

A Review of Data-Driven Immigration Decision Systems and Global Talent Mobility Optimization



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Abstract: Global competition for high-skilled talent has made immigration decision-making increasingly complex due to fragmented information, policy variability, and uneven evaluation standards. This paper reviews the conceptual foundations and practical value of data-driven immigration decision systems in improving global talent mobility. It proposes a three-layer analytical framework consisting of a Data Layer, an Evaluation Layer, and a Decision Layer. The Data Layer integrates applicant profiles, pathway requirements, and contextual case information; the Evaluation Layer transforms these inputs into assessments of feasibility, risk, and competitiveness; and the Decision Layer generates pathway recommendations and strategy options. Based on this framework, the paper discusses how structured decision systems can improve decision efficiency, strengthen case preparation, and support talent allocation across sectors of strategic importance. In addition, the study highlights the role of systematic comparison and structured evaluation in reducing information asymmetry and improving the transparency of immigration decision processes. The study also identifies key limitations, including data quality issues, policy change, model bias, and the continuing need for human judgment. It argues that data-driven immigration decision systems should be understood as decision-support tools rather than deterministic mechanisms. The analysis further suggests that integrating analytical frameworks into immigration practice can facilitate more consistent decision-making across different cases and institutional contexts. As global competition for talent intensifies, improving such systems will become increasingly important for both individual applicants and broader talent governance.

Keywords: Global Talent Mobility; Immigration Decision-Making; Data-Driven Systems; Risk Assessment; Talent Allocation Efficiency

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1 Introduction

1.1 Background of the Study

The global economy has entered a period in which talent mobility plays an increasingly strategic role in shaping competitiveness, innovation, and productivity. Countries that were once primarily concerned with capital flows and trade liberalization now place much greater emphasis on attracting, retaining, and allocating highly

skilled workers. Immigration policy has therefore become not only an administrative tool for population management, but also a policy instrument connected to industrial upgrading, technological innovation, and national development strategy.

High-skilled migration is commonly associated with positive outcomes such as knowledge transfer, entrepreneurial activity, scientific collaboration, and regional

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productivity gains. For destination countries, the ability to attract qualified professionals can ease labor shortages, strengthen innovation ecosystems, and support the development of emerging industries. For applicants, migration may offer expanded professional opportunities, greater institutional support, and access to international labor markets. Yet the apparent openness of global talent competition does not necessarily translate into transparent or efficient decision-making at the individual level.

In practice, immigration systems are often characterized by complexity rather than clarity. Applicants must navigate multiple visa categories, assess their own qualifications against evolving legal standards, prepare documentation under time pressure, and determine which pathway is most suitable for their background. Different programs may emphasize different forms of merit, such as academic degree, work experience, entrepreneurial contribution, research output, industry recognition, or labor market demand. The coexistence of multiple standards makes decision-making more difficult, especially for those whose profiles do not fit neatly into a single category.

1.2 Research Problem

A central problem in immigration decision-making is the gap between policy complexity and applicant understanding. Immigration rules may be publicly available, but the practical meaning of those rules is not always easy to interpret. The same profile may appear promising under one pathway and weak under another. Similar applicants may receive different advice from different intermediaries, not because the law changes from one day to another, but because interpretation methods, evidence standards, and strategic assumptions differ widely.

This situation creates a form of decision uncertainty that is both structural and informational. Structurally, immigration pathways are complex because they involve multiple criteria, sequential procedures, and variable adjudication practices. Informationally, applicants frequently rely on fragmented sources: informal forums, social media discussions, general policy summaries, anecdotal success stories, or advisory services that differ in quality and rigor. As a result, pathway selection is often made on the basis of incomplete comparison rather than systematic evaluation.

The consequences of such uncertainty are not trivial. Poor pathway selection can lead to avoidable rejection, weak document preparation, higher costs, repeated filing, or delayed career planning. At a broader level, inefficient

individual decisions may also produce inefficiencies in talent allocation, especially when qualified individuals fail to match themselves to the most suitable immigration channels. This suggests that immigration decision-making should be understood not only as a personal administrative choice, but also as part of a larger mechanism through which talent is distributed across borders.

