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FOSTERING SOCIAL INTEGRATION AND REINTEGRATION: ASSISTIVE TECHNOLOGIES AND PROGRAMMES FOR SUSTAINABLE INCLUSION

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Anotacija

Neįgaliųjų, ypač nukentėjusių nuo karo veteranų, priverstinių migrantų socialinė integracija ir reintegracija yra svarbi technologinės pažangos ir socialinės transformacijos kontekste. Tyrime nagrinėjamas šiuos procesus palengvinančių priemonių ir technologijų vaidmuo, gerinant prieigą prie reabilitacijos, bendravimo ir profesinio įsitraukimo. Analizuojamas jų poveikis ir institucijų vaidmuo skatinant įtrauktį, teikiant medicininę, psichologinę ir švietimo pagalbą, formuojant socialesnes bendruomenes. Tyrime atsakoma į klausimus: a) kokie sprendimai bus veiksmingi, vykdant socialinę integraciją ir reintegraciją, skatinant socialinę sanglaudą? b) kaip pagalbinės technologijos veikia reintegracijos procesus? c) kokių veiksmų reikėtų imtis siekiant skatinti socialinę integraciją ir reintegraciją? Šiuolaikinių pagalbinių technologijų naudojimas ir su suinteresuotaisiais subjektais vykdoma veikla įgyvendinant programas padės formuoti įtraukią visuomenę, kartu kurti socialiai atsakingesnę Europą ir užtikrinti tvarų vystymąsi.

PAGRINDINIAI ŽODŽIAI: tvarios įtraukties programos, socialinės integracijos ir reintegracijos procesai, pagalbinės technologijos.

Abstract

The social integration and reintegration of people with disabilities, especially war veterans and forced migrants, is important in the context of technological progress and social transformation. The study examines the role of instruments and technologies in facilitating these processes by improving access to rehabilitation, communication and professional engagement. Their influence and the role of institutions in promoting inclusion, providing medical, psychological and educational support,

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and in the formation of more social communities, are analysed. The study answers the questions: (a) What solutions will be effective for social integration and reintegration for fostering social cohesion? (b) How do assistive technologies affect reintegration processes? and (c) What steps should be taken to foster social integration and reintegration? The use of modern assistive technologies with stakeholder activities through the implementation of programmes will contribute to the formation of an inclusive society, the co-creation of a more social Europe, and more sustainable development.
KEY WORDS: sustainable inclusion programmes, social integration and reintegration processes, assistive technologies.
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Introduction

The sustainable development goals declare equal opportunities for all. Modern societies change much faster than even a decade ago. New challenges appear, to be solved by people. One of them is inclusiveness. The population is not becoming healthier, and this means communities, researchers, businesses, NGOs and policy makers should create new solutions paying more attention to diversity.

From 20 March 2014, the world and Ukraine faced a new challenge: the integration and reintegration of adults and children who have lost arms, legs, eyes, etc, in new communities, because of the war of aggression by the Russian Federation against Ukraine. Citizens from the eastern part of Ukraine and Crimea, escaping from war or occupation, or being bombed by the Russian Federation in their homes or at their work places, became invalided physically and mentally. A new category appeared: forced displacement (Refugee, 2023). From 24 February 2022, people from all regions of Ukraine started suffering in drone and missile attacks, and at the same time the combatants and volunteers who chose to become combatants, protecting the order of world peace, faced a new challenge: an increasing amount of people with more than one amputation and mental trauma, their reintegration into peaceful societies, and their integration into new communities (IOM, 2022).

The problem of the integration of forced migrants and people with special needs, to whom the war became a new abnormal reality for some period of their lives, is highly relevant for Ukraine and for EU countries. Internally and externally displaced people, war veterans, and non-EU migrants to EU countries, should be supported by local people and programmes to become the ‘new ours’ in any place where they are safe. It is about dignity and quality of life, about sustainable inclusion. To make this possible, the age of technology has been forced to provide solutions, assistive technologies. It is more than rehabilitation; it is about communication, while creating technologies, and personal and professional engagement, i.e.

by means of community, and the governmental co-development and implementation of EU programmes (League, 2023).

