
Designed by Nicki Aviel



I. Can Games Be Used for Sustainability?

Market

2.2 BILLION gamers worldwide

OVER 2/3 of Americans play video games

NEARLY 2/3 of Americans play mobile games

MARKET VALUE OF 80 BILLION DOLLARS

Today, games and reward systems are ubiquitous. Whether or not we realize it, reward systems play a critical role in our society, daily activities, and achievements. We receive monetary rewards for the work we do, grades for the assignments we turn in, and a feeling of purpose and satisfaction for achieving something of personal importance. We also use reward systems to affect the behavior of others. For example, when we give our pets treats for performing tasks correctly, or take our children out for ice cream when they get good grades. The very idea that a reward may be coming can drive behavior. A great example of this is casino games or raffles, where participants continue to gamble with or without rewards. The bottom line is that reward systems are a powerful way to shape our behavior and provide feedback.

The average person is perhaps most familiar with the use of games for pure enjoyment, with video games being the leading example. Video games have become increasingly popular and common in recent years with upwards of 2.2 billion gamers worldwide. It's estimated that over two thirds of Americans play video games, and nearly two thirds of Americans play mobile games. This translates into a market value of approximately 80 billion dollars, and is projected to steadily increase. Video games offer both individual entertainment and social engagement. Whether individuals connect by hovering over a bulky arcade game or via headset from their couches, video games provide tools for both competition and cooperation with others.

gam·i·fi·ca·tion

the application of typical elements of game playing (e.g. point scoring, competition with others, rules of play) to other areas of activity, typically as an online marketing technique to encourage engagement with a product or service.

Elements

To date, we have seen little emphasis on emotional connections or intrinsic motivators like social purpose or values as drivers for gaming. However, that does not have to continue. Engaging individuals through games in a social and competitive manner can be translated beyond the gaming world. However, achieving this same level of engagement relies on employing similar storytelling, feedback, and rewards mechanisms while working towards a goal with substantive impacts.

Reward systems, games, and gamification all possess some iteration of user engagement, point systems, and progression. However, gamification stands out by reaching players on a deeper more emotional level with the ultimate purpose of intrinsic motivation. Gamification harnesses technological infrastructure and storytelling to move people to action. There are a few key components which distinguish a gamified solution from a typical video game. While gamification can be fun and engaging, its principal purpose is to promote change. Gamified solutions are able to change behavior by using a game-like interface and are designed to motivate competition and cooperation, establish emotional connections, and promote skill mastery. The game should have a clear goal in mind so that through the amalgamation of individual behavioral choices and game playing it serves to promote change in a community, government, or business. These behavioral changes are achieved through a multi-faceted design that contains intrinsic and extrinsic motivators and should combine positive and negative feedback that is both evaluative and comparative.

However, gamification stands out by reaching players on a deeper more emotional level with the ultimate purpose of intrinsic motivation.

Intrinsic Motivation

Motivated to perform an acitivty for its own sake and personal reward

To engage players at a greater depth, intrinsic motivators are necessary and promote a more long-term meaningful engagement with a game and a community. Intrinsic motivators spark meaning in gameplay by offering players autonomy to direct the game, mastery over the task, and to be a part of something with a greater purpose. Intrinsic motivators promote longer-term use and more meaningful engagement. It also gives players the requisite flexibility and control over their involvement over the game, allowing them to define their individual purpose and understand how that fits into the greater purpose of the game. Intrinsic motivators can be supplemented by extrinsic motivators. These are transactional exchanges where individuals get money, rewards, or prizes for performing a certain task. The effect of such motivators is short-term engagement.

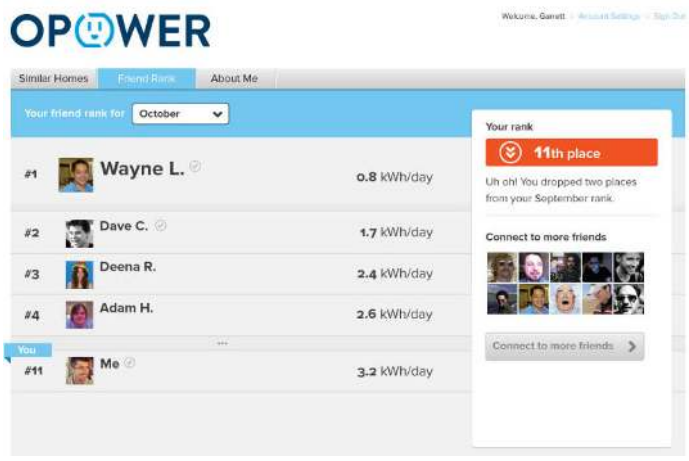
The disparity in behavioral change also exists with the type of feedback mechanisms employed. The three factors which contribute to the efficacy of feedback in games are the frequency, valence (positive or negative), and type (evaluative or comparative). Games should provide positive feedback at a greater frequency than negative feedback. Negative feedback promotes increased willingness to replay immediately, but positive feedback fosters long-term motivation and willingness to play again. Feedback type also influences player use. While evaluative feedback promotes willingness for immediate replay, comparative feedback increases likeliness that a player will engage long term. These feedback mechanisms can serve to inspire action through promoting competition and skill mastery.

