

Article

# Multimodal Mismatch in Digital Language Promotion: A Conceptual Framework for Migrant Workers in the Pearl River Delta

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**Abstract:** Digital technologies have widened access to language-learning and language-service resources, but availability alone does not ensure relevant participation. This conceptual article examines that problem through the context of mobile workers in the Pearl River Delta (PRD), where occupational diversity, mobility, and varied patterns of digital participation complicate fixed assumptions about language need. Drawing on language needs analysis and research on digital inequality, the article develops a framework of multimodal mismatch to describe misalignment across five linked dimensions: user representation, situated communicative needs, resource provision, participation conditions, and feedback. Four forms of mismatch are distinguished: representation mismatch, resource relevance mismatch, participation mismatch, and feedback mismatch. To address these gaps, the article proposes multimodal profiling, which understands users relationally as people acting in particular situations rather than as collections of demographic or behavioral attributes. It then conceptualizes precision promotion as a process of sustained alignment involving needs sensing, profile integration, resource matching, participation, feedback interpretation, and collaborative adjustment. The framework further introduces functional data boundaries and distributed institutional knowledge as conditions for responsible implementation. The contribution is therefore not a model of greater personalization alone, but a broader account of how digital language promotion can connect people, communicative situations, resources, participation opportunities, and feedback over time.

**Keywords:** digital language promotion; multimodal mismatch; multimodal profiling; precision promotion; mobile workers; meaningful digital participation; Pearl River Delta

## 1. Introduction

Digital technologies now form part of the infrastructure through which language learning, language services, and language promotion are delivered. Mobile applications, online learning platforms, short-video media, digital public-service systems, recommendation technologies, and AI-supported language tools can widen access across time and place. Recent reviews of mobile-assisted language learning further indicate that AI and mobile technologies are becoming increasingly important in the organization, delivery, and adaptation of language-learning experiences [1]. However, technological expansion does not itself resolve the question of whether resources correspond to users' situated communicative needs.

Their appeal is especially clear for people whose participation in conventional courses is constrained by work schedules, mobility, or limited contact with formal educational institutions. Yet the expansion of digital provision introduces a distinction that is easy to overlook: a resource may be available without being usable, relevant, or consequential for the communicative work a person needs to do. The issue is how well resources connect with situations of actual language use.

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This distinction is particularly important for migrant workers. The category itself covers people with different regional and linguistic backgrounds, occupations, educational experiences, lengths of residence, workplace environments, social networks, and levels of digital literacy. Recent research on migrant workers in the Pearl River Delta also points to variation in language adaptation among this population, suggesting that migrant workers should not be treated as a linguistically homogeneous group [2].

Their communicative demands also change across settings. The language needed to understand a workplace instruction is not necessarily the language needed to complete a digital public-service procedure, speak with a customer, seek medical assistance, arrange housing, or communicate with a child's school. Even within one occupation, needs may change with tasks, workplaces, or institutional encounters. For this reason, broad demographic labels can be useful for describing a population while remaining insufficient for explaining the particular communicative situations that shape language need.

The Pearl River Delta offers a relevant setting because population mobility, occupational diversity, and extensive digital mediation coexist in everyday life. Digital technologies are embedded in employment, public services, transportation, and ordinary communication, while diverse users and situations make standardized definitions of a "target user" increasingly unstable. A platform may know a user's occupation, location, browsing history, or frequency of use and still fail to identify what the person is trying to accomplish in a specific interaction. The resulting problem is not simply a shortage of information or resources. It is a problem of alignment between representation, need, provision, participation, and learning from use.

Existing lines of research provide important pieces of this problem. Needs analysis has long linked language provision to target situations, communicative tasks, learner characteristics, and educational purposes [3-6]. Research on digital inequality has shown that access to devices and connectivity does not eliminate differences in skills, patterns of use, or outcomes [7, 8]. Work on technology-enhanced language learning has likewise emphasized the opportunities created by mobile and digital environments [9, 10]. These strands are highly relevant, but access, needs, personalization, participation, and institutional support are often treated separately. The conceptual gap addressed here lies in explaining how misalignment can emerge across these dimensions and how a digital language-promotion system might respond to it dynamically.