The *scientific definitions of the concepts as the* theoretical foundation for the study *are*: 1) assistive technologies are strategies and an adaptive tool designed to bridge the gap between an individual's current and expected levels of functioning, enabling greater autonomy, supporting employment and communication, and enhancing social cohesion, especially among people with disabilities (Marinaci et al., 2023); 2) sustainable inclusion integrates social and environmental aspects to ensure fairness, equality, and the long-term participation of all individuals in society, particularly those at risk of exclusion (Gupta et al., 2016); 3) programmes for sustainable inclusion are targeted initiatives that promote long-term participation and equity for marginalised groups, by addressing systemic barriers and integrating social and environmental goals (Mir et al., 2024).

The purpose of the study is to research processes of social integration and reintegration of people with disabilities in the context of the newest technological solutions, the co-creation and exploitation of assistive technology, and key stakeholder activities, and to develop propositions for sustainable inclusion.

To contribute to making possible the process of achieving this purpose, technical solutions to enforce processes of readaptation, resocialisation, integration and reintegration are being developed by Zhytomyr Polytechnic State University. The university is a partner of the Interreg Europe project 'Migrants' integration in local economies', which contributes to 'A More Social Europe' (MILEstone, 2024).

1. Methods

Results were obtained from analytical reviews, data from international organisations, and a comparative approach used to disclose the effectiveness of assistive technologies and support systems and programmes for people with special needs and war veterans. Official institutional reports, policy documents (the World Health Organization, the United Nations, Interreg Europe, the Ministry of Health of Ukraine, and others) and scientific publications from open science peer-reviewed journals on the problem of social integration and reintegration, rehabilitation, and the use of assistive technologies with references, were used for the analytical reviews. The results disclosed and formed a deep understanding of existing theoretical frameworks and empirical findings on related topics. Data from international organisations included statistical reports, policy documents, best practices and case studies of the organisations and government institutions, and local support initiatives in open access. This allowed us to understand and to disclose current integration and reintegration mechanisms, gaps in social services, and the

impact of economic and other factors on the inclusion of people with disabilities. A comparative analysis was used to identify the best practices and trends in the integration and reintegration of war veterans and people with disabilities, in a variety of socio-economic contexts. By analysing rehabilitation programmes and the implementation of assistive technologies, the prospects for potential applicability were defined.

Thus, the key challenges and opportunities in social integration and reintegration with assistive technologies and valid support programmes for sustainable inclusiveness were indicated.

2. Results

Solutions to be proposed and implemented as the result of the study come from a deep understanding and sharing the position that in modern societies characterised by rapid technological progress, changing economic conditions and evolving social structures, the need for effective mechanisms of social integration and reintegration is becoming increasingly urgent (Grunow et al., 2023). And it is very important for countries affected by armed conflict and war, where the transformation/destruction of social norms and institutions exacerbates the problem of the reintegration of affected persons. Ukraine and EU countries met the challenge of increasing quantities of forced migrants, and are currently facing an urgent need to reintegrate war veterans and people with disabilities into social and economic life.

The ongoing war by the Russian Federation against Ukraine has increased the number of people in need of rehabilitation, social support, reintegration and employment for sustainable inclusion. The study highlighted the fact that, in addition to the physical and psychological impact of the war, affected individuals often experience the disruption of social cohesion, a loss of trust in institutions, and collective trauma (Hirschberger, 2018; Li et al., 2023). Even more, the reintegration process is complicated by economic instability, an inadequate infrastructure, and insufficient social services (Timchenko et al., 2022). This is why the authors mention that the policies and programmes that are being co-created should lean towards and ensure the active participation of the aimed groups.

