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Multidisciplinary Aspects of Design

Objects, Processes, Experiences and Narratives

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Sustainable Mobility as a Sport

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Abstract. In recent years many studies focused on steering behavioural change to face the climate crisis. A significant part of these opted to deal with mobility habits, i.e. prompting citizens towards more conscious and sustainable choices. One widely used approach involved game techniques to hack the habit loop by exploiting the similarities that keep players hooked. In this context, narrative can be key in engaging people's emotions. It can facilitate the integration of game elements and emphasise the tension that arouses emotional reactions and fuels the desire to play. Several examples of games with distinct narratives exist in the context of individual mobility.

After conducting several field research, it emerged that mere game mechanics of 'prizes for sustainable travel' would not have been able to generate lasting behavioural change besides severe scalability limitations.

The proposed research originated from previous work and focused on creating an entirely novel narrative able to change the experience of moving around the city by leveraging those values that encourage people to rethink their daily choices. These reflections lead to MUV, a digital game that turns sustainable urban mobility into a sport and citizens into athletes competing in various disciplines such as walking, cycling or public transport. According to their performance, they can level up from amateur to professional, gaining fame and honours. This approach demonstrated significant engagement and impact results, particularly concerning CO2 savings. Therefore, the 'mobility as a sport' narrative proved crucial to involve citizens actively, make them feel part of a cohesive movement and nudge them to build greener and healthier habits.

Keywords: Sustainable Mobility · Game Design · Behavioural Change

1 Behavioural Change as an Antidote to Climate Change

1.1 Facing a Human-Caused Climate Crisis

In recent years there has been widespread debate about the ongoing climate crisis on our planet and the corrective actions that need to be taken as a matter of extreme urgency to prevent irreversible global climate change. The situation, which already appears critical,

could worsen in the coming years if heating above 1.5 °C, the limit agreed upon in the Paris climate deal[1], fails to be avoided.

The scientific community agrees in identifying an undeniable guilty for this announced environmental disaster: humans.

According to the IPCC Climate Change Report 2022, the climate crisis is unequivocally caused by human activities, and it is essentially due to population growth and individuals' resource consumption behaviour. The only way to slow this process is to reduce emissions immediately and on a large scale within the next two decades. Solely through these drastic cuts can global warming be mitigated and even more catastrophic impacts averted [1].

On the other hand, the world population is constantly growing and is expected to reach eight billion by the end of 2022 and exceed ten billion by 2100 [2]. Therefore, profound and lasting behavioural changes are urgently necessary both at the individual consumer/citizen and the broader community level.

In short, quoting the Intergovernmental Panel on Climate Change: «we need behavioural change, not climate change».

1.2   Individual Behavioural Change and Mobility Habits

The focus, therefore, is whether changing the behaviour of individuals can mitigate the climate crisis and to what extent [3].

Research from Rare's Center for Behavior & the Environment quantified individual behaviour change's contribution to curbing Greenhouse Gas (GHG) emissions and concluded that it could be decisive. By analysing 30 behavioural solutions, it has been estimated that greater adoption of these could help reduce about one-third of the projected global emissions by 2050. About 20% of these reductions are related to the transport sector, which is one of the most polluting [4].

The impact of transportation and individual mobility is indeed huge. The transport sector accounts for 24.6% (almost a quarter) of all the GHG emissions in the EU, with projections showing increased growth by 2050. A large portion (46%) of these is attributable to individual mobility [5].

From this perspective, fostering changing citizens' mobility habits appear to be a challenge worth dealing with. It starts with understanding why and how people move around in cities and then how to encourage more conscious, sustainable and active daily mobility choices [6].

1.3   Building a Mobility Habit

The most relevant research in urban mobility and human behaviour confirms that, as predictable as it may seem, people move mainly for two reasons [7]. To go to work,

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[1] *The Paris Agreement* is a legally binding international treaty on climate change. It was adopted by 196 Parties at COP 21 in Paris, on 12 December 2015 and entered into force on 4 November 2016. Its goal is to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels. https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement.

i.e. to earn money (or to go to school or university to create the conditions for a future job); and to go shopping/entertain, i.e. to spend the money they have earned. These are recurring trips and account for most mobility flows within cities.

