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# Creative Organic Smart Spaces and Communities: Leveraging Technology to Fight Socio-Environmental Impacts

FAEZEH B. PASANDI

The integration of technology in community spaces has emerged as a pivotal strategy in addressing critical societal issues such as food waste, hunger, and environmental degradation. This research explores the impact of smart community initiatives, particularly focusing on the design and implementation of the **OrganicSpace** application, a novel platform aimed at enhancing food distribution efficiency [43], ensuring privacy, and promoting cost-effective solutions for food waste reduction. The application's unique approach, utilizing QR codes for individualized access and its implications for reducing CO2 emissions and food waste, exemplifies a significant stride towards sustainable living and climate change mitigation.

Additional Key Words and Phrases: Climate Change, Global Warming, Food Wasting, Smart Spaces, Smart Communities, Application Development

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## 1 INTRODUCTION

In the modern era, technology's influence on everyday life is undeniable. Its potential to reshape and enhance our approach to environmental sustainability is a topic of increasing importance and urgency. The concept of 'Creative Organic Smart Spaces and Communities' emerges at the intersection of technological innovation and sustainable living, advocating for a synergy between these contexts to combat socio-environmental challenges. This paper explores the transformative role of technology such as different connectivity and vision [9–11, 32–38] in this context, highlighting both its benefits and the complexities it introduces to the environmental paradigm.

**The Role of Technology in Sustainable Practices.** Carpooling is a prime example of how technology can promote sustainable practices. By reducing the number of vehicles on the road, carpooling significantly decreases energy consumption and emissions. Studies have shown that individual carpoolers can reduce greenhouse gas emissions by approximately 4% to 5%, while employees carpooling to work can decrease CO2 emissions by 22%-28% [40, 41]. These statistics not only underscore the environmental benefits of shared mobility but also reflect the broader impact of collective action in pursuit of sustainability.

**Challenges in Environmental Stewardship.** However, alongside these benefits, technology also presents challenges in environmental stewardship. The United States, a leader in technological innovation, faces significant issues with waste management and CO2 emissions. As a major contributor to global environmental degradation, the U.S. demonstrates the complex relationship between technological advancement and ecological impact [2]. Here, we provide an statistical analysis of food waste in the united stated.

*Composting to Reduce Food Waste* is chosen to reduce food waste and its environmental impact in the United States. This approach is based on the idea that by composting organic waste, we can significantly reduce the volume of waste that ends up in landfills, thereby decreasing methane emissions and carbon footprint.

**Analysis and Insights.** Figure. 1 shows a comparison between the current scenario and the scenario after implementing composting. The reduction in food waste from 40% to 20% and in carbon emissions (in arbitrary units) from 100 to 70 highlights the effectiveness of composting in mitigating environmental impacts.

**Economic Impact.** The second graph compares the expenses in waste management and recycling efforts. The cost is reduced from 100 to 80 arbitrary monetary units after composting is implemented, alongside a savings of 20 units. This suggests that composting not only benefits the environment but also offers economic advantages.

## Takeaways.

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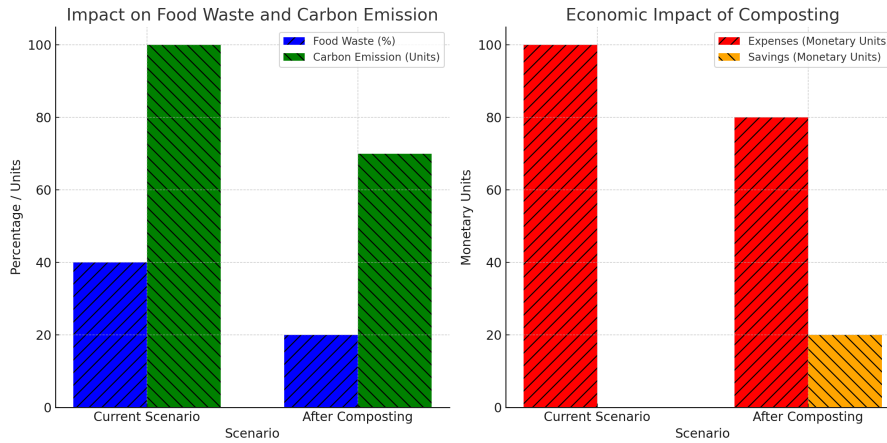


Fig. 1. Statistical Analysis of The Impact of Composting to Reduce Food Waste, Carbon Emission and Economy Growth. (alternative: Statistical Analysis of Food Waste, Carbon Emission, and Economical Growth if composting is used in statistically in the US. It is illustrated using python code available in the provided URL in the abstract.)

