# Inclusive Digital Education for *diverse learners*: recent facts & figures from Portugal

Helena Cabeleira

Abstract:

This paper discusses the role of digital technologies and environments (with emphasis on visual and multimedia technologies) in enhancing inclusive education for disabled or diverse learners. Drawing on five theoretical frameworks and related literature reviews, this research maps and highlights current accessible digital platforms, tools or software for Inclusive Digital Education (IDE), and their potential applications within mainstream public education in Portugal. Based on statistics and empirical data collected from recent national and international studies and policy documents, the paper identifies key 'facts and figures' related to Portuguese inclusive education in recent years, including shifting conceptualizations of disability and diversity. The aim is to provide the research-education communities with systematic and up-to-date information, documentation, and findings that emphasize the importance of critical perspectives and multifaceted approaches to the design, implementation and use of technologies and environments for IDE. Consideration for IDE is essential given the contemporary challenges and needs posed by an increasingly diverse and demanding student population in Portugal.

Keywords:

Inclusive Digital Education; Theoretical Frameworks for IDE; Design for Learning; Public Education; Portugal.

## Educação Digital Inclusiva para *aprendentes diversos*: factos & números recentes de Portugal

**Resumo:** Este artigo discute o papel das tecnologias e ambientes digitais (com ênfase nas tecnologias visuais e multimédia) na educação inclusiva de *aprendentes deficientes ou diversos*. Com base em cinco quadros teóricos e respetivas revisões de literatura, esta investigação visa mapear e destacar algumas das plataformas digitais, ferramentas e softwares atualmente acessíveis para fins de Educação Digital Inclusiva (EDI), e suas potenciais aplicações no ensino público regular em Portugal. Com base em estatísticas e dados empíricos recolhidos em estudos e documentos políticos nacionais e internacionais recentes, o artigo identifica alguns dos principais 'factos e números' relacionados com a educação inclusiva portuguesa dos últimos anos, incluindo conceptualizações sobre *deficiência* e *diversidade*. O objetivo é fornecer às comunidades de investigação-educação elementos, documentos e resultados sistemáticos e atualizados que sublinhem a importância das perspetivas críticas e das abordagens multifacetadas para o design, implementação e utilização de tecnologias e ambientes para a EDI. Esta consideração pela EDI é essencial perante os desafios e necessidades contemporâneos colocados por uma população escolar cada vez mais diversificada e exigente em Portugal.

**Palavras-chave:** Educação Digital Inclusiva; Quadros Teóricos para EDI; Design para Aprendizagem; Ensino Público; Portugal;

## Éducation Numérique Inclusive pour des *apprenants diversifié*: faits & chiffres récents au Portugal

**Résumé:** Cet article examine le rôle des technologies et des environnements numériques (en mettant l'accent sur les technologies visuelles et multimédias) dans l'éducation inclusive pour les *apprenants handicapés ou divers*. S'appuyant sur cinq cadres théoriques et des revues de littérature connexes, cette recherche cartographie et met en évidence les plateformes, outils ou softwares actuellement accessibles pour l'éducation numérique inclusive (ENI), et leurs applications potentielles dans l'éducation publique au Portugal. Sur la base de statistiques et de données empiriques collectées à partir d'études et de documents politiques nationales et internationales récentes, l'article identifie les principaux 'faits et chiffres' liés à l'éducation inclusive portugaise au cours des dernières années, y compris l'évolution des conceptualisations du *handicap* et de la *diversité*. L'objectif est de fournir aux communautés de recherche et d'éducation des informations, documentation et résultats systématiques et à jour qui soulignent l'importance des perspectives critiques et des approches multiformes pour le *design*, la mise en œuvre et l'utilisation des technologies et des environnements pour l'ENI. La prise en compte de l'ENI est essentielle compte tenu des défis et des besoins contemporains posés par une population étudiante de plus en plus diversifiée et exigeante au Portugal.