Extrinsic Motivation

Motivated to perform an activity to earn a reward or avoid punishment

Messages promoting cost savings, positively impacting climate change, and being a good citizen triggered no marked response from individuals, but comparison to neighbors caused individuals to decrease energy consumption by 6%.

Behavior of peers influences a person's motivation. OPower, an UX Design company, formats utility bills so that they clearly display household consumption relative to one's neighbors. As compared to other techniques tested, this was the single most important factor in reducing consumption. Messages promoting cost savings, positively impacting climate change, and being a good citizen triggered no marked response from individuals, but comparison to neighbors caused individuals to decrease energy consumption by 6%. To date, OPower users have saved enough energy to replace the Hoover Dam. These results indicate the power of competition as a motivator for behavioral change.



OPower challenge page between Facebook friends.

In educational tools, like DuoLingo, gamified solutions are used to promote skill mastery. Language learners collect gems and points and wager them internally within the app based off of the amount of time per day they practice their chosen language. This feedback and incentivization for continued and consistent use is an example of how gamification can be used to incentivize skill mastery.

Gamified solutions also serve to establish an emotional connection or capitalize on an existing one. The Mario franchise exemplifies how individuals get emotionally invested in characters from games which further motivate their participation. Celebrating Japanese pride in the 2016 Olympic games in Rio the Japanese prime minister, Shinzo Abe, dressed as the Italian New Yorker Mario, mustached and chubby. This is a testament to Mario as a global icon as people continue to chronical his age. The emotional pull people feel toward Mario and his accompanying cast of characters is also highly profitable as Mario titles have amassed 558 million sale units from 1982-October 2016. Video games serve only to entertain while gamified solutions are aimed at driving real change, yet gamification can harness video game techniques to drive player engagement.

Application

Gamification in the environmental space can use comprehensive reports and leaderboards driving competition between individuals or departments. In harnessing that competition, gamification aims to promote skill mastery by reinforcing sustainable habits and the nature of sustainability as a worthy goal helps establish an emotional connection.

Promoting sustainability in corporations is a ripe platform for gamification techniques because it is a space in which individual behavioral change can impact shared goals of sustainability. Climate change exemplifies a collective action problem as it affects every individual on earth but paradoxically mass mobilization is especially challenging. The challenge of mass mobilization towards a shared goal is largely because it is difficult to coordinate action across a big number of people, but gamification can help improve and incentivize this coordination. Companies have access to a large employee base and can utilize gamified solutions to drive employee engagement for the purpose of reducing their environmental impact without making changes to infrastructure. Gamification in the environmental space can use comprehensive reports and leaderboards driving competition between individual or departments. In harnessing that competition, gamification aims to promote skill mastery by reinforcing sustainable habits and the nature of sustainability as a worthy goal helps establish an emotional connection. This emotional connection can be amplified by certain aspects of user experience that focus on environmental impact in real time.

Section II: Benchmarking Analysis

Characteristics

Sustainability is a complex systemic view of how to manage the finite resources on our planet with many approaches and stakeholders. This complexity makes sustainability hard to tackle, but at the same time allows for creativity in the problem-solving and storytelling approach. We believe that the emerging discipline of leveraging gamification to motivate individuals to create and maintain sustainable habits is a promising and far reaching one. However, with over 2 million mobile applications offered to users on the Apple Store alone, it can be difficult to find an engaging app that best suits an individual or company's needs in motivating sustainable action. This section presents the results from two benchmarking analysis exercises which examined the use of gamification for mobility and energy, water, and waste. The goal of these analyses was to identify some leading sustainability solutions, compare them with each other, and locate trends across applications. The analysis identifies the strengths and weaknesses of the applications so as to inform users on available options. Furthermore this deep-look allowed us to offer recommendations for future application of gamification to the sustainability field.

Table 1 provides overarching characteristics of the two categories of games. Rather than looking at individual games, it synthesizes the six components exhibited across different platforms which are necessary for a successful game. It defines these components with respect to mobility and waste, water, and energy — the two sectors we look at in the upcoming benchmarking analysis. The definitions given are common across all five games in each of their respective sectors.

Table 1

Game Characteristics

Game Component	Mobility Solutions	Energy / Water / Waste Solutions
Business Outcomes and Success Metrics	Engage and incentivize employees to opt for ridesharing, public transit, biking or walking to work. This increases employee retention and engagement and reduces costs associated with parking	Engage community members and promote sustainable actions. Success metrics can include number of participants, gallons of water saved, Kw electricity reduced, waste diverted, and CO2 reductions.
Target Audience	People who have a desire to change their commute habits and save money. Employers who wish to be socially responsible	People who have access to mobile devices and use them regularly (need to log actions/habits), and people who are care about the environment and want to make a measurable impact
Player Goals	Goals include both saving and earning money while living a healthier lifestyle. It also builds community and promotes competition with peers	Goals include racking up points, badges, and/or rewards for completing sustainable activities. Players aim to create new habits and reduce footprint in the process.
Engagement Model	Engagement from employers and municipalities incorporating leaderboards and an interface which allows people to connect with neighbors and coworkers	Players can compete against friends and community members in order to see who achieves more points or impacts (sometimes within a given time period or geographic space).
Play Space and Journey	Most play spaces serve to connect carpool matches and plan and schedule commutes. They also consist of leaderboards and reports which include CO2 reduction and savings.	Players can navigate through various habits and actions at work and home. Players earn more points with rising complexity and impact of activities.
Game Economy	The economy can vary from points on a leaderboard, credits towards gift cards and free goods, and actual cash rewards	Fun, social capital, satisfaction, points, rewards, badges, and trophies

