# DICE NETWORK+ CASE STUDY

## Freegle: Turbo-charging the gift economy through geospatial optimisation

**February 2026**

DICE NETWORK+ DIGITAL INNOVATION & CIRCULAR ECONOMY

UKRI Engineering and Physical Sciences Research Council

University of Exeter

# DICE Network+ Case Study

The **DICE Network+** is a three-year UKRI EPSRC-funded programme that seeks to leverage the power of the digital revolution to drive a circular economy across sectors and value chains. Led by the University of Exeter, our expert academic team comprises eleven investigators from nine UK universities. We are creating an inclusive, connected community harnessing interdisciplinary collaboration and research to guide industry partners, government bodies and policy makers towards a digitally enabled sustainable and circular economy.

Our work is focused on two key challenge areas:

- **EMBED:** Embedding sustainability and circularity within the design and development of digital and communication technologies.
- **ENABLE:** Realising the potential of the digital revolution to enable a circular economy across sectors.

By adopting a network of networks approach, harnessing interdisciplinary collaboration, research, and technological innovation, our network will be a beacon for change, inspiring and guiding industries, policymakers, and communities towards a digitally enabled sustainable and circular economy.

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February 2026

For and behalf of the **DICE Network+**

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# 1. Introduction & Summary

**Freegle**[1], a non-profit charity, tackles the UK's waste problem by providing a **free, easy-to-use digital platform that connects people who have unwanted items with others who can use them.** It is primarily powered by a UK-wide network of local volunteers and funded through grants and voluntary donations from its users and supporters. It also collaborates informally with local councils and waste reduction organisations.[2]

In a project collaboration with Newcastle University, led by Dr. Clement Lee and Ed Hibbert, founder and CTO at Freegle; the team took over one of the main challenges the digital platform has: **How to help users to increase successful exchanges of their unwanted items.**

The digital nature of the data and the community structure of the platform lent itself to potential business optimisations through data analytics. This requires to use of geospatial analysis[3] to determine how communities perform. More importantly, **moving away from the hard and arbitrary boundaries of pre-defined named communities** (i.e., cities, towns, or neighbourhoods). **They introduce a concept called the "relevant neighbourhood"**, a data-driven alternative that potentially optimises the matching of users and items on the platform.

1 https://www.ilovefreegle.org/

2 To find more about funding & donations, legal structure, and other questions. Visit: https://www.ilovefreegle.org/about

3 Geospatial analysis is the process of collecting, displaying, and analysing data tied to specific geographic locations using tools like Geographic Information Systems (GIS), satellite imagery, and mapping software. More info here: https://cas.umw.edu/gis/

# 2. The Challenge: What we were trying to achieve

On Freegle's digital exchange platform, available in web browser and app versions, users give away household items to other users, with no financial transactions involved. **The exchange typically follows a standard process:** A user (offerer) posts an item, for example, an old lamp or a TV stand on the platform and other users (repliers) ask to be considered, with one user (receiver) ultimately chosen by the offerer. Typically, the receiver goes to the offerer's house for collection, thus completing the exchange.

**By default, users sign up to pre-defined communities,** which are an essential component of the Freegle infrastructure, according to their spatial location. Therefore, in the Freegle feed, potential repliers are presented items from offerers who belong to the same communities. However, it was found that the replier-offerer distance, rather than being in the same community, drives the probability of a successful exchange.[4]

**By limiting the recommendations according to an arbitrary community boundary, repliers may not see relevant items from proximate offerers who happen to live on the other side of the boundary.** Furthermore, there is currently no equity consideration i.e. recommending items from a less deprived community to a neighbouring yet more deprived one.

The goal of the project was to use statistical methods to improve the spatial facets of item recommendation and, ultimately, the effectiveness and equity of the platform. By optimising the **relevant neighbourhood** for individual users, we would be informed of the potential changes to the platform.

[4] https://rss.org.uk/membership/volunteering-and-promoting/statisticians-for-society-initiative/case-studies/freegle/

# 3. The Approach: How we tackled the challenge with the use of digital technology

**Freegle's data is digital by nature**. Details recorded for each exchange include the time of exchange, the locations of the users, the number of messages between them, and the communities they belong to. This greatly facilitates the analysis outlined below, while ensuring user privacy through data anonymisation and restrictions on personal and sensitive data, such as the full addresses of the users.

Some key activities developed through the project were:

1. **Predicting whether exchanges are successful from various attributes:** a statistical model reveals that the **offerer-replier distance** and the **number of messages** between them are good indicators of the likelihood of a successful exchange.