**Mots-clés:** Éducation Numérique Inclusive; Cadres Théoriques pour l'ENI; Conception pour l'Apprentissage; Enseignement Public; Portugal;

## Educación Digital Inclusiva para *aprendentes diversos*: datos & cifras recientes de Portugal

**Resumen:** Este artículo analiza el papel de las tecnologías y entornos digitales (con énfasis en las tecnologías visuales y multimedia) en la educación inclusiva de *aprendentes discapacitados o diversos*. Basada en cinco marcos teóricos y revisiones de su respectiva literatura, esta investigación mapea y destaca algunas plataformas, herramientas o software digitales actualmente accesibles para la Educación Digital Inclusiva (EDI), y sus posibles aplicaciones en educación pública regular en Portugal. Basado en estadísticas y datos empíricos recopilados de estudios y documentos políticos nacionales e internacionales recientes, el artículo identifica algunos 'datos y cifras' clave relacionados con la educación inclusiva portuguesa en los últimos años, incluidas conceptualizaciones cambiantes sobre *discapacidad* y *diversidad*. El objetivo es proporcionar a las comunidades de investigación y educación elementos, documentos y resultados sistemáticos y actualizados que enfaticen la importancia de perspectivas críticas y enfoques multifacéticos para el diseño, implementación y uso de tecnologías y entornos para la EDI. Consideración por la EDI es esencial ante los desafíos y necesidades contemporáneos que plantea una población escolar cada vez más diversa y exigente en Portugal.

**Palabras clave:** Educación Digital Inclusiva; Marcos Teóricos por EDI; Diseño para el Aprendizaje; Educación Pública; Portugal;

## Introduction

Inclusive education is globally recognized for its potential to provide equitable quality education for all, particularly those with special needs and severe disabilities (UNESCO, 2020). In more recent years, it has become evident that education and technological innovation are intrinsically interlinked. The digital transformation of school is now widely accepted as both an imperative and inevitability that many believe will help us to improve education systems and lead to greater equity and accessibility (UNESCO, 2023). As digital technologies and environments are increasingly ingrained in educational systems and processes, it is crucial to explore how these tools can address the specific challenges faced by disabled individuals and other traditionally marginalized or minority groups - which are now generally identified under the label: *diverse learners* (OECD, 2022). Today, the interdependence and interconnection between the field of education and technological development has reached a point where "the successful transformation of inclusive education systems depends on successful digital transformation" (Turner-Cmuchal & Weber, 2024, p.7).

Inclusive Digital Education or IDE (Mintz, et al., 2024; Ramirez-Montoya et al., 2024) emerges as a new conceptual framework or paradigm for addressing key issues related to social justice and pedagogical diversity (Ellyton, et al., 2022; Mena & Waitoller, 2022) and the current hegemonic status of digital technologies in fostering learning from the perspective of *learners*, as well as the role of mainstream education in securing Assistive Technologies (AT) and providing accessible digital learning environments and contents to the diverse learners and workers of the digital economy (EC, 2021; Olney & Donoso, 2021; Cerna, et al., 2021). This new conceptual approach of IDE is also largely grounded on an emerging consensus around the role of the *new science of learning* - and not the traditional *sciences of education* - in providing research and well-vetted strategies to support learning opportunities and "help educators respond to individual variability" (Darling-Hammond, et al., 2019, p.97).

Recent findings and evidence-based research point to the fact that digital technologies and environments are particularly useful and beneficial in inclusive education. Among those studies, many highlight the role of "newer theories for digital learning spaces" (Downs, 2023, p.129) and open access platforms in facilitating an IDE that considers contextual and diverse learning needs, while expanding individual agency, interaction, engagement and collaboration (Weber et al., 2022; Ramirez-Montoya et al., 2024).

The first section of this paper maps and describes some prominent facts & figures related to inclusive education and discusses the most recent shifts in international policy discourses and guidelines on this matter, while giving particular emphasis on the ways by which concepts and categorizations of disability and diversity are shaping

(and being shaped by) new approaches to inclusive education within Portuguese mainstream public schools. The following two sections identify and exemplify five interrelated theoretical frameworks that call our attention to the centrality and relevance of developing educational designs and pedagogical approaches to IDE resorting to digital technologies and environments, including examples of platforms and resources currently accessible, in Portugal, for purposes of inclusive education.