The article asks: how can digital language-promotion systems better align language resources with the situated communicative needs of heterogeneous and mobile users? The argument developed below is that effective promotion should be understood as continuous alignment rather than one-time delivery. Multimodal mismatch names the points at which alignment breaks down; multimodal profiling provides a way to understand the user in relation to a communicative situation; and precision promotion describes the dynamic process through which needs, resources, participation conditions, and feedback can be kept in workable relation. The aim is not to replace segmentation or personalization, but to place them within a framework sensitive to context, function, and user autonomy.

Three contributions follow. First, the article brings representation, communicative need, resource relevance, participation, and feedback together under multimodal mismatch. Second, it develops multimodal profiling as a relational alternative to static user categorization. Third, it reframes precision promotion as sustained alignment rather than increasingly individualized recommendation. In doing so, the article offers a conceptual framework that can support both the design of digital language-promotion systems and the development of empirical studies capable of testing how different forms of mismatch affect meaningful participation. The discussion remains conceptual: no claim is made here about the prevalence of mismatch among PRD migrant workers, and the framework is presented as a basis for subsequent empirical examination.

## **2. Conceptual Background: From Access to Situated Communicative Needs**

### *2.1. Language Need as a Situated Construct*

Language need has traditionally been approached through analysis of target situations, communicative tasks, linguistic requirements, learner characteristics, and curricular purposes [3-6, 11-13]. These approaches establish a useful principle: language provision becomes meaningful when connected to what learners must do with language. In digital environments, however, the relevant "need" cannot always be treated as a stable characteristic of an individual. The same person may require different resources when speaking to a supervisor, using a public-service application, interacting with customers, or participating in community life. What matters is not only proficiency or membership in a social category, but the relationship among the person, the task, the setting, the people involved, and the consequences of successful or unsuccessful communication.

For migrant workers, the question is therefore not whether a person belongs to a group that "needs" a language, but what the person needs to accomplish in a particular situation. Studies of migrant workers have also examined variation in language attitudes and language ability, indicating that migrant workers may differ substantially in their linguistic experiences and resources even within the broader category of migrant labor [14, 15]. A worker might need language for understanding a safety instruction, reporting a problem, negotiating a task, responding to a customer, or completing a digital service procedure. Another worker with the same age, occupation, and place of residence may have a different communicative priority because the workplace, task structure, social network, or institutional encounters differ. Demographic and behavioral data can still provide contextual clues, but they should not be treated as direct substitutes for understanding situated need. In this article, situated communicative needs therefore refer to language-related requirements that emerge through the interaction of communicative purposes, social and institutional settings, user characteristics, and conditions of participation.

### *2.2. Digital Access and Meaningful Participation*

The distinction between access and participation is central to understanding digital inequality. Access to a device or connection can expand opportunity, but it does not guarantee that people have the skills, time, confidence, or circumstances needed to use digital resources effectively [7, 8, 16]. This distinction is particularly relevant to migrant workers in China. Research on the digitalization of migrant-worker citizenship has identified a "double divide," indicating that access to digital resources alone does not eliminate inequalities in their ability to participate in digitally mediated social life [17]. The same point applies to digital language promotion. A migrant worker may have a smartphone, use messaging or short-video platforms frequently, and encounter language-learning resources regularly while still finding those resources difficult to understand, poorly timed, disconnected from immediate tasks, or too demanding to use under real working conditions. A resource can therefore be technically accessible while remaining functionally inaccessible.

This article distinguishes digital access from meaningful digital participation. Digital access concerns devices, connectivity, and technical opportunity. Meaningful participation concerns whether users can understand, engage with, apply, and benefit from resources in ways that support communicative goals. For migrant workers, participation may depend on irregular schedules, fragmented time, digital literacy, device conditions, and opportunities for interaction. A short, task-oriented resource may be more usable during a break than a synchronous course requiring uninterrupted attendance. Likewise, some users may benefit from video or voice-based resources while others require concise written instructions. These are not peripheral design preferences; they condition whether a resource that is available can become useful.