These routines naturally generate habits, which often develop automatically, almost unconsciously. Most habits are built similarly and follow a precise mechanism called the 'habit loop'. It is a process that is managed by our brain and occurs in three phases: the recognition of the trigger, which acts as a cue to suggest that it is time to activate the habit (1), the mechanical execution of a particular action or sequence of actions (2), namely the habit, and the moment of obtaining the reward (3), which helps the brain to recognise the cycle that has just ended and to remember it, to be able to repeat it in the future. As time goes by, this pattern of repetition becomes automatic [8].

Thus, one who leaves for the office in the morning clutching their car keys in their fist is already looking forward to the moment of happiness they will feel when they finally find a parking space. Whether this means being stuck in traffic for a long time in a state of constant stress is of little importance.

2   The Role of Game Design in Hacking People's Habit Loop

2.1   Game Loop vs Habit Loop

Since the habit loop regulates most of the automatic responses to external stimuli and the establishment of recurring behaviours, to remedy bad habits, it is necessary to act on this loop by finding effective ways to short-circuit it. One approach that has shown significant results in this regard involves using games to change given behaviours. This is because games possess a similar structure to habits and are consequently treated by the human brain in a broadly similar way [9].

They likewise are based on a cycle, which is called 'game loop', and which consists of three elements: action (1), reward (2) and expansion (3). Indeed, any self-respecting game requires the player to perform an action (such as killing enemies) which, once completed, leads to a given type of reward (such as obtaining gold coins). The reward then allows one to 'expand', i.e. improve one's skills and thus progress in the game (through coins, it is possible to upgrade one's weapon and therefore kill even more enemies). Nestled between the reward and the expansion is the so-called 'anticipation', a significant event that consists of the brain's dopamine release to the player. This chemical reaction causes a feeling of euphoria and satisfaction and is the basis of the motivation that keeps the player engaged and makes games addictive [10].

2.2   Gamification, Serious Games and Transformational Game Design

Having pointed out how it is possible to change a habit or even create a new one by leveraging game techniques and dynamics, it is then worth explaining how these can be integrated into the different spheres of human life, including mobility (Fig. 1).

The most direct approach is known as gamification. It consists of incorporating typical game elements and principles into non-game contexts to interest, entertain, involve and motivate. This strategic attempt is made by designing game-like experiences and
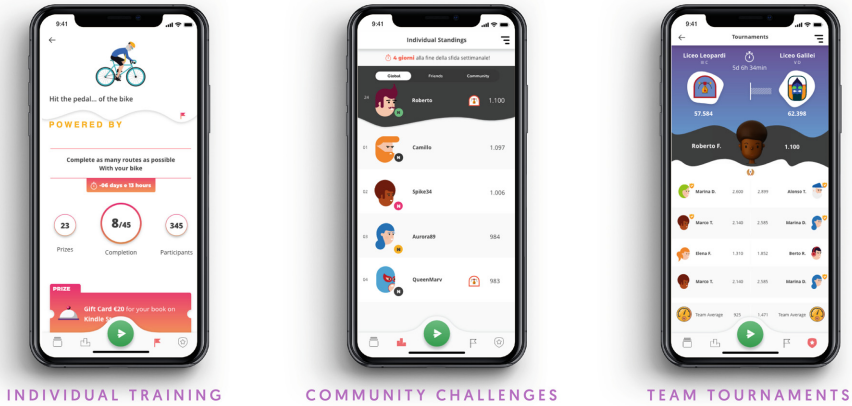
INDIVIDUAL TRAINING   COMMUNITY CHALLENGES   TEAM TOURNAMENTS

Fig. 1. Screenshots of the MUV mobile app showing the game dynamics.

has proven to be an effective method for engaging people, as it stimulates proactive behaviour and, hence, participation. Gamification is often applied as an educational and behavioural modification tool and is also widely used in marketing to enhance services and support users' overall value creation [11].

A different concept is the one underlying the so-called serious games, meaning those games that do not have entertainment as their sole, or at least primary, purpose [12]. Serious games are actual games and therefore possess the four distinctive traits that characterise them, i. e. objective, rules, feedback system and voluntary participation.