2. **Ranking communities and visualisation:** The communities are ranked according to the **number of exchanges per capita.** This presents a more objective measure of how successful communities are, as they are vastly different in terms of their urban/rural nature and population. The **results are visualised in an interactive web application,** allowing the community volunteers to see their work validated.

3. **Computing the relevant neighbourhood:** For any location, the **relevant exchanges can be defined as those that took place within the circle of a certain radius.** This radius can be expanded or shrunk until it coincides with the average distance of the relevant exchanges. The circle of this optimal radius is deemed the relevant neighbourhood. This data-driven optimisation presents us how the typical distance a replier travels for an item varies (naturally) across the country.

By **presenting the data insights through interactive visualisations**, rather than the raw data, **to Freegle and its volunteers**, it shows them in an objective way the **value of their data and their grassroot work**. They also **contribute to extending the useful life of their items and reducing waste in their communities**, which was not an objective to quantify in this project.

# 4. Unexpected Outcomes: What we learned along the way

While the primary analysis was focused on using geospatial analysis to increase the items exchange success rate, they made a few detours and discovered the potential of other aspects of the data and the methods used.

- **The use of machine learning?:** It is tempting to jump on the bandwagon given the availability of machine learning models. What they have discovered is that the right method reveals itself when we ask the right question:

  **Is it possible to predict how desirable an item is, right when it is posted on Freegle?** While retrospective statistical analysis[5] is rendered obsolete in the face of live forecasting, predicting desirability from the text description and images of the item using machine learning becomes a natural progression.

- **Interesting questions, but not highly impactful:** We also examined **if limiting the replies for a highly desirable item will save people's time as most repliers are unlikely to get picked**. It turns out that an overwhelming majority of items only ever got one reply. While the question potentially leads to some operations on Freegle being optimised, there's a bigger fish to fry.

While these ideas remained unrealised or not pursued, the process of investigating them was vital. **Navigating these 'dead ends' is a prerequisite for discovery;** without this process of elimination, they would not have identified successful ideas, such as that of a relevant neighbourhood.

[5] Retrospective statistical analysis examines existing, historical data (e.g., medical records,, databases) to identify patterns, associations, or trends, typically after outcomes have occurred.

# 5. Key Learning: What we would do differently next time

Looking in retrospective, if Freegle would set to start today, some things could be done differently:

1. **Embrace Digital Twins.** Integrating the research, experiment and analysis workflows into the system, so data analytics and business optimisations can be carried out in real-time.
2. **Research-driven Tool Integration:** First, by identifying the core underlying problem a group/community model is trying to solve, then the analytics can be embedded into the platform to measure the effectiveness of the actions and interventions accurately from the outset.
3. **Formalise Partnerships Earlier:** Proactively seeking formal partnerships with local authorities and retailers at an earlier stage, would help to integrate Freegle into official waste reduction campaigns and take-back schemes.

The advice they would give to any organisation embarking on a similar initiative is simple: **Build the community first.** Empowering passionate, local champions and giving them the simple tools they need to succeed. As Ed mentions, **"Don't let a desire for a "perfect" technical solution get in the way of a simple, effective human one."**

# 6. The Outcome: What we achieved

- **Overall:** This project has enabled us to investigate the implications of the historical data of Freegle in much more detail and much more carefully than we would otherwise have been able to do. It has highlighted a number of features which will directly lead to improving the experience of the users.
- **Visualisation:** We have created interactive visualisations that show the key insights into the geospatial aspects of Freegle's data.
- **Optimisation:** We have developed the idea of relevant neighbourhood, which helps drive the thinking in one area of geospatial processing – which posts to show to which users, and how often – which is central to the platform, and which will lead to a major change in its next version.

# 7. Looking Forward: Next Steps and Future Directions

Freegle's work is ongoing and continues to evolve. Their journey is far from over.

As **immediate next steps**, they are focusing on refining the idea of relevant neighbourhood, from a circle defined by a simple Euclidean radius distance to an isochrone-based model defined by travelling time. They are also interested in developing machine learning models to predict item desirability by analysing both textual descriptions and visual assets.

Their long-term vision is to **integrate the results of the geospatial analysis and machine learning into Freegle's platform**, record the changes in the user behaviour and overall success rate, and demonstrate impact through various metrics.

They are **actively seeking new funding and strategic partnerships with businesses and foundations that share their commitment to a circular economy**. This will enable them to invest further in their technology and outreach.

Ultimately, the long-term vision is to make reuse so easy and commonplace that throwing away a functional item becomes unthinkable. Their aim is to **be an indispensable tool in every community's journey towards a sustainable, circular future.**

# 8. Acknowledgements

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