### *2.3. From Static Categories to Relational Understanding*

Digital platforms commonly organize users through segmentation and categorization because categories are efficient for service organization and recommendation. Recent research on digital user profiling in education likewise highlights the growing role of user-profile information in understanding learners and

supporting differentiated educational provision [18]. The present framework, however, shifts the emphasis from constructing increasingly detailed profiles to understanding users in relation to particular communicative situations.

Such categories become problematic when they are treated as sufficient explanations of communicative need. "Migrant worker," for example, can identify a socially meaningful population while saying little about the communicative repertoire, occupational demands, social networks, institutional encounters, or participation constraints of a particular person. A more detailed profile does not automatically solve the problem. Adding more variables can produce a richer description without improving the system's understanding of what a user needs to accomplish.

The alternative proposed here is relational understanding. Descriptive profiling asks what characteristics a user possesses; relational profiling asks how those characteristics interact with situations, tasks, institutions, participation conditions, and available resources. This shift also qualifies the idea of personalization. Personalized recommendation can be valuable, but it depends on the quality of the assumptions on which recommendation rests. A highly individualized recommendation based on weak indicators can remain imprecise, while a resource shared by a group can be highly precise when it is closely aligned with a common communicative situation. Table 1 places access, categorization, personalization, multimodal profiling, and precision promotion within a movement from provision toward relational alignment.

**Table 1.** From Descriptive Categorization to Relational Alignment

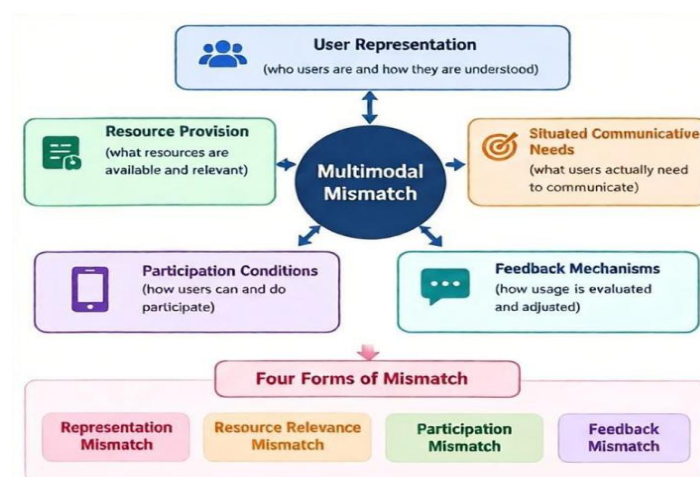
| Analytical approach              | Primary focus                             | Typical question                                                      | Main limitation or advantage                                    |
|----------------------------------|-------------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------|
| Digital access approach          | Devices and connectivity                  | Can the user access digital resources?                                | Access does not guarantee meaningful participation              |
| Conventional user categorization | Demographic or behavioral characteristics | What type of user is this?                                            | Categories may not adequately explain situated needs            |
| Personalization approach         | Individual content recommendation         | What content should this user receive?                                | Personalization may rely on inaccurate assumptions              |
| Multimodal profiling             | User-in-situation relationships           | What does this user need in this situation?                           | Integrates context, task, participation, and resource relevance |
| Precision promotion              | Sustained system alignment                | How can needs, resources, participation, and feedback remain aligned? | Emphasizes dynamic adjustment rather than one-time delivery     |

### 3. Multimodal Mismatch as an Analytical Framework

#### 3.1. Defining Multimodal Mismatch

The central concept is multimodal mismatch. Here, "multimodal" refers not primarily to the semiotic combination of speech, writing, image, video, or gesture, but to the interaction of multiple dimensions through which digital language promotion is organized. These dimensions include how users are represented, how their communicative needs are interpreted, which resources are provided, the conditions under which participation occurs, and how evidence from actual use is incorporated into later adjustment. Multimodal mismatch can therefore be understood as a misalignment among these dimensions. The value of the concept is that it shifts attention from a simple shortage of resources to the interfaces through which users and resources are connected.