**Environmental Benefits:** Composting can significantly reduce the volume of food waste, thereby lowering methane emissions from landfills and reducing the overall carbon footprint.

**Economic Savings:** By diverting waste from landfills and reducing the need for extensive waste management and recycling, composting can lead to considerable cost savings. **Encouraging Sustainable Practices:** Implementing composting encourages a more sustainable approach to waste management, fostering environmental consciousness among individuals and communities.

The meat industry further exemplifies this paradox. The substantial CO<sub>2</sub> emissions associated with livestock farming, particularly cattle, coupled with high levels of meat wastage, highlight the environmental costs of certain technological and industrial practices [1].

Addressing these challenges requires a shift towards more sustainable practices at both community and individual levels [30]. This paper advocates for communal resource sharing and conservation, underpinned by trust and collective responsibility. We explore various strategies to reduce waste and emissions, contributing to more sustainable living.

As a use-case, we introduce **OrganicSpace**, a mobile application designed to facilitate sustainable practices among communities and individuals. Through statistical analysis and practical examples, this paper aims to demonstrate how technology, creatively and responsibly used, can be a powerful ally in combating socio-environmental impacts.

## 2 SOCIO-ECONOMIC DISPARITIES AND DIGITAL DIVINE

The global problems of poverty and inequitable resource distribution have substantial social and economic ramifications. Each day, countless individuals face challenges like insufficient access to food, water, housing, healthcare, education, and economic opportunities [17]. These issues predominantly affect developing countries and marginalized regions; but it's not isolated to those areas only [24]. In many regions, including the United States, waste generation is a pressing concern, with substantial amounts of resources going unused [27]. This issue is particularly evident in cities like San Francisco, where a paradox emerges: despite being known for its prosperity, poverty persists and affects a significant portion of the population [15], a substantial quantity of resources is wasted while a segment of the community struggles to meet basic needs, highlighting the stark disparities in resource allocation and access. Studies reveal that about 35% of the total food supply in the U.S. goes unsold or uneaten, equating to 103 million tons and \$408 billion worth of food in 2019 [39]. This not only represents a colossal waste of resources but also contributes to approximately 4% of total U.S. greenhouse gas emissions [8].

Additionally, limited financial resources and unfair wealth distribution contribute to significant disparities in people's lives. Concurrently, substantial quantities of resources and food are wasted worldwide. This wastage occurs across sectors such as agriculture, industrial production, and household consumption [27]. For instance, in agriculture, inadequate distribution systems, limited market access, and insufficient infrastructure lead to spoilage and premature disposal of agricultural products [45]. Industries contribute to waste through overproduction and inefficient resource usage, while households commonly discard food, clothing, electronics, and other items [13]. For businesses, wastage equates to lost revenue. For households, it means spending on food that isn't consumed. On a larger scale, it impacts national economies through inefficient use of resources. Managing and disposing of excess food require significant public and private resources. This includes the costs of

collection, transportation, and landfill operations, which are often borne by taxpayers. The intensive agricultural practices often used to produce more food can lead to habitat destruction and a loss of biodiversity. When food is wasted, these environmental costs have been incurred for no benefit.

The problems of poverty and resource wastage also have notable implications for climate change and global warming. When organic matter decomposes in landfills, it releases methane, a potent greenhouse gas. This exacerbates climate change and its associated risks, such as extreme weather events. The production of food that ultimately goes to waste consumes vast amounts of water, energy, and land. This unnecessary exploitation of resources leads to their depletion and can contribute to environmental degradation, including soil erosion and water scarcity. Moreover, it exacerbates the issue of hunger, particularly among vulnerable populations like the homeless in urban areas such as San Francisco, where approximately 8,035 individuals are experiencing homelessness, many of whom struggle to access adequate nutrition [15] and can lead to health problems like malnutrition and associated diseases among vulnerable populations like the homeless and low-income families. This can strain public health systems and reduce overall societal well-being. On the other hand, the disparity between the waste of edible food and the presence of hunger raises profound moral and ethical questions about distribution and justice. It challenges the values and priorities of societies.