## Facts & Figures of disability and diversity in Portuguese inclusive education

Since 2009/10, most "special education schools" in Portugal have been turned into Resource Centers for Inclusion (CRI), and the "one-track approach" has prevailed as the norm for integrating students with Special Education Needs (SEN) into regular school settings. In practice this meant that "mainstreaming" became the most common approach for including or integrating students with "special needs" in the Portuguese education system, while "specialized" educational institutions became an exception. Programs and activities developed in mainstream schools have been adapted to match the individual needs of these students, and various specialized services have been put in place to support their learning processes and general well-being. In 2017/18, most students "in need of additional support" attended mainstream education (98.9%), with 86.4% of them enrolled in public schools (OECD, 2022, p.64).

In Portugal, disability - and the rights of persons with disabilities - is a pressing issue given the high percentage of the population affected by it: in 2022, Portugal figured among the three countries with the highest share of people with disabilities (34%), followed by Denmark (36.1%) and Latvia (38.5%). In 2023, according to the Eurostat, 27% of the EU population over the age of 16 had some form of disability, corresponding to 101 million people or one in four adults in the EU. It is also known that many people with disabilities face barriers to access healthcare, education, employment, leisure, and participation in political life. Almost half of the EU population considers that discrimination based on disability is widespread in their country (EC, 2024).

Since the publication of the *Decree-Law 54/2018* (july 06) and the launch of the *National Strategy for the Inclusion of Persons with Disabilities 2021-2025*, inclusive education has emerged in Portugal as a critical framework in addressing educational inequities (ENIPD, 2021). This reform has involved significant legislative measures and institutional efforts to grant more flexibility and autonomy to local actors, including the participation and systematic involvement of the national network of School Clusters (from pre-school to basic and secondary education levels). However, the shift from the dominant "medical model" based on students' deficits towards a "social model" of inclusive education based on the assessment of contextual barriers faced by students, has been systematically constraint by a "narrow view of diversity, largely focused on

students with special education needs" (OECD, 2022, pp.14, 220). Also, in Portugal, "students with an immigrant or ethnic minority background" tend to be "less of a priority and suffer from a lack of support" (OECD, 2022, p.17). These are two of the most challenging features of the Portuguese educational system that block the full realization of the democratic principles of inclusive education.

Though in Portugal a significant amount of resources and funding are available to support students with SEN - who are now included in the broader category of "students in need of support measures" -, the number of students identified as "in need of such measures" has consistently increased since 2012/13, with overall increase (7%) between 2016/17 and 2017/18 (OECD, 2022, pp. 21, 62). In 2018, the new inclusive education framework has extended the notion of special needs beyond the strict boundaries of disability (physical or mental), to deal with a wide range of situations emerging from the growing socio-cultural, economic and ethnic *diversity* of the school population. Nevertheless, the term "inclusive education" has tended to remain largely confined to "the mainstreaming of students with specific education needs" (OECD, 2022, p.23).

In 2022/23, there were 1.141.842 students enrolled in pre-school, basic and secondary public schools of the Portuguese Ministry of Education (Continent and Islands). The number of students under the rubric "selective and/or additional measures to support learning and inclusion" has reached a new milestone: 88.682 (7,8 % of student population), corresponding to a 13% growth in two years (DGEEC, 2024, np; Viana, 2024, np). Another significative fact of the Portuguese educational landscape relates to the abrupt increase (+160%) of the number of "migrant students" enrolled in basic and secondary schools, within the timespan of five years: from 53.000 in 2018-19 to 140.000 in 2023-24, corresponding to 5,3% and 13,9 % of the school population, in each year (MECI, 2024, p.17). Even though these numbers deserve a more detailed analysis and description (which will not be possible in the present study), they show us a wide and vivid picture of the overall scenario framing teaching and learning activities in Portuguese public schools in more recent years.

As the notion of "student in need of support measures" tends to replace the notion of "special education needs" (and associated categories), any student from any background can be included under the first category. This conceptual shift also means that the new categorization system is based not on "personal characteristics" (medical model) but on the type of "support" that each student receives (social model). In Portuguese schools, students are distributed according to three broad categories of "support measures": universal, selective and additional which, in turn, correspond to different forms of tutoring, curricular adjustment or differentiation, psycho-pedagogical support and re-design of pedagogical strategies (OECD, 2022, pp.61-62). This new categorization system has substantial impacts not only on students' learning processes

and outcomes, but also on the very system of data collecting and processing. In fact, nowadays it is very difficult to access information regarding students with special needs or students in need of support measures, or simply students with disability, not only because Portuguese legislation forbids from collecting data based on "personal" features (except nationality and gender), but also because most of the available data is based on the "school leader's perception" and not on quantitative data collected among students and their families (OECD, 2022, p.62). It is also not possible to access specific data related to the different levels and categories of disability and diversity within the school populations who benefit from support measures.