The process can be represented as User Representation → Needs Interpretation → Resource Matching → Actual Participation → Feedback and Adjustment. Mismatch may arise at any interface in the sequence, and a problem at one stage may shape the next. If a user is represented mainly by occupation and browsing behavior, the resulting needs interpretation may overlook an immediate communicative task. In turn, a poorly interpreted need may lead to weak resource matching. Limited participation may then be read as low motivation when the more plausible explanation is a timing, usability, or relevance problem. If subsequent feedback is not interpreted in context, the same pattern may be reproduced. The framework therefore treats mismatch as a process problem: it is generated and maintained through relationships among multiple parts of a digital promotion system (As shown in Figure 1).



**Figure 1.** Conceptual Framework: Multimodal Mismatch in Digital Language Promotion

### 3.2. The Alignment Problem

A digital language-promotion system implicitly makes several claims about what it can know and do: identify relevant users, infer what they need, provide appropriate resources, create workable conditions for participation, and learn from users' responses. These claims correspond to five analytical questions. Does the system adequately represent the circumstances that matter? Does it interpret what users need to accomplish communicatively? Do the resources correspond to those requirements? Can users realistically engage with the resources under actual conditions? Does information generated through use lead to meaningful adjustment? The framework treats alignment across these questions as more important than technological sophistication in isolation. More data may increase descriptive detail without increasing practical precision, and a larger resource inventory may not improve outcomes if users cannot identify or use what is relevant.

The alignment perspective also provides a way to avoid a false opposition between technology and human judgment. Digital systems can contribute valuable information about patterns of use, while educators, employers, community organizations, public institutions, and users can provide contextual interpretations that behavioral data alone cannot supply. Algorithms may infer needs, but inference should remain open to correction and connected to the situations in which language problems arise. In this sense, alignment is both an analytical condition and a design objective: the system should be capable of revising its own assumptions when use reveals that the initial match was weak.

### 3.3. Four Forms of Multimodal Mismatch

#### 3.3.1. Representation Mismatch

Representation mismatch occurs when the categories, indicators, or data used to describe users fail to capture circumstances that are relevant to communication. Age, occupation, location, educational background, and general proficiency can all be useful,

but none is equivalent to a situated communicative need. A system may possess extensive information and still overlook workplace interaction, mobility, social networks, institutional encounters, or recent changes in a user's circumstances. The result is a system that can appear data-rich while remaining context-poor. Representation mismatch is therefore not a matter of having too little data in a quantitative sense. It is a matter of representing the wrong things, or interpreting useful information without sufficient connection to the situations that generate language-related problems.

### 3.3.2. Resource Relevance Mismatch

Resource relevance mismatch occurs when the content, format, or function of a resource does not correspond closely enough to an actual communicative requirement. A resource may be linguistically sound yet have limited practical value if it addresses situations users rarely encounter or omits the linguistic functions required for a task. For migrant workers, relevance may concern workplace instructions, reporting and negotiation, customer interaction, healthcare, transportation, housing, public services, or everyday social communication. Resource quality therefore has at least two dimensions: internal quality, such as linguistic and pedagogical soundness, and functional relevance to the circumstances in which users need to act. A resource becomes more useful when users can recognize its relationship to a task they actually need to perform.

### 3.3.3. Participation Mismatch

Participation mismatch arises when users cannot engage with otherwise relevant resources under realistic conditions. Work schedules may be long or irregular; time for sustained study may be fragmented; device conditions and connectivity may vary; and digital literacy, cognitive load, and opportunities for interaction may limit participation. The assumption that online resources are automatically available "anytime and anywhere" can conceal these constraints. Technical accessibility is therefore only one component of accessibility. Meaningful participation also depends on whether users can understand the interface, invest the required time, maintain attention, interact where needed, and apply what they learn. This distinction explains why a carefully designed resource can fail not because its content is poor, but because its delivery model conflicts with the conditions under which users live and work.

### 3.3.4. Feedback Mismatch

Feedback mismatch occurs when evidence from actual use does not inform subsequent system adjustment. Digital platforms can record clicks, views, completion, repetition, and abandonment, but behavioral traces do not explain themselves. A low completion rate may reflect lack of interest, limited time, excessive difficulty, technical barriers, or poor relevance. Treating behavior as a transparent expression of motivation risks reinforcing the wrong diagnosis. Meaningful feedback can instead combine user reports, interaction patterns, observation, educators' interpretations, workplace knowledge, community experience, and information from public-service institutions. Distributed feedback matters because the same behavioral pattern may have different meanings in different situations. Without contextual interpretation, a system may continue to reproduce the mismatch it was expected to reduce.