The United Nations report on the World Social Situation defines social inclusion as ‘the process of improving participation in society, particularly for disadvantaged people, through enhancing opportunities, access to resources, voice and respect for rights’ (UN, 2018). On the other hand, reintegration specifically concerns the return of individuals, such as war veterans and people with disabilities, to civilian life after displacement, injury or trauma (Van-Vleet, 2021). In the context of countries affected by war, both processes are necessary to maintain

social cohesion and economic stability (Khan et al., 2015). However, traditional approaches to integration and reintegration often do not take into account the specific needs of people with disabilities, especially those who require assistive technologies to regain mobility, communication and vocational skills. The legitimacy of rehabilitation in Ukraine in general is presented by the law 'On Rehabilitation in the Health Care Sphere' as a set of measures required by a person who experiences or may experience a limitation of daily functioning due to a state of health or ageing in interaction with his environment (Rehabilitation, 2020). It encompasses medical, psychological, social and professional interventions, including the provision of assistive technologies and services to support independent living and social inclusion (Onishchenko et al., 2023).

Social sustainability is a wide category and has four key components: 'social cohesion, inclusion, resilience, and process legitimacy' (Barron et al., 2023). Thus, these components should be presented in policies and implemented on all levels.

Social cohesion has been greatly demonstrated by EU countries since 2015 (with the Syrian refugee crisis) and by Ukraine since 2014 (due to the occupation by the Russian Federation of Crimea and part of its eastern regions). Societies showed resilience, enabled by legislation, and taking inclusiveness as a fundamental of civilisation. In 2025 each community of the EU and Ukraine stayed supportive.

A total of 16% of the global population, or approximately 1.3 billion people, experience a significant disability (WHO, 2023); among them, forcibly displaced people with disabilities represent one of the most vulnerable groups, facing barriers to accessing essential services, securing livelihoods, and integrating into new communities. A UNHCR survey conducted among displaced families in Ukraine's neighbouring countries (Hungary, Moldova, Poland, Romania and Slovakia) revealed that 27% of households had at least one member with specific needs, a disability, or a serious medical issue, making it significantly more difficult for them to meet basic needs (UNHCR, 2023). And in Ukraine, among displaced people, one third (31%) of IDP households reported that at least one person in their household was living with a disability (IOM, 2025).

According to the data for 2023, more than 2.7 million people in Ukraine live with disabilities, many of whom have sustained injuries as a result of the war (Drabkina, 2025). Only for one year, from 2022 to 2023, 58.8% of individuals were officially recognised as people with disabilities. Including combatants who have disabilities, the numbers increased from 5,816 in 2022 to 23,685 in 2023 (MHU, 2023). This increase raised the urgent need for advanced rehabilitation programmes and assistive technologies: a) prosthetic and orthopaedic devices, including prostheses, orthoses, and specialised footwear, increased from 54,298 in 2022 to 77,509 in 2023; b) assistive communication technologies for hearing

aids (surdotechnics) increased from 2,308 in 2022 to 4,161 in 2023, and visual aids (typhlotechnics) to 6,074 individuals, up from 3,850 the previous year (MHU, 2023). Beyond individual mobility and accessibility, adapting living environments has also become a priority. In 2023, 20,996 individuals received recommendations for housing adaptations, compared to 13,587 in 2022; the number of people in need of wheelchairs increased from 14,097 in 2022 to 20,470 in 2023 (MHU, 2023).