Waste, Water & Energy

This analysis focuses on applications meant to foster a more environmentally conscientious community through the gamification of sustainable living. This can include actions that impact a user's carbon footprint, energy usage, water consumption, or waste generation. These applications aim to form habits through notification systems and frequent usage. Players are encouraged to participate by competing for points and seeing how they stack up to their friends and fellow players. Through research we have identified the following applications to be suitable for the benchmarking analysis:

Oroeco makes it fun and rewarding to help solve climate change. In this application, players can learn about and track their impacts, earn badges, go up levels, connect and compete with friends and family, and see how they can improve their carbon offsets.

TODAY helps users track their positive impacts while connecting environmentally conscientious consumers with eco friendly businesses. TODAY helps create daily habits and offers challenges and tracks personal impacts.

JouleBug motivates people to engage in sustainable actions throughout their day by logging actions and earning points. Users can learn about each action with tips, helpful links, and statistics about the actions' impact. JouleBug allows people to participate in challenges, add friends, earn badges, and more.

EcoCRED first establishes your baseline carbon footprint and then pushes users to actively reduce their impacts. The app then gives you fun and relevant ways to reduce your carbon emissions while earning points and participating in challenges.

Each application addresses different environmental impacts (see Table 2). These includes water, waste, energy, electricity and CO_2. While most applications allow the user to establish habits or complete actions in every impact category, not every application reports overall impact the same way. For example, JouleBug reports each participant's impact in terms of gallons of water saved, pounds of waste diverted, and pounds of CO_2 reduced. Alternatively, EcoCRED exclusively reports overall impact in terms of CO_2 equivalent. Table 2 illustrates how each application has chosen to report user impact.

Impact Categories for Each Application in the Benchmark Analysis

Application	CO_2	Water	Energy/Electricity
JouleBug	✓	✓	
Oreco	✓		
TODAY	✓	✓	✓
EcoCred	✓		

Table 2

Successful and Unsuccessful Components of Applications in the Benchmarking Analysis

Application	What We Liked	What We Didn't Like
JouleBug	• Great user interface that is easy to use and looks very professional • Users are rewarded with badges when they buss (complete) an action a sufficient number of times • Motivates users to continuously complete actions and build habits • Robust social network component with user profiles, friends/followers, challenges, and sharing capabilities • Educational component with videos and blurbs	• Doesn't provide the option for taking a lifestyle or carbon footprint quiz to determine your own baseline • Monetary savings per action completed can be confusing or ambiguous
EcoCRED	• User gains "EcoCRED" which can be used to redeem rewards in the app • Easy to set up daily habits and track impacts	• "Community" portion needs work • Lack of collaboration and community level challenges may hurt user retention
Oreco	• Shows savings/reductions of both CO_2 and money	• User interface isn't impressive/polished • To access the "community" portion of the app you must log in with a Facebook account • No ability to complete actions on a daily basis – only a yes/no switch • Lacks the habit-forming component
TODAY	• Reports the amounts of electricity you've reduced • Solidly educational component and easy to use	• Lacks badges and/or point systems to motivate users • Can only log in with a Facebook account

Table 3

Table 3 shows the successful and unsuccessful components for each application that was assessed in the benchmarking exercise. App store reviews and personal experience with the application were used to examine the implementation of game components. The app store ratings and number of reviews also helped us identify how others felt about their experiences with the game, and estimate how many people use the application. It also allowed us to figure out if the game was available on all operating systems and phones - providing insight on accessibility and scalability of the platform. JouleBug stands out for its robust social network elements, polished interface, and educational components (see page 13 for more details). EcoCRED does a great job of creating a game economy and setting up daily habits for users (see page 15 for more details). JouleBug stands out for its robust social network elements, polished interface, and educational components. EcoCRED successfully creates a game economy and sets up daily habits for users. However, no application was perfect, and each of the four apps offers something that the others can learn from.

Mobility

This analysis focuses on various transportation and mobility services offered which aim to reduce traffic congestion and foster community. This ultimately leads to reduction of costs associated with transportation and parking, a more connected community, and less VMTs (vehicle-miles traveled) and associated greenhouse gas emissions. In 2016, the transportation sector generated the largest share of greenhouse gas emissions. These applications serve to minimize that impact by decreasing single-occupancy vehicles (SOVs) on the road through incentivizing individuals to rideshare, take public transit, bike, walk, or any combination of these options. These apps vary in how they market to individuals, whether they are open source or promoted by employers or municipalities. The benchmarking analysis compares the following companies as it relates to their game characteristics and impact.

Hytch: An open-source application that offers cash rewards for driving, walking, biking, or using public transit with another person. They have recently launched a marketing campaign in Seattle Washington and are in full use in Nashville, Tennessee, but anywhere in the world you can use the application and get feedback on passenger miles travelled or "trees saved" by employing sustainable transportation habits.