## 4. Multimodal Profiling: Understanding the User-in-Situation

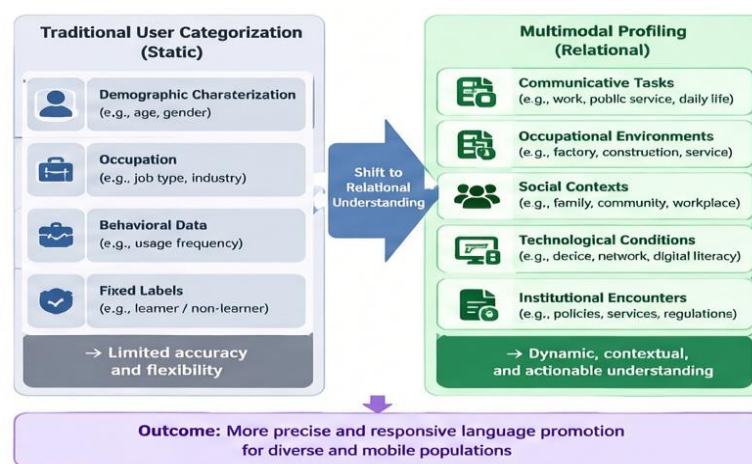
### 4.1. From User Categories to Relational Profiling

Multimodal profiling responds primarily to representation mismatch. It refers to the integration of multiple dimensions of user and contextual information for the purpose of understanding people in relation to particular communicative situations. Its objective is not to create increasingly detailed digital portraits. Rather, it is to connect who a user is with what the user needs to accomplish, where and with whom communication occurs, which linguistic resources are involved, what constraints affect participation, and what evidence emerges through use. Profiling can become another form of categorization if

additional variables do not improve the connection between user information and communicative situations.

#### 4.2. The User-in-Situation Principle

The user-in-situation principle treats the relationship between person and context as the relevant analytical unit. The same individual may require different language resources in different situations, while people with different demographic profiles may share the same need when they perform a common workplace task or navigate the same institutional procedure. This relational formulation offers a more cautious understanding of personalization. Precision does not necessarily require a unique recommendation for every person. A resource designed around a well-defined communicative situation may be more precise for a group than an individually customized recommendation based on unreliable assumptions. Figure 2 represents this logic as  $\text{User} \times \text{Situation} \times \text{Communicative Task} \times \text{Resource} \times \text{Participation Condition}$ . The multiplication sign emphasizes that the dimensions are interdependent.



**Figure 2.** Multimodal Profiling: A Relational Alternative to Static User Categorization

#### 4.3. Functional Data Boundaries

Relational profiling raises a practical question about how much information should be collected. Digital systems may be technically capable of capturing location, activity, interaction patterns, communication practices, or other behavioral traces, but technical possibility is not by itself a justification for collection. The framework therefore proposes functional data boundaries: information should be collected and used only to the extent that it has a defensible relationship to the communicative or service function being supported. The goal is not to know as much as possible about users, but to know enough of the right things to improve alignment. This principle places user autonomy and responsible governance inside the design of precision rather than treating them as external ethical constraints.

Five practical principles follow from this position. Purpose limitation links information to a clear functional objective. Proportionality requires the scope of data use to correspond to the value it provides. Transparency gives users meaningful awareness of how relevant information affects recommendation or service provision. User autonomy allows people to correct or challenge inappropriate assumptions. Responsible governance requires caution about turning probabilistic patterns into deterministic labels. Together, these principles define a boundary around relational profiling: context matters, but not as a rationale for unrestricted surveillance. The framework represented in Figure 3 therefore treats technology, autonomy, and governance as mutually dependent conditions for sustainable personalization and resource alignment.