Emission of greenhouse gases from industrial and economic activities is a primary driver of global warming. Resource wastage in various sectors leads to increased energy consumption, unsustainable resource utilization, and excessive pollutant production. Moreover, poverty and economic limitations hinder the adoption of clean energy and sustainable technologies, resulting in a heavier reliance on polluting and unsustainable energy sources. In general, poverty and resource wastage directly and indirectly contribute to global warming. Global warming manifests through rising temperatures in the air and oceans, melting ice caps, rising sea levels, and imbalanced weather and climate patterns. These changes give rise to widespread natural disasters, decreased agricultural productivity, and significant economic losses. The challenges of poverty and resource wastage worldwide create imbalances in resource distribution and wealth, reduce economic opportunities, and impact shared living conditions. In conjunction with greenhouse gas emissions and climate change, these challenges compound the threats posed by global warming. Addressing these issues necessitates comprehensive efforts to alleviate poverty, enhance resource distribution, optimize resource utilization, and implement environmental conservation measures.

The coexistence of waste and poverty is not just a logistical or economic issue but a comprehensive challenge with far-reaching consequences. Addressing this paradox is crucial for environmental conservation, economic efficiency, and social equity. To address these challenges, previous works have explored various approaches, ranging from policy interventions to technological innovations [19, 42]. However, the need for a holistic, cost-effective, and privacy-conscious solution [31] remains unmet. In modern societies, several solutions can be leveraged; such as implementing waste reduction and recycling programs, promoting *circular economy* practices, supporting social enterprises and cooperatives, enhancing access to affordable housing and engaging various stakeholders, including government agencies, community organizations, businesses, and residents, in collaborative efforts is essential for creating sustainable solutions. Collaboration can facilitate knowledge sharing, resource pooling, and joint initiatives to address waste and poverty issues effectively. Each environment should be tailor a solution base on its specific needs. However, most of this solutions necessitate the improvement is global knowledge, and change the paradigm of the current economy from linear to circular.

A circular economy is an alternative approach to the traditional linear economy of "take-make-dispose." In a circular economy, resources are kept in use for as long as possible, and at the end of their useful life, they are recycled or repurposed to create new products or regenerate natural systems. While the concept of a circular economy offers numerous benefits, the transition to this kind of economy takes time and resources and necessitates redesigning regulations, businesses and needs collaboration from all stakeholders. Although we wait for this change to happen, the issues of waste and poverty continue to affect a significant number of individuals. In last years, the advances in technology helps in so many cases that improved human daily lives. we believe technology can be helpful in this matter to; In an ideal, waste-less smart environment, sustainability and technology harmoniously intersect to create a seamlessly efficient ecosystem. Imagine a community where every element is designed to minimize waste and maximize resource utilization. Buildings are constructed using eco-friendly materials and designed to conserve energy, with solar panels and green roofs. Waste management systems are highly advanced, with smart bins that automatically sort recyclables and compostables, significantly reducing landfill contributions.

To bridge the gap between wastage and the people in need, we believe steps such as **OrganicSpace** application, a pioneering platform designed to facilitate efficient and accessible distribution while respecting individual privacy and reducing operational costs is a significant step.

### 3 COMPARATIVE ANALYSIS OF FOOD DISTRIBUTION TECHNOLOGIES

Efforts to address poverty must involve comprehensive strategies that encompass economic development, social welfare, and education. Sustainable solutions should aim to break the cycle of poverty by promoting inclusive economic growth, ensuring equitable access to education and healthcare, and creating employment opportunities for marginalized communities. International collaboration and targeted interventions are crucial to effectively address the multifaceted nature of poverty and improve the overall well-being of vulnerable populations. Tackling the global issue of poverty requires a holistic approach that addresses its root causes and encompasses a range of social, economic, and educational interventions. By fostering inclusivity and promoting sustainable development, the international community can work towards creating a world where everyone has the opportunity to lead a dignified and fulfilling life, free from the constraints of poverty. A solution lies in a smart environment, an optimal setting that addresses the problem by bridging gaps in the food system, linking those in need of food with entities faced with the dilemma of discarding uneaten food. This intelligent design has the potential to mitigate economic costs and preempt social vulnerabilities by efficiently delivering surplus food directly to those who require it. Several initiatives and technologies have been developed to address these issues. However, many fall short in various aspects, such as success rate, organizational support, cost-effectiveness, and privacy preservation. To address these gaps, the **OrganicSpace** application was developed, leveraging smart technology to provide a comprehensive solution to food waste and hunger.

