MASTER'S THESIS

Thesis submitted in fulfillment of the requirements for the degree of Master of Science in Engineering at the University of Applied Sciences Technikum Wien - Degree Program SWE

Project Report Step Quest

By: David Strauß, BSc

Student Number: 52112310

Supervisors: Jürgen Konrad, MSc
Ing. Dr. techn. Dominik Dolezal, MSc

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1 Introduction

1.1 Goal

The goal of StepQuest is to develop a Unity-based mobile game that motivates players to go for regular walks by linking real-world movement to in-game progress, quest completion, and unlockable content. The project follows a theory-informed exergame approach, emphasizing that successful activity-based games must balance exercise goals with enjoyable gameplay and sustainable player engagement [1], [2].

1.2 Background

Physical inactivity is a significant public health concern and is addressed as a global priority in health promotion strategies [3]. In response, digital interventions, including mobile games that integrate movement, have gained attention because they can combine entertainment with behavior change mechanisms in everyday contexts. Exergame research suggests that effectiveness depends not only on including physical activity, but also on how the game is designed: players need clear goals, meaningful feedback, appropriate difficulty and progression, and experiences that remain engaging over time [1].

StepQuest builds on these insights by using walking (step counts) as the core resource for progress and daily quest-based gameplay. This approach aligns with findings from theory-based exergames: when game elements are explicitly analyzed through a behavioral lens, designers can better justify which mechanics should motivate activity and which are expected to drive retention [2]. However, there is also a risk in relying too strongly on a single gamification model. For example, reflection on the Octalysis framework highlights that while it is useful for ideation and qualitative evaluation, applying it rigorously requires careful interpretation and may introduce subjectivity if used without clear operationalization [4].

All design and development decisions in StepQuest are therefore informed by existing research on gamification and behavior change. As a primary design framework, the project leans on the Octalysis gamification model to structure motivational mechanics such as progression, ownership, social influence, and scarcity-driven rewards [5], [6]. In addition, StepQuest considers the Behavior Change Wheel as a complementary perspective to ensure that the implemented mechanics do not only feel motivating, but also plausibly support real-world walking behavior (e.g., by supporting capability, opportunity, and motivation).

1.3 Research Questions and Hypothesis

Research Questions:

- **RQ1:** Does playing StepQuest increase the frequency and duration of walks compared to a control group?
- **RQ2:** How does player engagement with StepQuest evolve over time, and what factors influence sustained use?

Hypothesis: Targeted use of motivational strategies in a mobile game can increase motivation to engage in regular walking [5], [6]. Based on exergame design literature, StepQuest further assumes that engagement and adherence are more likely when progression and feedback are structured in a way that supports long-term play rather than short-lived novelty effects [1], [2].

2 Methodology

2.1 Design Rationale and Framework Selection

Before implementation, StepQuest was designed around established principles from exergame research and behavior change theory. Exergame design literature emphasizes that successful activity-based games must balance exercise-related goals with enjoyable, safe, and sustainable gameplay (e.g., appropriate feedback, progression, and minimizing elements that interfere with physical activity) [1], [2].

For motivational design, StepQuest uses the Octalysis framework to structure and evaluate game mechanics according to different motivational drivers [5], [6]. Because Octalysis can be interpretive and may introduce subjectivity if used without clear operationalization, the framework is applied primarily as an ideation and qualitative evaluation tool rather than as a strict measurement instrument [4].

To complement this, StepQuest also considers the Behaviour Change Wheel (BCW). The BCW links behavior change intervention functions (e.g., education, incentivisation, persuasion) to determinants of behavior through the COM-B model (capability, opportunity, motivation), supporting a more explicit justification of how selected mechanics may influence real-world walking behavior [7].

2.1.1 Key Pre-development Design Decisions

The following design decisions were defined before starting development:

- **Low-attention walking experience:** No dialogue or reading-heavy interaction during walks, because players are expected to keep attention on the environment while walking. This follows the general exergame design principle that gameplay should not undermine safety or the physical activity experience [1].
- **Quest-centered content architecture:** Quest-related dialogue options and narrative snippets are stored directly on quest ScriptableObjects to keep content modular and easy to iterate without refactoring the core game logic.
- **Daily choice structure:** Players select one quest target per day from a small set of options, supporting a clear “daily loop” and reducing complexity in the prototype.