RideAmigos: Software purchased by municipalities, companies, and universities that offers multimodal trip planning. Those parties can then run competitions and engagement along with offering rewards of different kinds.

Luum: Integrated into a company or university software, it allows for carpool matching within a closed network of your organization, but also partners with Scoop and Waze carpool to allow for carpooling outside the network.

RideShark: Software purchased by municipalities, companies, and universities that offers multimodal trip planning and rewards. Partners can run competitions and challenges which impact team building and sustainable goals.

Scoop: Safe and effective carpool matching service that offers door to door pickups and flexible scheduling. This impacts employee retention and individuals cost for parking.

RideAmigos & Century City, CA

RideAmigos partnered with Century City Transportation Management Organization (CCTMO) aiming to reduce congestion, capture commute data, and increase the use of carpooling, vanpooling, public transit, walking, and biking. They did this by using an Esri's ArcGIS Online service which offers detailed routes for alternate modes of transportation. These routes come with real time cost benefit analysis which takes into account cost, time, CO_2, and health benefit of each option. Options are also incentivized on a tiered system and points can earn commuters rewards. This case study saw impressive results including diverting 218,000 pounds of CO_2.

DIVERTED
218,000 POUNDS of CO_2

Scoop & Palo Alto TMA, Palo Alto, CA

Palo Alto TMA is committed to provide transportation solutions to employers and residents. The bustling downtown has posed challenges causing congested streets and increased parking demand. TMA partnered with Scoop and invested in marketing with the objective of decreasing SOV trips by 30%. Since this partnership there has been a significant impact on downtown traffic attributed to behavioral change. After 2 years TMA has observed 2,000+ employees carpooling, 540,000+ CO_2 diverted, and 46,000+ fewer SOV trips.

Luum & Swedish Cherry Hills, Seattle, WA

Swedish Cherry Hills (SCH) needed to reduce the amount of people driving alone from 56% to 50% as a regulatory obligation to expand medical facilities. With 3,000 employees and 1,850 parking spaces this decrease was necessary and they aim to continue to decrease the amount of SOVs by 2% per year until 2034. With the launch of Caregiver Commute, Luum surpassed the regulatory obligation and reduced the amount of single occupancy vehicles by 9 percentage points by December of 2017.

Hytch & Nashville, TN

Per EPA regulation metro areas are required to have HOV lanes and programs to encourage employees to use public transportation. HOV lanes often have weak enforcement and are frequently equally congested so taken alone provide little incentive for individuals to carpool. Similarly the impact of employee engagement and encouraging public transit is unknown. Hytch offers both data collection and increased incentives. Since launching in Nashville they have recorded 133.9K shared trips. Over the course of 3 months they have registered 8.8K users and see 42% of continued use over this time span.

RECORDED
133,900 shared trips since launching in Nashville

Table 4

Mobility Solutions Benchmarking

Company	Interface	Intrinsic Incentives	Extrinsic Incentives	Feedback Mechanisms	Distinguishing Features
Hytch	open-access app.	• Reducing C02 emissions • Traffic reduction • Connected community	Cash rewards	• 100% user-organized • Can run engagement campaigns	• App is available to anyone. • Offers cash rewards to all users in Nashville regardless of employment.
Luum	integrated into company software.	• More engaged workforce • Traffic reduction	• Leaderboard • Gift cards and prizes • Reduce parking associated costs	• Commuter Statement	• Seamlessly integrated into HR software. • Incorporates third-party mobility services (like Waze and Scoop)
RideAmigos	Interface purchased by companies, municipalities, and universities.	• Largely determined by company culture and challenges. • Traffic reduction.	• Money, either in the form of cost reduction or benefits. • Peer recognition. • Competitive challenges.	• Government partners are able to run engagement programs using software.	• Promotes ride-sharing to local events. • Multi-modal trip planning. • Bike-pooling.
Scoop	Commuter app which partners with companies.	• Employee retention. • Time savings • Stress reduction • Work productivity	• Savings on parking.	• Carpooling as means to connect with others.	• Flexible morning and afternoon commute. • Door-to-door pick-up and safety.
RideShark	Interface purchased by companies, municipalities, and universities.	• Sustainable commute options.	• Accumulate points which translate to gift cards and rewards.	• Competitions and challenges which incorporate sustainable transit and team building.	• Transit and bike mentor program. • Routes can be edited and can search along route.

Table 5

Mobility Solutions Impact

Company/Application	CO2 reduction for 2018 (tons)	Ride-sharing frequency and absolutes	Reach
Hytch	2,524.18	8.5 million miles saved	1,000 daily active users
Luum	n/a	8-10% reduction in 1st year 2% reduction each subsequent year	10,000 companies
RideAmigos	11,0000	17.5 million alternative trips	n/a
Scoop	9,071	3 million trips in 2018	1 million connections in 2018
RideShark	n/a	n/a	n/a

Table 5 is all the data found on the impact of each mobility solution using three different measurements. It is important to note that some applications have been around for over a decade while others started in 2018 so this disparity may contribute to a difference in their 2018 impact and reach.

JouleBug

JouleBug users have...