1.3 Why More Research Is Needed

Existing research has examined migration from multiple perspectives, including labor economics, transnational mobility, demographic change, policy reform, and migrant integration. However, less attention has been paid to immigration decision-making as an analytical process that can be systematically modeled, evaluated, and improved. In many studies, migration appears as an outcome explained by macroeconomic variables or policy structures, while the actual micro-level decision process remains underdeveloped.

At the same time, advances in data analytics, decision support systems, and digital governance provide new possibilities for understanding immigration choice as a structured decision environment. If applicant data, policy conditions, and historical cases can be integrated into a coherent framework, then immigration strategy may be made more transparent and more evidence-based. Such an approach is relevant not only for applicants, but also for advisors, institutions, and policymakers seeking to improve the efficiency of talent mobility systems.

1.4 Purpose and Main Content of the Paper

This paper aims to review the role of data-driven immigration decision systems in the context of global talent mobility and to propose a conceptual framework for understanding how such systems may improve immigration decision quality. The paper first examines relevant literature on talent mobility, information asymmetry, and decision support. It then proposes a three-layer system architecture consisting of a Data Layer, an Evaluation Layer, and a Decision Layer. On that basis, the paper discusses major application scenarios, practical benefits, and key limitations. The final section summarizes the findings and outlines possible future directions for research and system development.

2 Literature Review

2.1 Talent Mobility as an Economic and Institutional Process

Research on high-skilled migration has consistently shown that talent mobility is closely linked to innovation, entrepreneurship, and economic dynamism. Skilled migrants contribute not only through labor supply, but also through the circulation of knowledge, the formation of professional networks, and the expansion of research and business collaboration across borders [1, 2, 12]. In innovation-driven economies, attracting highly trained individuals can strengthen universities, research institutions, technology firms, and specialized industries.

At the same time, talent mobility is not simply an economic movement determined by wage differentials. It is shaped by immigration law, professional recognition systems, recruitment structures, institutional openness, and perceptions of future opportunity [3]. This means that migration is both a market phenomenon and a policy-mediated process. Individuals do not move into a neutral global space; they move into systems governed by legal categories, documentation standards, time constraints, and administrative discretion.

A useful insight from migration scholarship is that mobility is selective. Not all qualified individuals migrate, and not all who attempt migration succeed. Decisions depend on perceived opportunity, risk tolerance, information access, and strategic timing [4]. These considerations reinforce the need to treat immigration decisions as structured choices rather than spontaneous acts.

2.2 Decision-Making Under Complexity and Uncertainty

Decision science offers a productive framework for understanding immigration choice. Classical models of rational decision-making assume that actors compare alternatives on the basis of stable information and choose the option that best maximizes expected utility. In reality, however, most important decisions are made under conditions of bounded rationality, incomplete information, and limited computational capacity [5]. Immigration is a clear example of such a setting.

Applicants must compare pathways that differ in eligi-

bility threshold, processing logic, evidence burden, and uncertainty of outcome. They often lack complete information about adjudication tendencies, the relative importance of specific credentials, or the best sequence in which to strengthen a case. Under such conditions, decisions may be shaped by simplification, analogy, or overreliance on individual anecdotes.

Behavioral decision research also shows that uncertainty can distort strategic judgment. Individuals may underestimate long-term advantages, overestimate single risks, or anchor too strongly on isolated examples [6]. In the immigration context, this may result in applying too early, waiting too long, selecting the wrong category, or investing effort in evidence that has limited persuasive value. A structured decision system can reduce these distortions by organizing variables into a clearer evaluative framework.

2.3 Information Asymmetry and Immigration Advice

The problem of information asymmetry is central to this discussion. Akerlof's classic insight that markets perform poorly when one side has access to better information applies in modified form to migration systems as well [7]. Immigration applicants typically do not possess the same level of procedural understanding, comparative knowledge, or strategic interpretation as institutions or experienced professionals. Even where policy documents are technically public, practical understanding remains unequally distributed.

In this environment, advisory services become influential. Yet advice markets themselves vary greatly in quality. Some advisors rely on systematic comparison and evidentiary reasoning, while others rely more heavily on formulaic templates or simplified checklists. Applicants may therefore receive guidance that is partially correct but strategically incomplete. The issue is not only that information is scarce; rather, relevant information is dispersed, unevenly interpreted, and difficult to evaluate.