2.1.2 Octalysis and BCW Mapping in StepQuest

StepQuest applies Octalysis as a structured checklist of motivational drivers [5], [6], and maps selected drivers to BCW intervention functions to make the intended behavior-change mechanisms explicit [7]:

- **Epic Meaning & Calling:** Narrative framing (escape the planet by collecting ship parts).
  BCW link: Persuasion and Education (positive framing and meaning).
- **Development & Accomplishment:** Progress bars, achievements/badges.
  BCW link: Incentivisation (rewards) and Reinforcement.
- **Creativity & Feedback:** Optional goal choice (e.g., step target or time-based target).
  BCW link: Training (supporting capability through self-set goals) and Enablement.
- **Ownership & Possession:** Collectible ship parts as a visible collection.
  BCW link: Incentivisation (collection as reward) and Enablement (progress visibility).
- **Social Influence & Relatedness (optional):** Low-effort social sharing ("brag button").
  BCW link: Modelling (social comparison / exemplars).
  Note: May be omitted due to prototype scope constraints.
- **Scarcity & Impatience:** One ship part per day (appointment-like dynamics).
  BCW link: Incentivisation (time-limited opportunity), but requires fairness/clarity to avoid frustration.
- **Unpredictability & Curiosity:** Occasional surprise rewards or short quizzes at the end of a walk.
  BCW link: Education (knowledge prompts) and Incentivisation (bonus rewards).
- **Loss & Avoidance (used cautiously):** Soft "missed chance" framing rather than punishment.
  BCW link: Coercion in a mild form (avoid overuse to prevent negative affect).

2.2 Prototype Development

The project is developed in Unity targeting Android. Android was chosen as a platform due to its wide availability and ease of deployment for testing purposes. The game prototype includes core mechanics such as step tracking, questing, and a simple user interface. The development process follows the waterfall model, due to the nature of the project as a prototype with a defined scope.

2.3 User Testing

User testing will be conducted with a small group of participants. Participants will be asked to install the APK on their Android devices and use the app over a period of two weeks. After the testing period, participants will be surveyed regarding their experience, motivation levels, and feedback on the app.

2.4 Data Collection

After deployment, data on user engagement and step counts will be collected. For this, a logging system will be implemented to track relevant metrics. They will be exported after the tester is done playing via a debug menu option.

3 Results

3.1 Status

At the current stage, the core gameplay loop is playable end-to-end. The player is greeted by an in-game companion character (dialogue screen) and proceeds into a daily mission selection flow. Missions are presented as ship parts with clearly communicated step goals (e.g., 2500–3000 steps). A day counter is shown in the main UI (“Sol 8”), and the build includes entry points for a settings screen as well as a collection view.

- **Dialogue onboarding flow:** A character-driven dialogue screen introduces the interaction and transitions into the daily choice (“What part would you like to retrieve today?”).
- **Daily mission selection implemented:** The player can choose from multiple available parts (e.g., Wing, Cockpit), each associated with a step target.
- **Prototype progression structure:** The chosen mission corresponds to a collectible ship part, supporting a clear short-term goal for walking and a longer-term collection objective.
- **Collection/inspection screen:** A dedicated view exists to inspect the ship/collection state (currently represented visually as a ship preview and a back-navigation flow).
- **General UX structure in place:** Consistent UI theme, navigation (e.g., back button), and a dedicated *Collection* button from the main screen.

Open work: While the loop is functional, the prototype is not feature-complete. Remaining work includes completing content breadth, refining balancing, adding excitement features such as sounds and animations and finalizing support features needed for the evaluation phase (e.g., robust data export/logging, and polish for settings and collection feedback).

4 Discussion

4.1 Timeline

The project timeline is structured to complete development by mid-February, allowing time for a personal test run before starting external user testing. User tests are planned for March - April, followed by evaluation and thesis writing in April - May.

- **Now - mid February:** Finalize prototype to a “test-ready” state.
  - Complete remaining core features.
  - Content completion for the planned missions/parts and balancing of step goals.
  - Internal QA: bug fixing, usability improvements, and edge-case handling (permissions, background step tracking).
- **Mid February - end February:** Personal test run.
  - Run the prototype daily under realistic conditions to validate the gameplay loop.
  - Verify data collection works reliably over multiple days.
  - Identify and fix critical issues before involving participants.
- **March - April:** User testing phase.
  - Distribute APK to participants and support installation.
  - Collect quantitative logs and qualitative feedback (survey/interview).
- **April:** Evaluation phase.
  - Analyze engagement patterns over time and summarize qualitative feedback.
  - Answer research questions using collected data.
  - Derive implications for design improvements and discuss limitations.
- **April - May:** Thesis writing and finalization.
  - Integrate evaluation findings with theory (Octalysis/BCW) and prior work.
  - Final proofreading, formatting, and submission preparation.

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Documentation table of AI-based tools

AI-Based Tool	Intended Use	Prompt, Source, Page, Paragraph…
DeepL Translate	Translation of an article in English	Source (XXX), Chapter X on page X-X
Chat GPT 4.0	Grammar and Spelling	"Please list issues with spelling and grammar in the following text: ...", Entire document

List of Abbreviations

ABC Alphabet

WWW world wide web

ROFL Rolling on floor laughing