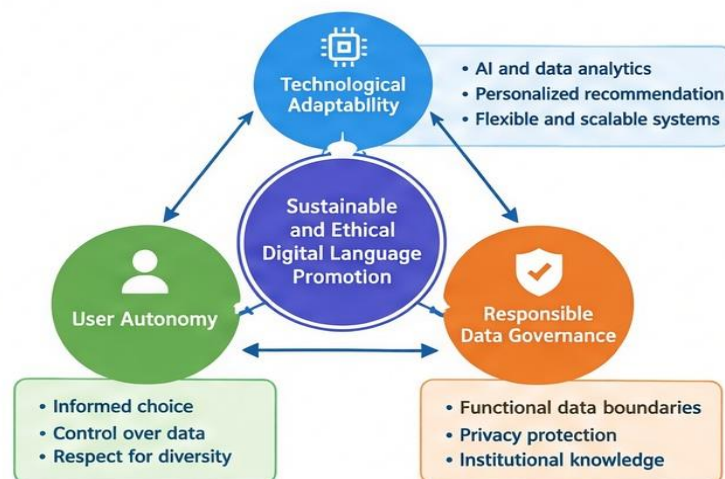


Figure 3. Balancing Technology, Autonomy and Governance

## 5. Precision Promotion as Sustained Alignment

### 5.1. Beyond Personalization

Precision promotion describes the capacity of a digital language-promotion system to sustain alignment among user understanding, situated communicative needs, resource provision, participation conditions, and feedback over time. The concept is related to personalization but has a different emphasis. Personalization generally focuses on tailoring content or delivery to an individual. Precision promotion asks whether the whole process remains functionally aligned with the situations in which communication occurs. A personalized system can remain imprecise when its underlying profile is inaccurate, while a shared resource can be precise when it addresses a well-understood common task. Precision is consequently treated as a property of the relationship between need and provision, not as the degree of individualization.

### 5.2. Dynamic Adjustment and Learning from Mismatch

Communicative needs are dynamic because users may change jobs, move between locations, enter new institutional settings, or develop different social and occupational demands. A system designed around a single assessment risks treating an evolving situation as a stable one. Precision promotion instead follows a recurrent process: Needs Sensing → Profile Integration → Resource Matching → Actual Participation → Feedback Interpretation → Collaborative Adjustment → Renewed Needs Sensing. Figure 4 illustrates this cycle. The system does not aim for a perfect initial profile; it aims to learn when the initial match proves incomplete or wrong.

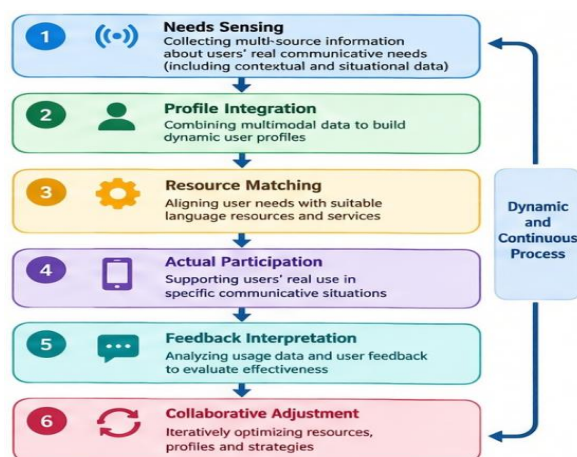


Figure 4. The Process of Precision Promotion

Within this cycle, mismatch becomes analytically useful. Repeated abandonment may indicate a participation barrier rather than low motivation; frequent requests for a topic may indicate that the resource inventory does not match current tasks; user corrections may reveal weaknesses in system representation. Such signals become valuable when interpreted as evidence about the relationship among people, resources, and situations. Recent discussion of intelligent assessment in language learning also highlights the opportunities and practical difficulties associated with using intelligent technologies to support learning evaluation and adjustment [19]. This concern is consistent with the present framework, which treats feedback not simply as measurement but as evidence for revising resource provision and system assumptions. The practical implication is that a system should not only detect behavior but also create opportunities to interpret behavior and revise assumptions. Dynamic adjustment therefore distinguishes precision promotion from one-time targeting: success lies in maintaining alignment as conditions change.