SAVED
over 175 MILLION gallons of water

DIVERTED
nearly 7 MILLION pounds of waste

CUT
105 million pounds of CO2

JouleBug is a gamified solution to people's daily sustainable actions. Users can track their daily actions and earn points based on how sustainable they are. Actions can reduce water, energy use, and waste streams. The application tracks how many pounds of CO_2, pounds of waste diverted, and gallons of water your sustainable actions have saved. There are many challenges and competitions that users can participate in – which pushes everyone to rack up points and be first. The JouleBug website offers the following description of the application: "JouleBug is the easy way to make your everyday habits more sustainable, at home, work, and play. Discover how you and your friends can use resources—without using them up".

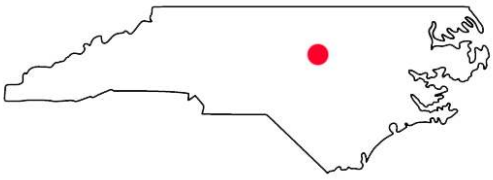
The original intent of JouleBug was to focus solely on the users' utility bills, and even linked directly to each participants utility account. This application received a lot of attention from the very beginning, receiving $400,000 in its initial investment round. It has since used this base platform to create many other applications for promoting sustainable living. In total, the developers have published 14 mobile apps. They have partnered with private sector companies like Ikea, Siemens, and Pizza Hut, communities like Sunnyvale and Austin, and schools like Boston University and New York University. They have also created a spinoff of JouleBug that is tailored towards employee wellness within specific businesses.

JouleBug is continuing to build its base and attract more users to their application. They incentivize participation through challenges and habits that bring utility savings. As of today, JouleBug users have saved over 175 million gallons of water, diverted nearly 7 million pounds of waste, and cut 105 million pounds of CO_2. With all the positives of JouleBug, one of the challenges is that it does not translate into direct and immediate rewards for players thereby losing potential and ongoing playership. JouleBug boasts several success stories from their users – both from a business level and from a community level. These case studies will be highlighted below.

JouleBug

JouleBug & The City of Austin, Texas (Austin Green Business Leaders)

The City of Austin set out a goal to achieve carbon neutrality by 2050. In order to do this, they partnered with JouleBug and created their own branded version of the application – called "Rethink". They also launched a 10-day community wide challenge through the app in order to help get the users excited. The communications manager for the office of sustainability in the City of Austin, Amy Petri, was quoted saying "It was great to see the savings report confirming just how much our small actions can really add up for meaningful impact."



Shine/JouleBug & HQ Raleigh

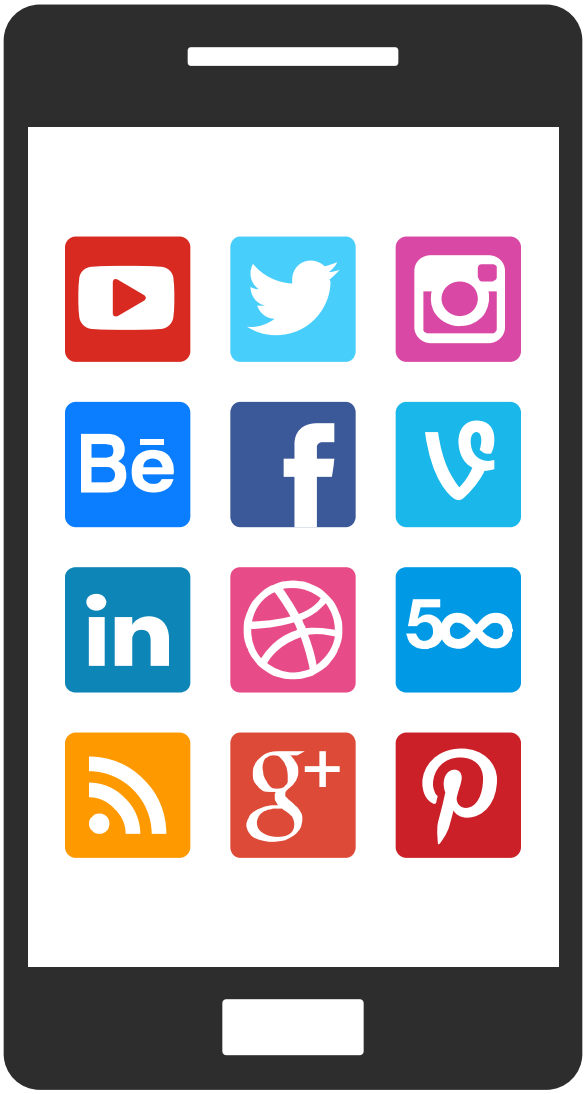
HQ Raleigh partnered with JouleBug to create a sustainability challenge and improve the office's sense of community and environmental awareness. HQ Raleigh also intends to become a B Corporation and felt like the use of JouleBug would be beneficial. The 10-day challenge saved over 100 tons of CO_2, 238,000 gallons of water, and diverted nearly 14,000 pounds of waste!