In such an atypical situation, when the numbers come to 10% of the population, processes of social integration and reintegration should be fostered. Sustainable inclusion is the solution. The importance of this is also confirmed by the analytical report 'The Social Reintegration of Veterans in Ukraine. With a special focus on the inclusivity of particularly vulnerable veterans and the role that veteran organisations can play in building inclusivity', based on a sociological study conducted in 2023 with the support of Ukrainian and international organisations (IOM, 2023). A total of 1,000 veterans and their families were surveyed, as well as 50 veterans' organisations from different regions of Ukraine, with the purpose of identifying the key challenges faced by veterans after returning to civilian life, and identifying effective strategies for their adaptation. The survey showed that military experience has a different impact on veterans' sense of belonging and connection to the community, namely '24.00% of females and 4.95% of males stated "worsened a lot", 13.43% and 4.00% "somewhat worsened", 52.12% and 44.00% "no change", 24.91% and 24.00% "somewhat improved", 4.59% and 4.00% "improved a lot"' (IOM, 2023). As can be seen, female veterans feel isolated and misunderstood by society five times more than the same indicator among male veterans. The case of Ukraine is a case of increased psychological pressure on women at war, because of: 1) the stigmatisation of female veterans in society (Hrytsenko, 2022); 2) day-to-day discomfort and further rehabilitation due to the long-term use of military equipment without anatomical differences (in general over 100 female combatants died either on the front line, during evacuation, or on special tasks and press assignments) (Andrews, 2023); 3) long harsh conditions leading to health problems (Snodgrass, 2023); and 4) limited possibilities to receive psychological rehabilitation related to phantom pains. Thus, while developing and implementing programmes, the gender difference should be taken into account.

Also available since 2014, practice demonstrated that the most effective ways to integrate people with disabilities are participation in social activities, onset and online meetings, contacting supportive organisations, sports, and volunteering. According to IOM data, the preferences of war veterans are: 'attending social gatherings or meetings (19%), engaging in volunteer work or community service (16%), joining veteran support groups (12%)', etc (IOM, 2023). Different needs and challenges are faced within the variety of communities and current legislation:

war veterans and people with disabilities still encounter physical/social barriers that make it difficult to participate in community-related/volunteer activities, and so support from other war veterans and people with disabilities, and the opportunity for social cohesion, are more important to them. The possibility to join activities is related to availability: transport, specially designed and equipped spaces, accessibility, and individual support. The importance of co-creating a new inclusive environment is important.

Organisations and the initiatives of forced displaced people and veterans' organisations play a special role in increasing social cohesion in the new reality. People from these initiatives and organisations support those who have a need at different stages of adaptation and readaptation to participate peacefully in civilian life (e.g. information, legal assistance, support with the availability of physical and mental rehabilitation, training, workshops, etc), and to work on co-creating an inclusive environment and spaces that facilitate not only recovery but active participation in community life, in the social, civic, educational, psychological and rehabilitation spheres. The activities of internally displaced people's councils (Fig. 1) (IDP, 2025) and the council of veterans of Ukraine (Regulations, 2025) can be presented as good practice. Their actions are also concentrated on education and professional inclusion (language, driving courses, professional retraining, lifelong learning programmes), the creation of psychological programmes, and also their availability for families, rehabilitation and assistive technologies.

The MILEstone project addresses the sustainable labour market inclusion of non-EU nationals, showing how policy improvements rooted in this project contri-

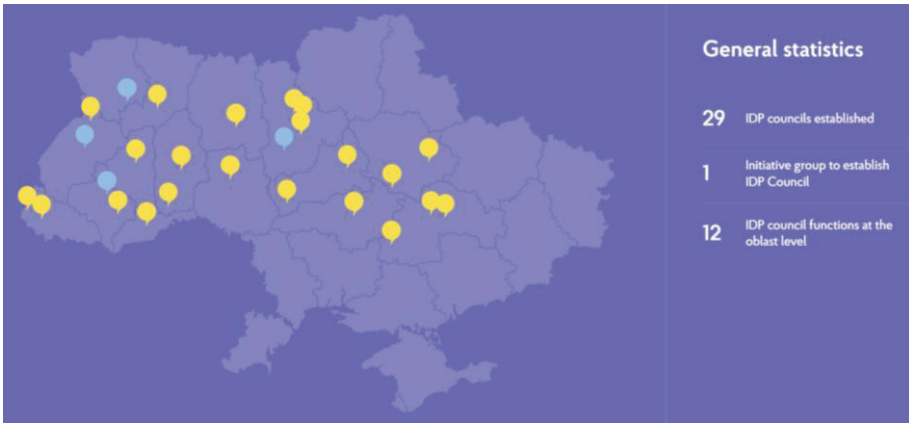

Figure 1. The distribution of IDP Councils in Ukraine, 2025
Source: IDP, 2025.