### *5.3. Distributed Knowledge and Institutional Capacity*

Precision promotion cannot be produced by platform technology alone because relevant knowledge is distributed across actors. Digital platforms may see patterns of use; educators may recognize learning difficulties; employers may understand workplace communication; community organizations may know local barriers; public institutions may identify language demands embedded in service procedures; and users possess direct knowledge of their own experiences. These forms of knowledge are not interchangeable, and no single actor can reasonably be expected to hold all of them. Institutional coordination is therefore part of the alignment mechanism rather than an optional supplement to technology.

The implication is not centralization, but channels through which situated knowledge can enter needs interpretation and adjustment. A technically sophisticated platform may still misdiagnose non-participation if it lacks access to workplace or community context. A more modest platform supported by contextual partnerships may be better able to identify why resources are not being used or why users report recurring problems. Precision should therefore be understood as jointly technological and organizational: it depends on the capacity to connect digital evidence with human interpretation and to translate that interpretation into changes in resources, delivery, or system assumptions.

## **6. Implications for Digital Language Promotion**

### *6.1. Context-Sensitive Resource Design*

The framework suggests organizing digital language resources around communicative situations as well as proficiency. Resources may address workplace interaction, safety communication, customer service, healthcare access, transportation, housing, public-service procedures, digital service navigation, and everyday social interaction. This does not imply abandoning proficiency-based organization or systematic language development. Instead, functional and situational dimensions can be combined with proficiency so that users can move between immediate tasks and broader language learning goals. A platform might therefore offer a short, task-oriented resource connected to a workplace problem while also providing pathways to more extensive practice at different levels of complexity. The relevant design question shifts from "What should this category of learner receive?" toward "Which communicative resources are most relevant to the situations this user or group is likely to encounter?" (As shown in Figure 5).



**Figure 5.** From Language Needs Analysis to Adaptive Resource Provision

### 6.2. Needs-Sensitive Institutional Coordination

Digital language promotion should also be understood as an institutional process. The range of communicative environments experienced by migrant workers means that educational institutions, workplaces, community organizations, public-service providers, and digital platforms may each hold information that is unavailable to the others. Workplace actors can identify recurring communication problems; community organizations can reveal barriers associated with mobility or access; educators can recognize linguistic difficulties that users may struggle to articulate; and public institutions can identify language barriers embedded in service procedures. Bringing such information into the alignment process creates a form of distributed needs analysis and reduces dependence on purely algorithmic inference. The platform remains important within a wider network capable of interpreting situated evidence.

### 6.3. Responsible Profiling and User Autonomy

Multimodal profiling also creates obligations: information should not be collected simply because it is technically available. Users should have meaningful awareness of how relevant information influences recommendations or service provision, and they should be able to challenge assumptions that no longer fit their circumstances. Occupation, location, or previous behavior may inform a recommendation without determining it. This distinction is especially important for populations whose access to institutions and resources may already be uneven. A system that treats past behavior as a fixed definition of future need can reproduce rather than reduce inequality. Responsible precision promotion therefore requires a balance between adaptability and autonomy: systems should learn from users while preserving the possibility that users can correct, refuse, or redefine the profile through which they are understood.

## 7. Toward Empirical Examination of the Framework

The framework is conceptual but designed for empirical examination. A useful research program would combine qualitative inquiry with digital and organizational evidence. Interviews could compare formally assumed needs with users' experienced communicative situations. Workplace and community observation could reveal tasks and barriers that questionnaires or platform data do not fully capture. Platform analytics could then examine access, engagement, abandonment, repetition, and continued use, provided that these behaviors are interpreted alongside contextual evidence rather than treated as self-explanatory. Needs-resource mapping could compare recurring communicative tasks with the content, format, and functions of available resources, while intervention studies could examine whether changes in profiling, resource design, or participation conditions produce improvements in relevance and meaningful participation.