Shine/JouleBug & KPIT Technologies

KPIT Technologies used JouleBug to help merge with their newly acquired company (I-Cubed). Their week-long challenge allowed the new employees to assimilate in to the company's green culture and feel like part of a community. The HR Manager, Erica Kose, said that "The Challenge brought benefits beyond the initial objectives of improving our sustainability habits in our work environment. Employee engagement and interaction between different business areas increased, too".

EcoCRED

EcoCRED was released in the end of 2017 by Exelon Corporation - an American utility company. The mobile application first establishes each user's baseline carbon footprint by providing a short survey. Once this introductory step is completed, the application shows participants ways in which they can reduce their footprint. Whether it's a daily habit or installation of new energy saving LED lights, each action is given a commensurate carbon dioxide offset. The application tracks your overall footprint and overall reduction in CO_2 equivalent. The application's target audience is individuals who are interested in their carbon footprint and ways they can reduce it. EcoCRED does not differentiate between environmental impact metrics like water, waste, or energy. However, the application breaks down your estimated CO_2 reduction by three different locations: transportation, home, and work. This allows the user to to see where additional sustainable action is needed.



There are a few specific strengths to EcoCRED. One is that the app allows you to set the frequency of repetition for each sustainable habit or action. You can choose from everyday, weekdays, weekends, or even make a custom period. This can help users slowly build up to doing actions more often. Another strength is that the app shows you a baseline footprint. This can help motivate users since they begin the user experience by seeing how much they can and should improve their lifestyle.

There are also a few weaknesses to the application. Unlike many other sustainability platforms, EcoCRED does not have a strong social network presence. You cannot connect with or friend other users. You can't compete or collaborate on a community scale. Additionally, the educational component is generally weak. It is hard to learn about the specific impact of each action, which may minimize the intrinsic value gained by completing it.

Hytch

Hytch is a gamified solution that motivates individuals to travel together by paying per mile. The application offers cash rewards to anyone who "Hytches" with another person regardless of transportation mode. This includes ridesharing, any kind of pooling including Wazepool, Uberpool or Lyft pool, public transit, bicycling, or walking. While Hytch can engage directly with employers on programs, it's real strength is that it connects directly with individuals and app users. . The open-source nature, along with offering cash rather than coupons or gift cards, is what differentiates Hytch from other gamified ridesharing and transit mobility solutions. Further, because of the sophistication of their rules engine, they are able to help jurisdictions manage and alter traffic patterns by influencing the behavior of certain individuals by increasing incentives. For example, if you take a specific corridor rather than a congested one, travel within a given time window, or park at a specific location you can recieve more rewards. Many other applications only provide ridematching service through their interface to employers.

Hytch works to motivate individual users by helping them to equate their vehicle and or passenger miles saved directly with trees saved. For this Hytch purchases carbon offsets directly.

Carpools are entirely self-organized, but there are programs and incentives for individuals to host Hytch rides thereby increasing the reach. Today, anyone is able to Hytch in Nashville and earn 5 cents per mile, but companies can further incentivize their employees through supplementary rewards claimed through employee ID codes entered through Hytch. Hytch can work directly through the employers, but their real strength is through direct relationship with app users and for this they rely on advertising, radio, rewards, and especially word of mouth to encourage enrollment through the host campaigns. This reliance on word of mouth generates engagement and is effective because an entire bus can Hytch together, which can also unite commuters who share public transit daily. User testimonial proves that people are excited about connecting with others and getting paid for doing so. One user excitedly spoke of this interconnection on her commute, "I never talked to anyone on the train. Now I have friends that I Hytch with every day. … We even notice when one of us doesn't show." Engagement patterns mirror this excitement — when in one region the rewards decreased from 13 cents to 1 cent, 80% of users stayed engaged.

Hytch has been gradually expanding its marketing beyond Nashville to cities like San Francisco, Los Angeles, Seattle, Austin, Phoenix, Denver and New York City. When expanding, it is most effective to adapt the solutions locally to specifically drive behaviors that serve specific congestion challenges. In order to do this Hytch works closely with conveners and partnering municipalities to do a travel assessment and identify goals. For example, in Seattle Hytch works closely with the Washington Area Business Alliance. This targeted, collaborative and strategic effect has proved powerful in Nashville as to date there have been 8,520,553 VMTs saved.

"I never talked to anyone on the train. Now I have friends that I Hytch with every day. … We even notice when one of us doesn't show." - Hytch user

RideAmigos

RideAmigos acts as a multimodal trip planning service that individuals of partnering municipalities, employers, or universities may join. This means that the software application is customized to fit with the larger entities enterprise system. As a company, their overarching mission is to get SOVs off the road. Their clients have shared goals and include municipalities aiming to reduce traffic and companies seeking to manage parking constraints. Aligning objectives is critical for effective gamification strategies, but these overarching goals need to be further aligned with individual action.