bute to ‘A More Social Europe’ (MILEstone, 2024). One of the Interreg Europe programme’s priorities is ‘social’. Driven by the aim of creating equal opportunities for all, the sustainable development goals could be co-reached through sustainable inclusion.

The mentioned EU technological leadership is a priority as well. Thus, by co-creating new assistive technologies, supported by the leading programmes, social integration and reintegration can be fostered.

Assistive technologies help improve the quality of life, maintain freedom of movement and independence, and foster processes for the sustainable inclusion of people with disabilities, especially those affected by war, children and senior citizens, who face difficulties in daily life (WHO, 2024). Depending on the tasks they need to solve, assistive technologies can take different forms: from the simplest, such as orthopaedic sticks and hearing aids, to high-tech solutions, such as smart prostheses and software that uses artificial intelligence (AI) to support communication (Matter et al., 2016). It is important to understand that their importance goes far beyond physical support: they provide access to education, work and communication, and thus contribute to social integration.

It needs to be noted that the first assistive devices, such as orthopaedic sticks or mechanical prostheses, appeared in ancient times, but a real breakthrough in their development occurred only in the 20th century. The development of electronics and computing technology has made it possible to create more complex solutions, such as electric prostheses, hearing aids with digital signal processing, and alternative communication software. From the second half of the last century there has been a shift in emphasis from simply restoring physical functions to integrating people with disabilities into society through technological innovation (Mishra et al., 2022).

The current stage of development of assistive technologies is characterised by the widespread use of AI, robotics and the Internet of Things (Brose et al., 2010). One of the most promising areas is bionic prostheses, which can adapt to the user’s movements by responding to nerve impulses. For example, modern models of prosthetic arms use electromyographic sensors, which allow a person to control the device in the same way as their own limb (Resnik et al., 2018). AI opens up new horizons in assistive technologies, significantly improving access to information, communication and mobility. One of the most notable achievements in this area is computer vision systems that help blind people navigate their surroundings and interact with the environment. For example, the ‘OrCam MyEye’ device is capable of recognising objects, reading texts, identifying faces, and even determining the face value of banknotes in real time. Such solutions significantly increase the level of user autonomy, and reduce dependence on outside help (Tsouktakou

et al., 2024). Another important category of AI-enabled technologies is adaptive software for digital devices. Special screen readers, such as JAWS (job access with speech) and NVDA (screen reader), convert textual information into audio format, allowing visually impaired people to use computers and smartphones without a traditional visual interface. Voice assistants integrated into modern mobile devices also make it easier to control applications, make calls, and send messages. Voice assistants such as Google Assistant, Alexa and Siri allow users to control household equipment and lighting without physical interaction (Milbergs, 2025). Also, the smart home system makes everyday life much more convenient. So by integrating with voice assistants and mobile apps, users can control their homes remotely: adjust the lighting, change the room temperature, and even monitor their home security system. Another revolutionary area is personalised assistive solutions: 3D printing makes it possible to produce orthopaedic devices, prostheses and even customised tactile displays at a much lower cost than traditional manufacturing methods. This not only makes technology more accessible but also allows for the anatomical features of each user to be taken into account (GPAT, 2024).

Innovation in spatial mobility also significantly improves the quality of life of people with musculoskeletal disorders. Smart electric wheelchairs are now equipped with sensors and navigation systems that allow users to move safely, even in difficult conditions (Zhang et al., 2024). In addition, exoskeletons, robotic devices that help people with spinal injuries or neuromuscular diseases regain partial or full mobility, are actively developing. For example, the ‘ReWalk’ system enables independent movement thanks to electromechanical joints controlled by the user’s body movements (Robotic, 2025).