The Table 1 provides a comparative analysis of applications and technological innovations that are dedicated to the reduction of food waste. It not only showcases their unique features and capabilities but also evaluates them against the benchmark set by OrganicSpace. This comparison is crucial in highlighting the strengths, weaknesses, and distinct approaches of each solution. By examining key parameters such as efficiency, user-friendliness, and overall impact on waste reduction, this table serves as a comprehensive guide for understanding how each application or technology contributes to the broader goal of minimizing food waste in comparison to the standards established by OrganicSpace.

Related Work	Success Rate	Organizational Support	Food Distribution System	Privacy-Preserving	Cost-effective	Individual Needs	Non-profit	Reference
GoMkt	N/A	✓	✓	N/A	✓	✓	×	[3]
Imperfect Foods	High	✓	✓	N/A	✓	✓	×	[3]
Misfits Market	High	✓	✓	N/A	✓	✓	×	[3]
Hungry Harvest	High	✓	✓	N/A	✓	✓	✓	[3]
Food Rescue US	Medium	✓	✓	N/A	✓	✓	✓	[3]
Magic Fridge	Medium	✓	×	✓	✓	✓	×	[5]
MyFoodways	Medium	✓	×	✓	✓	✓	×	[5]
nosh	Medium	✓	×	✓	✓	✓	×	[5]
NoWaste	High	✓	×	✓	✓	✓	×	[5]
Olio	High	✓	✓	N/A	✓	✓	✓	[7]
Foodfully	Medium	✓	×	✓	✓	✓	×	[6]
Goodr	High	✓	✓	N/A	✓	✓	✓	[6]
ImpactVision	High	✓	×	✓	✓	✓	×	[6]
NoFoodWasted	High	✓	✓	N/A	✓	✓	×	[6]
No Food Waste	High	✓	✓	N/A	✓	✓	✓	[6]
Too Good To Go	High	✓	✓	N/A	✓	✓	×	[4]

Table 1. Comparative analysis of food distribution technologies(alternative: is designed using Latex code to show how other works are different than our work.)

By the detailed comparison of various technologies and organizations dedicated to improving food distribution and reducing waste provided in the table, we can see each entity is evaluated across several key metrics, which include their success rate, level of organizational support, effectiveness of their food distribution system, commitment to privacy preservation, cost-effectiveness, responsiveness to individual needs, and whether they operate as a non-profit. Several organizations, such as Imperfect Foods, Misfits Market, and Too Good To Go, have demonstrated a high success rate in their initiatives. This success is often supported by robust organizational backing, ensuring that these initiatives are sustainable and impactful. The analysis reveals a mixed approach towards food distribution systems, with some organizations incorporating advanced systems while others do not. The aspect of privacy preservation varies among these initiatives, indicating different prioritization levels for this factor. A notable trend across most of these organizations is their focus on cost-effectiveness, which is crucial for long-term sustainability and wider adoption. Catering to individual needs is another common feature, underscoring the importance of

personalization in food distribution. The table also distinguishes between non-profit and for-profit organizations, providing a perspective on their operational models and underlying motivations.

OrganicSpace stands out in the context of food distribution with a unique, holistic approach that seamlessly blends logistical efficiency with a deep understanding of individual psychology, privacy, cost-effectiveness, and accessibility. This strategy goes beyond conventional methods, showcasing creativity and the integration of smart environments. By tailoring its services to individual preferences and needs, OrganicSpace ensures a personalized and sustainable approach to food consumption. The emphasis on privacy protection and cost-effectiveness makes the platform not only trustworthy but also accessible to a wider audience, breaking down barriers and fostering inclusivity. The standout feature of OrganicSpace is its innovative use of a distinctive QR code system, which revolutionizes the food distribution process. This technology streamlines interactions, allowing users to access information and services quickly and efficiently, enhancing the user experience. This integration of smart technology is indicative of OrganicSpace's commitment to creating a smarter, more responsive environment. By combining advanced technology with a user-friendly approach, OrganicSpace exemplifies a forward-thinking solution that addresses contemporary challenges in sustainable living while paving the way for future innovations [26].