There is also a growing awareness and recognition that inclusive education in mainstream formal settings will not be integrally accomplished or fulfilled through the mere transplanting of special education thinking and practice into the grounds of the regular school (and its traditional pedagogies). On the contrary, this shift implies moving away from an individualized planning frame to more innovative perspectives and pedagogical strategies based on personalized learning, classroom engagement and cooperative learning. In Portugal, significant strides have been made since 2019-20 to foster these purposes and to enhance educational inclusivity, particularly through the implementation of nationwide programs and projects such as the National Plan For The Arts or PNA, which is a cultural-educational-artistic initiative that operates through multi-institutional partnerships and collaborative projects destined to promote curricular development, differentiation and enrichment, as well as inclusive and community-based education focused on making the arts and culture more accessible to citizens, particularly children and young people (NPFTAEC, 2021). Also, the Digitalization Program for Schools included in the Action Plan for the Digital Transition of Education (since 2020), is strongly committed to the digital training and capacitation of teachers, the development of the digital infrastructure of schools, the creation of Digital Education Laboratories, and the provision of digital educational resources such as, for example, the Project-Pilot for Digital Textbooks (Wastiau, Looney & Laanpere, 2024; DGE, 2024).

These programs and initiatives relate to inclusive education and, most notably, to the creation, development and dissemination of open access digital platforms, infrastructures and environments to support the digital transition of schools, the digital capacitation of teachers and students, and the digital accessibility of educational, cultural and artistic resources. The focus on digital strategies and resources for teaching and learning is also visible in a wide range of online courses, MOOCs, webinars and digital repositories of pedagogical and didactic materials made available through these programs. Together, all these digital tools and resources are the product (and outcome) of major policy and financial investments made in the Portuguese systems of education and training, so that it can adapt to the abrupt technological and demographic changes that impact educational institutions and labor markets at both the global and local

scales. They also mirror an internationally consensualized political (and pedagogical) understanding that digital access and literacy are the great promoters and facilitators of inclusion, as they play a decisive role in ensuring that certain student groups or minorities are not further excluded from the educational, cultural, economic and political process (Olney & Donoso, 2021). There is also a wide consensus around the idea that digital education tools and environments can contribute to increase pedagogical flexibility and curriculum personalization to better respond to diverse student expectations and specific needs, thereby underscoring the importance of tailored approaches to education (Weber, et al., 2022; UNESCO, 2023).

## Theoretical frameworks for Inclusive Digital Education (IDE)

This study systematizes (and draws upon) five interrelated theoretical frameworks that provide a comprehensive overview on different educational designs and pedagogical approaches to inclusive education resorting to digital technologies and environments:

1. Universal Design for Learning (UDL) advocates for flexible learning environments and pedagogical strategies aimed at optimizing teaching to accommodate individual learning differences. It emphasizes the role of design in reducing barriers for disabled learners and in promoting access and engagement for all students (CAST, 2024). The UDL principles stand for multiple means of engagement (strategies to motivate students by providing choices and fostering a sense of belonging), representation (use of varied modalities to present information and accommodating different learning preferences), action and expression (encouraging diverse methods for students to demonstrate their understanding and knowledge). In Portugal, the implementation of UDL is gaining traction, particularly through educational initiatives that emphasize accessibility and personalized or individualized learning strategies (Costa & Seabra, 2023).
2. Social Model of Disability (SMD) challenges traditional notions of disability, advocating for the removal of societal barriers that inhibit access to education. It redefines disability as a societal construct rather than an individual deficit. This framework posits that disability arises from the interaction between individuals and barriers created by society, such as inaccessible environments and negative attitudes. In educational contexts, the SMD emphasizes the need for systemic and structural changes to foster inclusivity. In Portugal, this model has been influential in shaping disability rights and policies, particularly in promoting educational practices that dismantle barriers to learning (ENIPD, 2021; CICDR, 2022).
3. Digital Inclusion Framework (DIF) emphasizes equitable access to technology and digital literacy, as essential components for empowering marginalized groups, includ-

ing disabled learners. It advocates for: access to technology (ensuring that all learners have the necessary tools to engage with digital content), and digital literacy (providing training and support to develop the skills needed to navigate and utilize digital environments effectively and safely). In Portugal, the *Digital Transition Strategy for Education* aims to enhance digital literacy across all demographics, with particular attention to underrepresented groups (Simões-Silva et al., 2022; Wastiau, Looney & Laanpere, 2024).