Nowadays, the development of assistive technologies is an important element of state policy on social integration and the reintegration of people with disabilities. One aspect of sustainable inclusion is ensuring equal access, including to education, and enabling lifelong learning. Ukraine is actively reforming its educational environment to make it more inclusive, despite the war conditions, although a significant number of children with disabilities still face barriers that limit their potential. But there is still limited access to assistive technologies, alternative and augmentative communication systems that would help children with hearing, visual, musculoskeletal or cognitive disabilities to learn effectively in an inclusive environment. The main challenges include a lack of funding, and an insufficient number of specialists who can adapt the learning process (some of them have also become forcibly displaced persons) (UNICEF, 2024). The widening of the development and implementation of specialised learning materials and devices, such as adaptive keyboards, Braille printed and ebooks, screen magnifiers and speech synthesis software, is becoming more necessary for education. For example, befo-

re the full-scale invasion of Ukraine by the Russian Federation, in 2021 educational institutions were equipped with appropriate equipment and software that provides equal learning opportunities regardless of physical or cognitive disabilities (Diachenko et al., 2024).

So social integration and reintegration are processes that lead to an active public, economic and social life. They involve not only overcoming the physical consequences of injury or adapting to a new social status, but also restoring the motivation of co-belonging to society. The success of reintegration is indicated through main aspects such as: 1) access to qualified medical care and rehabilitation; 2) support for psychological health; 3) opportunities for training and retraining; and 4) employment and the creation of an inclusive environment that promotes social interaction and active involvement in communities. The main result is to find new roles and realise people's potential.

Best practices demonstrate a reasonable combination of 1) medical, 2) psychological and 3) socio-economic support, to fully return to active life. Ukraine demonstrates this unity through the programmes of the Superhumans Charitable Foundation, which specialises in comprehensive assistance for Ukraine's defenders who have suffered severe injury and other consequences of war (Fig. 2). The charitable organisation provides a personalised approach to each patient. The team of specialists develops personalised rehabilitation programmes, taking into account the specifics of each person's injuries and needs. Psychological support is an integral part of the programme: psychologists work to overcome post-traumatic stress syndrome and other traumas.

The foundation collaborates with government institutions, businesses and local initiatives to provide adults and children affected by the war with access to high-

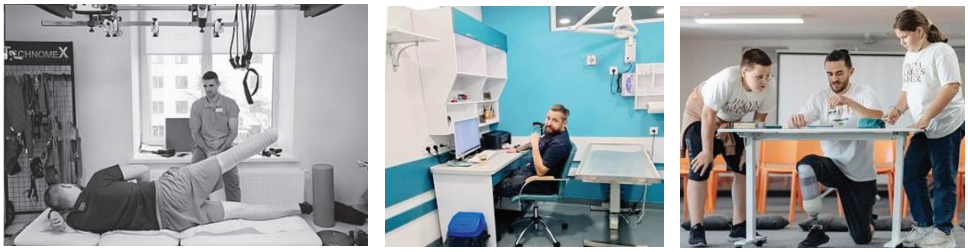

Figure 2. Medical and psychological rehabilitation, inclusive work space and employment, and co-reintegration, at the Superhumans Charitable Foundation
Source: Superhumans, 2025.

quality rehabilitation services, including prosthetic care, reconstructive surgery, and psychological support for free.

One of the necessary activities is engaging veterans and adults affected by the war in training programmes and business initiatives, helping them not only to adapt to civilian life but also to bring their own ideas to life. Also, adapting jobs for people with disabilities which will create the conditions for decent employment. And also, attention is paid to the development of the veterans' community and the creation of a supportive environment. Thus, social reintegration involves not only individual recovery, but also the creation of conditions in which veterans can interact, share experience, and support each other.