#### 4 ORGANICSPACE APPLICATION DESIGN OVERVIEW

The OrganicSpace application embodies the essence of the organic creative space concept, harnessing the power of technology to foster community connections, mitigate food waste, and champion sustainable practices. This innovative application, as highlighted in Garrone's 2014 study [19], is more than just a digital tool; it's a platform that bridges the gap between surplus food and those who need it, aligning with the modern ethos of responsible consumption and environmental mindfulness.

Central to the OrganicSpace application's functionality are its user-centric features, as elaborated by Aschemann-Witzel et al. in 2016 [25]. The application offers real-time notifications alerting users to the availability of surplus food in their vicinity, facilitating prompt and effective distribution. This feature not only helps in reducing food waste but also aids in addressing community hunger issues. Moreover, the inclusion of meal planning and tracking functionalities empowers users to make informed decisions about their food consumption, further minimizing waste. The application also fosters a sense of community engagement by encouraging users to participate in local food rescue operations and share surplus food within their networks, thereby cultivating a culture of sharing and sustainability.

#### 5 ORGANICSPACE APPLICATION ENTITIES, FUNCTIONS, IMPACT

The application's unique feature of generating a unique QR code for each member simplifies access and enhances user experience [46]. The **OrganicSpace** application is not only a technological innovation but also a manifestation of smart and creative spaces that synergize technology with human-centric design. The initial idea of the application was to provide a platform for communication between restaurants, stores, and food providers on one side, and homeless and hungry individuals on the other side. In this provided platform, instead of restaurants disposing of untouched food at the end of the day, they deliver it to designated stations, thereby reducing the costs of waste disposal. Homeless individuals can also receive these meals by presenting a code provided to them through the application, based on the number of family members they have. OrganicSpace leverages the psychological aspects of individuals, ensuring that the process of food distribution is both accessible and respectful of privacy concerns [22]. This approach is particularly pertinent in addressing the food needs of homeless individuals in cities like San Francisco, offering a dignified and efficient means to access food [14].

Furthermore, the application contributes significantly to environmental sustainability. By reducing wastage, it directly impacts the reduction of CO<sub>2</sub> emissions, a critical factor in the fight against climate change [21]. In the United States, for instance, food waste is responsible for more greenhouse gas emissions than the airline industry, highlighting the urgent need for effective solutions [18]. The **OrganicSpace** application, through its innovative approach to distribution system and waste reduction, aligns with global efforts to create sustainable food systems and combat climate change [29]. This application can also serve as an educational tool, raising awareness about the environmental consequences of food waste. By providing information and insights about how reducing food waste benefits the environment, it can encourage behavioral change and through educational content helps users understand the broader context of their actions. The importance of such smart spaces and applications is underscored by the fact that the U.S., despite having a population that constitutes only about 4% of the global total, is responsible for over 12% of global municipal solid waste [23]. This disproportionate contribution to global waste highlights the critical role that innovative solutions like the **OrganicSpace** application can play in creating more sustainable communities and reducing the environmental impact of waste [12].

The **OrganicSpace** application represents a significant advancement in the context of smart spaces and community-driven initiatives. Its focus on leveraging technology to address food waste, hunger, and environmental sustainability exemplifies the potential of creative and sustainable solutions in transforming society. By reducing food waste, promoting efficient distribution, and considering the psychological and privacy aspects of individuals, the application paves the way for a future where technology and human-centric design coalesce to create a more sustainable and equitable world [20]. Restaurants, supermarkets, and households are equipped with smart systems that track food inventory and expiration dates, alerting them to use or donate items before they spoil. Excess food is swiftly redirected to those in need through a network of food banks and redistribution centers, all orchestrated by a sophisticated logistics platform that ensures no edible food goes to waste. By further studying the issue of waste beyond food, we have come to the conclusion that this application can be beneficial in addressing other problems as well. Items such as clothes, toys, stationery, and electronics that owners no longer need can be shared through this platform. By sharing items that are no longer needed, we can create a better quality of life for those in need. This can help prevent the social harms associated with poverty. Moreover, it can also contribute to mitigating climate change by reducing the need for new production. Additionally, the economic benefits of this sharing practice can benefit the entire society as a whole.