Individual engagement is motivated by multiple factors including alignment with corporate objectives, individuals responding to financial incentives and overall cost savings. Companies and municipalities have the flexibility and freedom depending on whether or not they offer individuals the value of these incentives, but as expected, higher rewards correlate with higher engagement. Another central feature to the RideAmigos interface is that it combines trip planning with environmental and health benefits. Therefore, individuals observe the effect of transportation habits in real time and this informs their decisions. The effects of this are evident in case studies. However, it is both habitual and relatively cheap and easy to drive to work so motivation to use alternative modes of transportation (anything but driving alone) is necessary. Companies enroll and engage participants as part of their benefits package when onboarding and it is part of individual's day to day work life. Whereas municipalities do not have as strong communication channels so they work together with employers. Municipalities host challenges and special events to generate engagement. Engagement also varies generationally, many millennials, tired of traffic and eager for human connection, are motivated to get out of their cars and explore alternate modes of transportation. The interface RideAmigos provides to companies and municipalities gives individuals the agency to easily make decisions on their transportation habits, armed with information on the options available to them and the health and environmental impacts related to each option. This interface proves to change behavior.

RideAmigos successfully balances financial incentives with reducing the carbon impact of workers' commutes. To date, it has generated 83,000 tons of carbon reduction, 11,000 tons in 2018 alone. Further, they have motivated 17.5 million alternative trips (non-SOV trips) which have created 271 million alternative miles.

To date, RideAmigos has...

REDUCED

83,000 TONS of carbon

11,000 TONS in 2018 alone

MOTIVATED

17.5 MILLION alternative (non-SOV) trips

Section III: Preventing Failure

Three common ways for gamified experiences to fail are that business outcomes were not defined well, the game was too centered on the businesses' goals rather than the participants, and that the game may not engage players on an emotional level. However, games can also fail if they take shortcuts, have a poor game economy, don't appeal to the desired audience, force engagement, or create an unnecessary amount of additional work. Gamified solutions require input from many different designers and experts, especially if they will be used to promote learning and understanding across diverse platforms. Here the intrinsic and extrinsic motivational factors are crucial to consider.

Table 6

Three Common Mistakes

Outcomes and goals are not clearly defined.	**Lack of alignment between player and organization objectives.**	**Engagement on a transactional rather than emotional level.**
Imbalance in challenges and skill building goals: Gamified solutions should prevent tasks that gradually build in complexity. Without an effective transition, retention rates and engagement tend to drop. Lack of engagement leads to decreased impact.	Forcing competition: The principal objective of these gamified platforms is increasing sustainability. By nature, this goal is inclusive and better suited for a collaborative game economy.	Removing process from the game: Badges and points need to represent a players' progress and achievements - and these need to be meaningful! Badges and points are only effective if they stand for something substantial. Games should emphasize the process rather than the end.
Mismanagement of game economy: Rewards should be both commensurate with player efforts and pursuant of a defined non-virtual outcome. This environmental impact should not be devalued by points or rewards easily achieved.	Failing to appeal to your target audience: Games will fail if the audience is not identified and defined. The game itself should align the target audience objectives with business objectives.	Requiring participation: In order to achieve an emotionally engaged audience they must willingly buy into it. Only with their eagerness can they clearly define personal goals to accelerate company objectives.
		Creating unnecessary work: Games should have smooth integration of tasks and fulfilling objectives. No one should have to do more work for something they were already doing.

Section IV: Lessons Learned

Driving sustainable action in individuals, companies and communities presents a continued challenge, but gamified technology is a promising solution. It is capable of connecting business and individual goals to collectively reduce environmental impacts. Through our benchmarking exercise and background research we are able to offer three recommendations, each focused on a different stage of gamification. These recommendations are intended to increase the effectiveness and reach of gamified solutions for communities, businesses, and individuals. Gamified solutions can be incorporated into businesses via in-house platforms or the adoption of existing applications. At the individual and community levels, gamified solutions that successfully motivate, push collaboration, and foster competition, have the opportunity to gain traction and drive legitimate behavioral changes.

These recommendations are intended to increase the effectiveness and reach of gamified solutions for communities, businesses, and individuals.

In order to generate effective community mobilization, it is vital to have a well-designed marketing strategy. From the benchmarking exercise, three salient aspects of gamification are evident. First, the framework of each constituent element of a game in the early stages of design is critical. Second, marketing of the game platform should be both persistent and strategic. Finally, in order to optimize user experience, concrete and actionable impacts must be demonstrated.

Participation-driven game framework

In sustainable gamification, everyone is working towards the common goal of reducing environmental impacts. Whether the focus is water, waste, energy or CO_2, collaboration, community building, and collective metrics are necessary elements. If the game design doesn't capitalize on the power of community building, connection, and engagement, then it will fail to make an impact.

Developing a strong game framework during early stage design is essential. Both Luum and Hytch had their business models significantly evolve from their outset. Luum began as a company to promote biking to work while Hytch began as a ride matching app rather than a rewards focused company. In essence, both companies got to test various markets before they landed on their final go-to-market offerings.

Identifying a clear problem and tailoring your game mechanism in pursuit of fulfilling your company's intent is critical in a game's success. For example, Luum as a way to promote biking to work does not clearly and holistically address reduction of SOVs or a company's problem with a parking shortage. Likewise, the shift from JustHytch to Hytch Rewards allowed the company to address the issue of incentivizing individuals to rideshare.

Well-designed sustainability gamification platforms focus heavily on how to engage individuals on a daily basis. This establishes positive behavioral patterns, helps form new habits, and uses participation to move the game forward. Ongoing and committed player engagement should be at the forefront of each gaming companies' metrics and goals, including working with targeted stakeholders and super users to identify potential glitches and enhance player engagement and game performance.