The implementation of serious games for educational or behavioural change goals appears, in general, less immediate than gamification. Still, depending on the context and target audience, it may be more effective and, in some cases, even more straightforward.

A further method that can be effectively applied is transformative game design. It aims to change players in a specific way that transfers outside and persists beyond the game [13]. The nature of the game and the game experience depend on the transformation one wants to produce and the barriers one must overcome to achieve it. Transformative games can be considered a sub-category of serious games, whose peculiarity lies in need to measure the effectiveness of the transformation induced.

This evaluation aspect is crucial for all initiatives aimed at changing behaviour since, without proper assessment, it becomes complicated to establish whether the targeted goal has been achieved and to what extent.

3   Examples of Game Narratives Regarding Individual Mobility

In recent years, successful examples of game narratives dedicated to individual mobility in pursuit of environmental sustainability and encouraging an active lifestyle have multiplied. Two different but equally effective examples have been selected to provide a more comprehensive overview of the topic (Fig. 2).

The first is 'Zombies, Run!', one of the earliest and still most original immersive attempts, published for iOS and Android platforms in 2012. It is a running game where

Fig. 2. Some MUV live events and initiatives.

players act as the character 'Runner 5' who tries to save themselves from a zombie apocalypse and must face a series of missions during which they run, collect items to help the city survive and listen to various audio narratives to uncover mysteries. The app can record the distance, time, pace and calories burned in each mission through the smartphone's GPS or accelerometer. The game consists of 9 seasons with over 300 missions, each lasting between 30 min and an hour. Zombies, Run! has been played by over 700 thousand players and has attracted widespread praise for its compelling storyline that has not only proven to incentivise players to go running but has changed their attitude towards exercise [14].

One of the most talked-about projects of recent times is undoubtedly STEPN, a lifestyle app that claims to reward users when they walk, jog or run. To earn money, users need to equip themselves with a pair of virtual sneakers, which can be found in the in-app marketplace. The shoes are made available in the form of NFTs (Non-Fungible Tokens), unique virtual items; to purchase them, one must link their cryptocurrency wallet and complete a transaction. The user's activity is measured outdoors via GPS, and earnings are provided in the game currency, which can either be used in-game or cashed out for profit. STEPN is based on a move & earn mechanism to nudge people towards a healthier lifestyle and intends to donate its profits to the fight against climate change by issuing carbon credits [15].

4   The MUV Narrative: Turning Sustainable Mobility into a Team Sport

Against the myriad of initiatives intended to gamify individual mobility, the MUV project, to distinguish itself from its competitors and offer a new point of view on the theme, has framed its service around a precise narrative, that of sport.

4.1 Why Choose Sport as a Motivational Driver for People

The choice of leveraging sport as a guise to stimulate people to improve their mobility habits turned out to be particularly suitable due to its distinctive features.

Sport is based on genuine and heartfelt values and holds together intrinsic (training is suitable for both body and mind) and powerful extrinsic motivations (self-esteem, desire to compete, team-building) [16]. Team sports, in particular, represent a positive metaphor for our society as they teach people to get together and share goals, victories and defeats.

Moreover, even though practising professionally or simply cheering means feeling frustrated at times, what makes sports so beloved is that after every disappointment, there can suddenly come an incredible burst of joy. This continuous flow between stress and joy is the secret of every game.

The practice of sports is one of the most popular activities globally; let it suffice to mention that while there are millions of professional athletes worldwide, extending the calculation to those who play a sport at any level brings the figure to billions of players.

4.2 A Heavily Practised Sport that Nobody Talks About

There is, however, another type of activity that involves about 4.4 billion people every day and that, if considered a sport, would be the most widely practised by far. It is characterised by the absence of clear rules, competition or motivation to do it, but despite this, countless people play it every day, regardless of where they are or what they do.

This sort of sport is about moving around cities and is practised by 56% of the world's population, those who live in urban areas today [17].

The MUV project arose starting from this reflection, intending to change the experience of travelling within the city. The goal was to transform moments such as cycling to work or taking a crowded bus to go shopping into epic sports moments such as scoring the winning point in the championship final or breaking a world record.