Furthermore, the application recognizes the importance of diverse contexts in evaluating its effectiveness. By conducting studies in various settings, including underserved communities and cross-cultural environments, as emphasized in Chen's work [14], OrganicSpace seeks to understand how its functionalities and impact may differ across different social, economic, and cultural landscapes. This inclusive approach to assessment ensures that the application's benefits are evaluated comprehensively, taking into account the unique challenges and dynamics of diverse user groups and environments.

In essence, the incorporation of first-person methods and longitudinal studies demonstrates OrganicSpace's commitment to rigorous and holistic evaluation, striving to not only quantify its impact but also qualitatively understand the experiences and perceptions of its users. This research-driven approach contributes to the ongoing refinement and optimization of the application, making it a more adaptive and effective tool in the global effort to combat food waste and promote sustainable practices.

## 6 ORGANICSPACE DESIGN DESCRIPTION, IMPACT, AND VISION

OrganicSpaces is a pioneering non-profit mobile application designed to address the critical issues of hunger and food waste, while fostering an organic, smart, and connected community. The app effectively bridges the gap between food surplus and food scarcity, leveraging technology to combat climate change and promote social responsibility. The app integrates four key entities: Admin, Food Distribution Centers, Donors, and Users, each playing a vital role in this ecosystem.

### 6.1 Roles and Functions

#### System Admin.

- **Primary Role.** Admins are responsible for maintaining the OrganicSpaces Database. They register eligible users by verifying their annual income, living situation, and other relevant criteria.
- **Key Functions:** User verification, database management, system oversight, and ensuring smooth coordination among all entities.
- **Food Distribution Centers.**
- **Primary Role\*\*:** These centers serve as the physical hubs where the donated food is collected, stored, and distributed to users.
- **Key Functions\*\*:** Updating the app with real-time information on available food items, operating hours, and special announcements.
- **Donors (Restaurants/Food Chain Centers).** - **\*\*Primary Role\*\*:** Donors are crucial in supplying the food that is near its expiration but still safe for consumption. - **\*\*Key Functions\*\*:** They log into the app to enter details about the type of food, quantity, expiration dates, and other pertinent information, ensuring a consistent supply of food donations.
- **Users (Recipients).**
- **Primary Role:** Users are individuals or families in need, identified and registered by the Admin.
- **Key Functions:** Users utilize the app to locate nearby Food Distribution Centers, check available food items, and view operating hours. Each user is equipped with a unique ID card with a QR code, facilitating access to services. For those without a smartphone, a paper map with necessary information is provided.

## 6.2 App Features

**Real-time Tracking.** Users can track food availability and center locations in real time.

**QR Code Scanning\*\*.** Simplifies the distribution process and ensures equitable access to food resources.

**Interactive Map.** Provides users with detailed information about food distribution centers, including directions and hours of operation.

**Donation Management.** Enables donors to efficiently manage their contributions, reducing food waste.

**Reporting and Analytics.** Offers admins valuable insights for better resource allocation and impact assessment.

**Technical Details.** Technologically, the OrganicSpace application is built on a robust and scalable foundation, utilizing advanced programming languages and frameworks. The backend development leverages C# and .NET Core, as stated in Microsoft's 2020 report [28], which are known for their efficiency, security, and ability to handle complex data structures. This choice of technology ensures that the application can manage a large user base and diverse functionalities without compromising on performance. The frontend development, on the other hand, is powered by Angular and Ionic, as per the Angular Team's 2020 insights [44]. This combination offers a seamless and responsive user interface, ensuring that the application is accessible and easy to navigate on a variety of devices, including smartphones, tablets, and computers. The cross-platform compatibility provided by these technologies means that the application can reach a wider audience, irrespective of the device or operating system they use.