4. Critical Disability Theory (CDT) focuses on the social, cultural, and political dimensions of disability, advocating for the recognition of disabled individuals' voices in shaping educational policies and practices. This framework highlights intersectionality, emphasizing how various identities (race, gender, socioeconomic status) interact in experiences of disability (Davis, 2013). In Portugal, the application of CDT can be observed in research that emphasizes participatory approaches in education, ensuring that "disabling experiences" inform policy and practice (Moura & Fontes, 2023).
5. Intersectionality in Disability Studies (IDE) explores how various social identities intersect to shape individual experiences, particularly for those who belong to multiple minority or marginalized groups. This framework is crucial for understanding the complexities of inclusion and exclusion in educational contexts, as it highlights how factors such as ethnicity, gender, and socioeconomic status can compound the challenges faced by all those traditionally marginalized and categorized as "disabled learners" according to the normative standards of the so-called mainstream or regular school. Research applying an intersectional lens reveals the nuanced experiences of disabled students from diverse backgrounds, emphasizing the need for tailored strategies that address their specific challenges (EC, 2021; Cerna et al., 2021; Varsik & Gorochovskij, 2023).

The combined insights from these theoretical frameworks underscore the necessity of further research into the design frameworks for inclusive digital learning environments in Portugal. While UDL and DIF advocate for the proactive integration of technology, the SMD and CDT highlight the importance of removing societal barriers and amplifying disabled learners' voices. Intersectionality brings attention to the diverse experiences and needs of disabled learners, ensuring that educational practices are not only inclusive but also equitable. Recent empirical evidence shows a positive correlation between the application of these frameworks and improved outcomes for disabled and/or diverse learners. For instance, schools implementing UDL principles have consistently reported increased engagement and academic performance (Bonança, Madureira & Lima, 2023), while policies aligned with SMD have led to enhanced accessibility and non-discriminatory approaches to disability and diversity (CICDR, 2021).

There is also another important issue which tends to be neglected or overlooked when we speak of the virtues of digital technologies and environments in enhancing inclusive education and design: the fact than much of the educational and pedagogical potential of *the digital* lays in its visual and multimedia features. In fact, prevailing dominance of vision in digital cultures of education has significant implications for how knowledge is constructed and disseminated. Theoretical frameworks like UDL, SMD, DIF, CDT, and Intersectionality offer critical insights that can both challenge and compensate for this visual hegemony, while offering critical perspectives and insights on the dominance of visually based technologies in our digital era.

## Digital platforms and environments for *disabled* and/or *diverse* learners

The integration of digital environments and technologies in education presents both opportunities and challenges for fostering inclusive education. This literature review examines the current landscape of digital tools, pedagogical strategies, and frameworks that promote accessibility and inclusivity, with particular emphasis on visual and multimedia technologies. It also identifies several examples of digital platforms and environments specifically designed to enhance learning experiences for disabled or diverse learners.

The effectiveness of UDL principles in creating inclusive digital learning environments has been proved in the pedagogical use of multimedia resources, such as videos with audio descriptions and interactive content which significantly enhances learning outcomes. UDL's emphasis on flexible formats allows educators to cater to diverse learning preferences, promoting engagement across various sensory modalities, while allowing educators to create accessible content and providing tools for differentiated instruction (Çeken & Taşkın, 2022; Bonança, Madureira & Lima, 2023). One example is the Project-Platform REDES which, since 2010, offers training courses, develops accessible learning resources in many school disciplines, and is building a multimedia resource center for the bilingual education of the deaf (REDES, 2022).