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Strategic Marketing

Recruit users in their daily lives.

Higher rewards will encourage regular use.

Once the sustainability gamification platform is designed and released, whether in-house with a corporation or an independent application, it needs to be strategically and persistently marketed. This requires companies to invest in purposeful marketing to their desired audience. One way to do so is to engage in point of sale marketing on utility bills, transit passes, waste management brochures, or at gas pumps. Another avenue for point of sale marketing within the transportation sector is to enumerate transit options on tickets for large-scale events. In more insular communities, like companies, marketing can be more personal such as tasking a few people in the office space to explain and encouraging the use of gamified solutions to benefit the company, the local and global community.

Effective broadcasting must be accompanied with game mechanisms that encourage habitual use to maximize impact. Habitual and committed use is often related to financial incentives or rewards being offered by a company, government entity or community. Money is a significant motivating factor for habitual use, but is not the defining factor. Hytch decreased its per mile reward from 13 cents to 1 cent and saw 80% of users remain engaged in the platform. Aside from financial incentives engagement can also be driven by deliberately demonstrating the impact of player action on the environment and community. Real time understanding and observation of consequences can be a powerful change tool.

One option for strategic marketing: engage in point of sale marketing on utility bills, transit passes, waste management brochures, or at gas pumps.

Optimizing User Experience

Gamification used to drive sustainable action should keep the environment as its focus and optimize the user experience by demonstrating how individual actions aggregate to either create negative consequences or a larger positive impact. This objective can be achieved in a variety of ways. The platform can use positive and negative reinforcement based off of the engagement of a single player or ideally a community of players. Along with reinforcement techniques the platform should also show upfront the implications and trade-offs of each action available to a player. For example, the game should show the energy saved with unplugging appliances for a week with the calculated expected time and convenience cost. Alternatively, a transportation platform can show the time, decreased stress levels, and environmental impact of each mode of transit.

After players consistently engage for some period of time the platform should show individual impact data through effective metrics and reporting expressed in relatable units like “trees” rather than “lbs of CO2” and players should be able to access the conversion information easily through the app. Similarly the reporting should make apparent the individual's role within a larger community effort by displaying the reach and impact of the gamification platform. Research has consistently shown that people want to do the right thing and need simple, concrete, convenient and actionable steps. These games have the potential to convey increasingly complex sets of data in a simple and engaging format.

Optimize User Experience

Make evident how user’s actions aggregate and impact the environment. »»

Convey complex results in a simple, easy to understand format. »»

600,000+ cell phone charges ***vs*** 5 metric tons CO^2

Section V: Conclusions

The prospect of its impact is promising as evidenced by JouleBug competitions which yielded impressive waste and water reduction and Hytch and RideAmigos which to date have diverted an estimated 2,514 and 83,000 tons of CO_2, respectively.

Gamification in the environmental sector utilizes behavioral psychology and technological engagement to motivate and incentivize users to opt for more sustainable behaviors. The prospect of its impact is promising as evidenced by JouleBug competitions which yielded impressive waste and water reduction and Hytch and RideAmigos which to date have diverted an estimated 2,514 and 83,000 tons of CO_2, respectively. The results exhibited in case studies prove that gamification has the potential to move communities and businesses forward. In the case of transportation, gamification has the potential for individuals to earn while businesses and communities save money. The most powerful component of gamification is that it is able to alter human behavior through incentives, competition, collaboration, and community. Optimizing sustainable actions and motivating behavioral change is a critical component of driving down resource consumption. These platforms have the potential to do so if they continue to delight and excite players and grow their daily usership.

Our recommendations are centered around how to most effectively impact environmental change, while taking into account the shortcomings and successes of current gamification. The platforms studied often have an interface that effectively shows the options available, but fail to engage the player on deeper levels with an emotional connection to the game and their actions.

"Games are the only force in the known universe that can get people to take actions against their self-interest, in a predictable way, without using force."
- Gabe Zichermann

While people may be willing to adopt sustainable habits, these gamification platforms have not reached the level of popularity and mass appeal like Minecraft and Fortnite. We maintain that gamification has the potential for more pervasive use much like the popularity of video games. This would require increasingly progressive product designs incorporating newer and more engaging technologies like augmented and virtual reality and an aggressive marketing campaign and budget.

Once a user base is consistently engaged it will continue to spread through word of mouth. This kind of viral behavior is exhibited by Hytch's community driven advertising model in Nashville, Tennessee which highlighted the bus community that formed and supported one another. Similarly, through community involvement, JouleBug's application has helped the city of Austin move toward its goal of becoming carbon neutral by 2050. Even more powerful and not to be forgotten is the role that the tools can play with public agencies when planning their capital investments, asset utilization and management.

Game spaces are the combination of a variety of elements including players, actions, storylines, and challenges. When that game space attempts to mimic real life resource management dilemmas it must not only translate complex system conditions, it must also emotionally engage players with the higher purpose of educating, motivating, and improving society and the environment. When we begin to see well-designed games enroll our larger community to take action against climate change, we will know we have made it. With 2.2 billion players on the earth, there is no more critical a time to leverage the tool of gamification in communities and corporations in support of this precious planetary playground we call home.

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