## 6.3 OrganicSpace Design Components

The OrganicSpace app is a comprehensive solution to food waste management, meticulously crafted to cater to a wide range of stakeholders. At its core, the app is built around a user-friendly interface, tailored to suit the specific needs of different user groups such as individual consumers, food retailers, and food rescue organizations. This customization ensures that each stakeholder can interact with the app in the most effective and intuitive way, thereby enhancing the overall user experience and facilitating greater engagement.

One of the key features of OrganicSpace is the integration of barcode scanning technology, which significantly broadens its inclusivity and ease of use. As outlined in Smith's 2018 study [42], this technology allows users to quickly and accurately identify food items, assess their freshness, and determine their suitability for consumption or donation. This feature not only simplifies the process of managing food inventory but also empowers users to make more informed decisions about food consumption and waste.

Furthermore, the app incorporates advanced location-based services to streamline the food distribution process. These services enable the app to provide real-time information on the nearest food donation centers, surplus food availability, and optimal distribution routes. This geographical intelligence is crucial in ensuring that food reaches those in need promptly and efficiently, thereby reducing waste and aiding in hunger alleviation. Figure 2 shows parts of the design of the App.

The design decisions behind OrganicSpace, as Hevner's 2004 research on design science in information systems research suggests [22], are centered on three pivotal principles: ease of use, privacy-preserving (no location or tracking of the users), and accessibility. The app's interface is designed to be intuitive and user-friendly, minimizing the learning curve for new users and enhancing the overall user experience. Privacy protection is another critical aspect of the app's design. With growing concerns about data security and privacy, OrganicSpace employs robust encryption and data protection measures to safeguard user information, ensuring that users can engage with the app with confidence and trust. Accessibility is also a cornerstone of the OrganicSpace app's design philosophy. The app is engineered to be accessible to a broad spectrum of users, including those with limited technological proficiency or access to advanced devices. This inclusivity ensures that the benefits of the app can be enjoyed by a diverse user base, thereby maximizing its impact in reducing food waste and addressing food insecurity.

## 6.4 Impact and Vision

OrganicSpaces aims to create a sustainable solution to hunger and food waste, reducing carbon emissions and promoting environmental responsibility. By connecting donors, distribution centers, and users through smart technology, the app fosters a sense of community and shared responsibility. It's not just an app; it's a movement towards a healthier planet and a more compassionate society.

OrganicSpace is more than just a tool for waste reduction; it represents a significant leap forward in tackling global challenges like food scarcity, waste management, and climate change. The application's innovative and user-centric design exemplifies the transformative power of technology in creating sustainable food systems. It stands as a model of organic

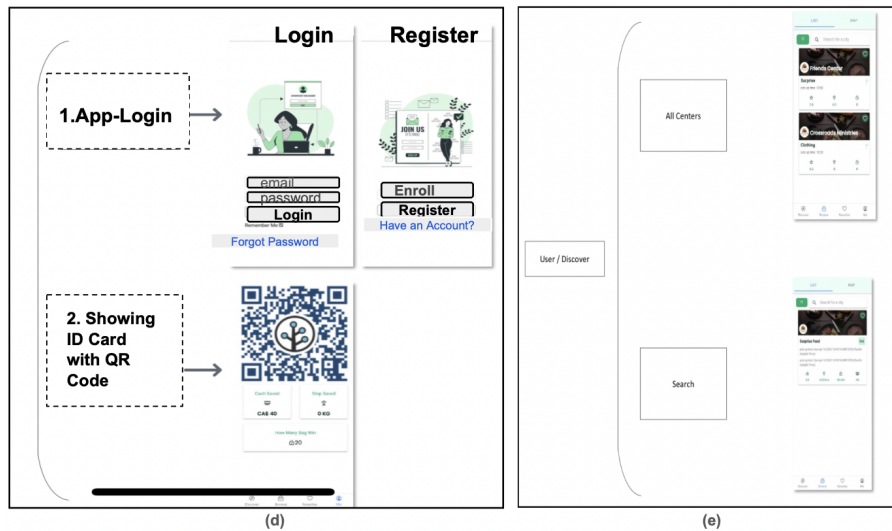


Fig. 2. d and e) The figures above show the flow chart of each user, the actions they can take, and their options on the app based on the user type. (Alternative: These are snapshot of how the OrganicSpace Application work and what entity it has.)

creativity and smart environment integration, demonstrating how technological solutions can lead to more sustainable, equitable, and efficient food distribution. By blending advanced technology with environmental consciousness, OrganicSpace not only addresses current ecological and social challenges but also sets a new standard for future initiatives aiming to unite technology, sustainability, and community involvement.