4.3 What is MUV? Concept, History and Core Features

MUV, which stands for Mobility Urban Values, is a sustainable mobility entertainment platform [18]. It was initially developed as a research and innovation action under the Horizon 2020 programme, which was conducted from 2017 to 2020. Thanks to its promising results, it became a startup and B Corp in mid-2020.

MUV is the culmination of research work on sustainable mobility and human behaviour that started in 2013 with a project named trafficO2. It was a simple digital game that offered users a fair deal: rewards in exchange for sustainable travel. Through the app, players could track their trips, collect points and exchange them for prizes provided by the network of local businesses [19]. It turned out to be an interesting experiment but did not prove effective over time and scalable as it was too prize-focused, not entertaining enough, and, above all, lacked a narrative.

For this reason, the focus of the further research was primarily on the aspects of the gaming experience, striving to find a compelling narrative capable of engaging players in the medium and long term, and stood out clearly from any other gamification project

applied to mobility. Thus the idea of a digital game able to turn sustainable urban mobility into a sport and citizens into athletes competing with each other in open challenges and tournaments emerged [20].

MUV's game mechanics are pretty simple: players can track their sustainable trips and earn points through the mobile app. Points depend on the length of the trip and the chosen means of transport, and at the end of each travel, a brief report shows the impact of one's mobility choice.

The collected points are then exploited in various game dynamics inspired by sports, such as training sessions, individual challenges and team tournaments. Athletes' performance depends on the sustainability of their travel and, besides producing a tangible impact, allows them to succeed in competitions or contribute to their team winning. MUV leverages competitive and collaborative game dynamics, launching open challenges where the most virtuous users are rewarded or tournaments between communities, such as schools or universities, or within companies and organisations, where the most motivated and steady team wins.

Another essential factor that contributes to reinforcing this sports-centred narrative and thus making it credible is all the events and initiatives that are not linked to the gaming experience via the app but rather happen live. These include, for example, award ceremonies and interviews with players as if they were sports stars, which are integral to the experience MUV offers.

Beyond the gaming experience it aims to deliver and the annexed sports narrative, the service distinguishes itself by two other aspects: the use of data and the measurement of the impact produced.

The mobility data collected is not sold to third parties but is used to support companies, universities or schools in developing mobility management plans (such as home-to-work or home-to-school travel plans) and public administrations in enhancing their sustainable mobility policies. Moreover, after being anonymised and aggregated, this data is made general to the community as open datasets.

Finally, impact measurement is guaranteed by a certified methodology to calculate the CO_2 reduction generated by each player that has been entirely built in-house. In this regard, MUV has proven effective and significantly impacted CO_2 savings as active users have reduced their emissions by up to 32% during their involvement in various competitions [21]. Kilograms of CO_2 saved are calculated[2] weekly and are constantly provided as feedback to the player (as well as other types of impact such as calories burned) as they represent a powerful motivational driver towards more conscious choices.

5   Conclusions

In its evolution from a mobile app for gamifying urban travel to an authentic sports game platform for sustainable mobility, MUV has proven that it can engage a broad audience and positively influence everyday mobility choices over time. Of course, this achievement is not solely attributable to the digital game but to all live collateral initiatives which are intrinsically part of the MUV experience and make it more complete and

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[2] The CO_2 reduction algorithm, developed and implemented by MUV, was validated in April 2020 according to ISO 14064–2.

authentic. Not to mention the acknowledgement of being able to generate a positive impact simply by playing.

Concluding, it can be emphasised that the narrative of mobility as a sport has three fundamental advantages: engage people in a way that is immediate, easy to understand and to identify with (1); make them feel part of a "MUVement" by setting up a playground for team-based competitive and collaborative events (2) and, finally, offer a multifaceted experience that adapts to different types of players and walks them through personal growth that nudges them into building greener and healthier habits (3).

The research will continue, and its possible future developments are related to the analysis of the collected data. The main aims are to identify the most effective game dynamics, constantly enrich the MUV narrative, thus ensuring that it remains compelling and original over time and find new ways to involve as wide a range of people as possible to maximise the impact produced.

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