Organisations like Superhumans facilitate the creation of veteran spaces where meetings, training sessions, group sessions with psychologists, and events that promote cultural and social integration, are held. The introduction of mentoring programmes is important, during which veterans who have re-adapted to civilian life help those who are still in progress, and also people who will. It is about more than practical exchange, but support to overcome psychological barriers, and to reduce the feeling of isolation.

Veteran organisations are an integral part of the social reintegration process, providing a wide range of services necessary for veterans' adaptation. At the same time, their effectiveness depends on addressing key issues, including financial instability, insufficient coordination, and restricted access to resources. One of the challenges is the lack of specially equipped spaces and the number of qualified specialists, which makes it difficult to organise meetings and training sessions. However, the rapid development of assistive technologies, as was mentioned above, offers an opportunity to bridge this gap, facilitating independent living, improving labour market integration, and enhancing social participation. The integration of assistive technologies into rehabilitation and daily life can significantly speed up the process of adaptation, reduce dependence, and foster self-sufficiency for affected individuals.

Regarding the professional adaptation and the gaining of new competencies as part of the social reintegration of former servicemen and servicewomen who may have disabilities or need retraining, one of the supportive instruments is the network of Veteran Development Centres (MVAU, 2024). These centres are important in the context of formulating and implementing state policy on professional adaptation, the promotion of employment, and increasing the competitiveness of veterans, their families and the families of fallen combatants in the labour market. They have already created and answered the requirements of inclusive spaces, providing consulting services and support in the employment process.

However, even with a quality education, people with disabilities face difficulties in finding a job in the present conditions. This is why there are a number of initiatives in Ukraine aimed at creating an inclusive work environment, which is an important element of social integration and reintegration, especially for war veterans. An important role in this process is played by initiatives to adapt workplaces for veterans who, after being injured and receiving prosthetics, want to return to their professional lives. Employers implement the physical adaptation of workplaces, change the design of offices to accommodate peoples' needs, install special equipment to facilitate the performance of professional work, and create comfortable and safe 'home-like' environments and flexible working conditions. Even in office (and home) kitchens, where specialised devices and tools help to increase the autonomy of users, assistive technologies apply. Adaptive cookware, ergonomic cutlery, package openers and modern touchscreen cookers enable people with disabilities to prepare their own meals, which is essential for their dignity and to improve their quality of life.

International, government and local programmes, responsible businesses, and charitable organisations are uniting to ensure the accessibility of jobs, implement technological solutions, and develop a culture of inclusiveness, giving dynamics to this ecosystem development and ensuring sustainable inclusion. Their influence and role in promoting inclusion, providing medical, psychological and educational support, creating work spaces, and in the formation of more social communities, are in line with the new reality.

Conclusions

Technological developments foster the social integration and reintegration of people with disabilities, especially those affected by the war. EU countries and Ukraine create effective solutions for the reintegration of affected people into social and economic life. The research has shown that traditional approaches to social adaptation face a new reality due to the war by the Russian Federation against Ukraine, and the challenge of amputation for people, some of whom have become forcibly displaced. To foster social integration and reintegration processes, access to 1) rehabilitation, 2) communication, and 3) professional activities should be widely provided. To disrupt any barriers, the co-creating new assistive technologies will, and already do, enable the easier fulfilment of daily and work operations for people with disabilities, and give a feeling of dignity. And in order to restore a sense of belonging to communities for them, organisations of displaced persons and war veterans have to act.

Programmes of international, national and local institutions, including councils, in partnership with businesses, organisations and charitable foundations, demonstrate flexibility, adaptability and support for the social integration and reintegration of people affected by the war, providing opportunities for 1) medical, 2) psychological, 3) educational, and 4) employment support, to enable sustainable inclusion. And now a recommendation: for further development, it is important that while developing and implementing programmes, gender differences should be taken into account.

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