In a broader sense, OrganicSpace is an embodiment of a sustainable future, where technology and ecological responsibility converge. Its approach goes beyond mere waste reduction, aiming to educate and inspire users about sustainable living and conscious consumption. This educational aspect is crucial in fostering a more informed and responsible global community, aware of the impacts of their food choices on the environment. OrganicSpace's role in this transformative process is invaluable, serving as a catalyst for change and a beacon of hope for a more sustainable world. Its success could inspire similar initiatives worldwide, leading to a global movement that prioritizes sustainability, combats climate change, and works towards a healthier planet for future generations.

## 7 ORGANIC CREATIVITY IN APPLICATION DESIGN

The OrganicSpace app exemplifies the essence of organic creativity by seamlessly weaving natural elements and principles into its technological framework. Inspired by bio-inspired computing, it harnesses algorithms and processes that mimic biological systems, as detailed in Dougherty's exploration of sustainable computing [16]. This approach not only enhances the app's efficiency but also aligns it with ecological principles, creating a harmonious blend of technology and nature. Additionally, the app's interface and user experience design draw on natural materials and forms, fostering a more intuitive and engaging interaction for users.

Crucially, OrganicSpace's innovative design and technology have a pivotal role in solving the food waste problem, particularly when integrated into a smart connected system. By leveraging real-time data, predictive analytics, and community networking, the app can effectively identify and redirect surplus food, filling critical gaps in the food distribution system. This efficient redistribution of resources not only mitigates food waste but also contributes to a more equitable and sustainable food system.

The implications of reducing food waste through applications like OrganicSpace extend far beyond the immediate context. By curbing food waste, we can significantly impact climate change mitigation. Food waste contributes to greenhouse gas emissions; thus, reducing it can help in controlling climate change. This intervention not only benefits the environment but also has positive economic repercussions. By optimizing food distribution and reducing waste, we can lower costs for producers and consumers alike, boosting the overall economy.

## 8 CONCLUSIONS AND FUTURE DIRECTIONS

The OrganicSpace application marks a significant advancement in the context of food waste reduction, embodying principles derived from organic creative spaces. This application is not just a tool but a testament to the fusion of sustainability,

community engagement, and cutting-edge technology. Its design and features underscore a deep-seated commitment to eco-friendly practices and fostering a sense of collective responsibility towards our environment.

Looking to the future, the potential for OrganicSpace to evolve is immense, particularly with the anticipated integration of state-of-the-art technologies. The incorporation of artificial intelligence (AI) and robotics, as suggested by Bibri in 2020 [12], could revolutionize the application's efficiency and reach. AI could enable more precise data analysis, leading to better predictions of food waste trends and more personalized recommendations for users. Robotics, on the other hand, could automate and streamline the collection and distribution of surplus food, making the process faster and more efficient. These technological enhancements could significantly bolster the application's capacity to reduce food waste on a larger scale.

Another vital aspect of future development lies in embracing cultural diversity and inclusivity, particularly through the integration of indigenous perspectives on organic creative spaces, as highlighted by Grenoble in 2019 [20]. By incorporating these perspectives, OrganicSpace could offer a more culturally sensitive approach, resonating with a broader audience. Indigenous knowledge systems often encompass sustainable practices and a deep understanding of the natural world, which can provide valuable insights into more effective and holistic ways of reducing food waste. This integration would not only enrich the application's cultural relevance but also promote a more inclusive and diverse understanding of sustainability.

The expansion of OrganicSpace in these directions promises a multifaceted approach to tackling food waste. By blending advanced technology with cultural wisdom, the application could set a new standard for sustainable practices in the digital age. This evolution would not only enhance the application's effectiveness but also position it as a leader in the global movement towards sustainability, setting a precedent for future initiatives in the context of food waste reduction and environmental stewardship. In essence, OrganicSpace stands at the forefront of a revolution in sustainable living, embodying the potential of technology and cultural inclusivity to create a more sustainable and equitable world.

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