The DIF emphasizes equitable access to technology and digital literacy through the aid of both Assistive Technology (AT) and online collaborative learning platforms. Research shows that AT, such as screen readers, text-to-speech software and machine translation, significantly improve access to digital content for visually disabled learners (and others). For example, *Google Classroom* has incorporated features such as voice typing and compatibility with various ATs. Tools like TalkBack and VoiceOver enable visually impaired learners to interact with digital content. It offers a flexible platform for collaboration and communication among students and teachers, incorporating a user-friendly interface and accessibility options. Moodle is also an open-source learning platform that supports various accessibility features, including customizable interfaces

and compatibility with AT (Sharpe & Young, 2023). Artificial Intelligence can also aid teachers and schools in the creation of open access educational content and learning resources that promise to tailor teaching according to students' learning styles (Knox, Wang & Gallagher, 2019; UNESCO, 2023).

In Portugal, the network of Centros de Recursos para a Inclusão (CRI) and Centros de Recursos de Tecnologias de Informação e Comunicação (CRTIC) develop resources specifically designed to support visually and hearing-impaired students, focusing on personalized learning experiences. These specialized services (accredited by the Ministry of Education) are aimed to support and intensify the school's capacity to promote the educational success of all students, and to advice, select or adapt the necessary products and resources for accessing the curriculum (Pedroso, 2018). Other studies highlight the role of "gamification" as a recent technique in software development that brings objective learning benefits when applied to "non-game contexts and environments". One case in which gamification can bring great benefits is in Autism Spectrum Disorder (ASD), where digital technologies, software, mobile applications and virtual environments can be helpful in developing *intra* and *inter* personal skills (Simões-Silva, et al., 2022).

CDT calls for the deconstruction of dominant narratives surrounding disability and special needs. This perspective is crucial in assessing digital environments that prioritize visual content and visually based forms of communication and interaction, because it addresses digital inclusion and equity by calling attention to platforms that offer diverse modes of interaction (such as auditory and tactile feedback), proving to be more effective in promoting learning and classroom engagement. Similarly, intersectionality frameworks highlight the experiences of disabled and/or diverse learners from different socio-cultural backgrounds. Studies suggest that tailored interventions considering *intersected identities* (gender, socioeconomic background, and type of disability) can lead to better educational outcomes (Varsik & Gorochovskij, 2023). Currently there is no substantial research evidence, within the Portuguese panorama, considering the role of intersected identities in inclusive design or pedagogical approaches specifically directed at digital technologies and environments that might be suited to respond to the needs of disabled or diverse learners.

Nevertheless, the aforementioned examples underscore the significance of adopting education designs and pedagogical strategies that integrate digital technologies and environments in inclusive ways. The five theoretical frameworks (UDL, SMD, DIF, CDT, and Intersectionality) provide a comprehensive approach to designing educational environments that are accessible and equitable for both disabled and diverse learners (Weber, et al., 2022). By leveraging current digital tools and ATs, educators can also create learning experiences that empower all students, fostering a culture of inclusion in educational contexts, without neglecting the fact that digital technologies and

environments for teaching and learning can also produce and reproduce numerous forms of exclusion. If technology has the potential to bridge disparities for students with disabilities, it also has the power to exacerbate inequalities. That is why designing, implementing and monitoring disability-inclusive technology solutions focused on accessibility and utility remains one of the most critical challenges of IDE.

## Conclusion

Enhancing inclusive education through digital technologies and environments for disabled and/or diverse learners is crucial for promoting equity and social justice. This paper emphasizes the need for a collective commitment to dismantling barriers and fostering inclusive practices across educational settings. By leveraging the design and pedagogical approaches to create more inclusive digital tools and effective communication strategies, we can generate learning environments that meet the needs of diverse students. Evidence from recent studies supports the effectiveness of digital technologies in promoting (or, at least, promising) more accessibility, engagement, and academic success opportunities. As Portugal continues to invest in inclusive education, the integration of these digital technologies and environments is crucial for ensuring that all students, regardless of their specific abilities or social conditions, have equal opportunities to access learning. Theoretical frameworks and empirical data highlight the importance of adopting a multifaceted and mix-methods approach to inclusive education that leverages digital technology to a truly pedagogical status, while addressing the local contexts and the specific needs of an increasingly diverse school population, in an increasingly complex educational ecosystem.

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Helena Cabeleira
Faculdade de Ciências Sociais e Humanas
da Universidade NOVA de Lisboa, Portugal
E-mail: helenacabeleira@fcsh.unl.pt
ORCID: https://orcid.org/0000-0003-0080-3332

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