The four mismatch dimensions provide a preliminary basis for operationalization. Representation mismatch can be examined by comparing platform categories with users' reported communicative situations. Resource relevance mismatch can be investigated

through the degree of correspondence between digital content and frequently encountered tasks. Participation mismatch can be assessed through barriers related to time, mobility, device access, digital literacy, cognitive demands, and interaction conditions. Feedback mismatch can be examined by tracing whether user feedback and behavioral evidence produce subsequent changes in profiles, resources, or delivery. Table 2 summarizes these possible indicators. Importantly, the framework does not assume that the four dimensions will always be empirically separable. They may overlap, and a single problem may create effects across several dimensions. Their analytical value lies in making different sources of misalignment visible and testable

**Table 2.** Possible Empirical Indicators of Multimodal Mismatch

| <b>Dimension</b>            | <b>Central analytical question</b>                      | <b>Possible empirical indicators</b>                                                                               |
|-----------------------------|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Representation mismatch     | Does the system understand relevant user circumstances? | Differences between platform categories and users' reported communicative situations                               |
| Resource relevance mismatch | Do resources correspond to actual communicative tasks?  | Degree of correspondence between resource content and frequently encountered tasks                                 |
| Participation mismatch      | Can users engage under realistic conditions?            | Barriers related to time, mobility, device access, digital literacy, cognitive demands, and interaction conditions |
| Feedback mismatch           | Does actual use lead to system adjustment?              | Extent to which user feedback and behavioral evidence result in changes to profiles, resources, or delivery        |

The framework also suggests several propositions for future research. First, stronger alignment between user representation and situated communicative needs should be associated with higher perceived relevance of digital language resources. Second, resource relevance alone should be insufficient to ensure meaningful participation when practical participation constraints remain high. Third, feedback that combines behavioral evidence with contextual interpretation should support more effective system adjustment than behavioral data interpreted in isolation. Fourth, functional data boundaries should improve the legitimacy and sustainability of relational profiling by limiting unnecessary data collection while preserving information that is functionally useful. These propositions are not empirical findings; they identify relationships for mixed-method, comparative, and intervention studies.

## 8. Limitations and Future Research

Several limitations should be acknowledged. First, the article does not provide empirical evidence on the prevalence or strength of the four mismatch types among migrant workers in the PRD. The framework is therefore explanatory and generative rather than confirmatory. Second, the discussion is anchored in migrant-worker contexts, and the framework's applicability to other mobile or heterogeneous populations should be tested rather than assumed. Third, the boundaries among mismatch types may be porous. For example, participation problems may appear as resource problems, while representation problems may propagate into feedback. Future studies should test whether these dimensions are empirically distinct or partly sequential. Finally, the framework raises questions about governance that cannot be answered through technical design alone, including who determines which information is functionally necessary and how users can challenge system assumptions.

These limitations define a practical research agenda: developing measures of situated need, comparing user-reported needs with platform profiles, and testing whether situational resources improve relevance and participation. Longitudinal research would

be particularly useful because precision promotion is defined here as an ongoing process rather than a single act of targeting. Comparative studies could also examine how different institutional arrangements affect the capacity to interpret feedback and adjust resources. Such work could move the framework toward measurable indicators of relevance, participation, adaptation, and user autonomy.

## 9. Conclusion

Digitalization expands the possibilities of language promotion, but greater access and technological sophistication do not automatically produce meaningful communicative participation. For migrant workers, language needs emerge across varied workplace, institutional, and everyday situations, and the conditions under which users can participate are themselves part of the problem. A system may therefore fail even when it has abundant resources and detailed user data. The central issue is whether the relationships among user representation, situated need, resource relevance, participation conditions, and feedback remain aligned.

The framework developed in this article addresses that issue through three linked concepts. Multimodal mismatch identifies four points at which alignment can break down: representation, resource relevance, participation, and feedback. Multimodal profiling provides a relational way to understand the user-in-situation without assuming that demographic categories or behavioral traces directly reveal communicative need. Precision promotion then describes the dynamic process through which needs are sensed, resources are matched, participation is interpreted, and adjustments are made in collaboration with relevant actors. The broader conceptual movement is from access to alignment, from static categorization to situated understanding, and from one-time delivery to dynamic adjustment.

For the PRD context, these shifts are relevant because mobility, occupational diversity, and changing institutional encounters make fixed assumptions about users increasingly fragile. The framework does not argue for collecting more data or maximizing individualization; it emphasizes functional relevance, contextual interpretation, and user autonomy. Its main value is therefore as a basis for designing and testing more responsive forms of digital language promotion. Reducing mismatch should not be understood as a promise of perfect prediction; it is a practical goal of keeping people, communicative situations, resources, participation opportunities, and feedback in productive relation over time.

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