From a systems perspective, this is precisely the kind of problem that benefits from structured data integration. If the major decision variables can be standardized and compared in a repeatable way, the gap between policy complexity and applicant comprehension can be narrowed. For this reason, the concept of a data-driven immigration decision system is not merely technical; it addresses a longstanding structural weakness in how immigration choices are made.

2.4 Decision Support Systems and Their Relevance

Decision support systems have been widely used in management, finance, healthcare, and public administration to assist users in evaluating alternatives under uncertainty [8, 9]. Such systems do not necessarily replace human judgment. Instead, they organize information, identify key variables, compare options, and present analytical outputs that support more informed choice.

The relevance of this framework to immigration is evident. Immigration pathways can be treated as decision alternatives; applicant features can be treated as input variables; evidentiary and policy conditions can be treated as evaluative dimensions; and the final pathway recommendation can be treated as a structured output. This does not mean immigration decisions can be reduced to pure automation. On the contrary, the value of a decision support approach lies in combining structured comparison with contextual interpretation.

Recent developments in digital governance and predictive analytics have made this approach more feasible. Structured data processing, rule-based evaluation, and scenario modeling can all be applied to immigration analysis, at least at the conceptual level [10, 11]. Even when predictive certainty is limited, systematic comparison remains superior to unsystematic guesswork.

2.5 Research Gap

Although there is growing discussion of digital tools in

migration management, there is still limited literature that specifically conceptualizes immigration pathway selection as a data-driven decision architecture. Most studies focus either on macro-level migration trends or on legal and policy analysis. Less attention has been given to the intermediate level where applicants, advisors, and policy conditions interact through evaluative systems.

This paper contributes to that gap by reviewing existing ideas across multiple fields and organizing them into a unified analytical framework. Rather than treating immigration decision-making as purely legal, purely personal, or purely economic, the study frames it as a structured system problem closely related to talent allocation efficiency.

3 Architecture of Data-Driven Immigration Decision Systems

3.1 Overall Analytical Logic

A data-driven immigration decision system can be understood as a structured framework that transforms dispersed information into interpretable strategic guidance. Its function is not simply to store documents or summarize eligibility rules. Rather, it integrates multiple forms of information, evaluates them against pathway-specific requirements, and produces comparative recommendations that support decision-making. As shown in Figure 1, the proposed architecture contains three interconnected layers: the Data Layer, the Evaluation Layer, and the Decision Layer.

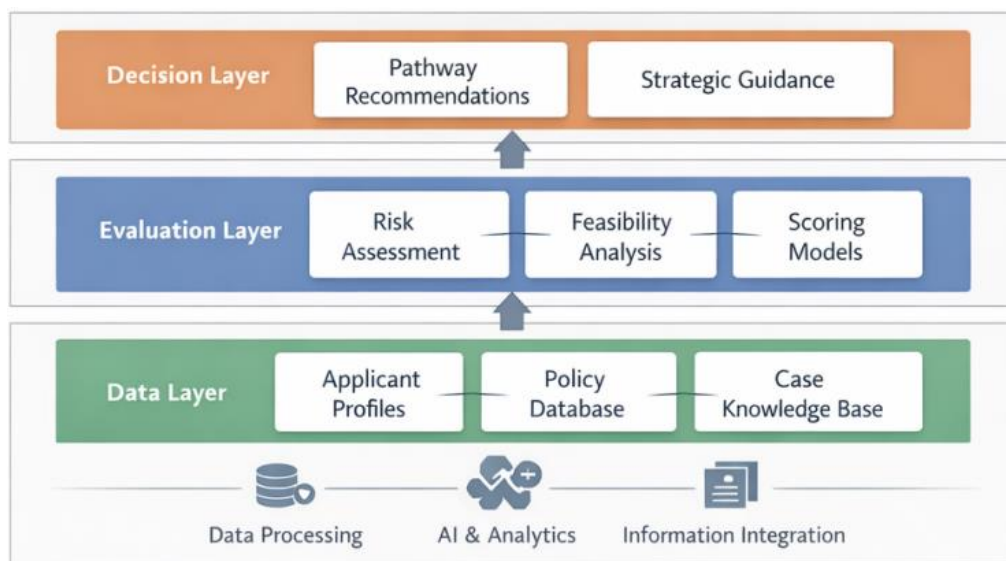


Figure 1 Architecture of Immigration Decision System

3.2 Data Layer: From Fragmented Information to Structured Inputs

The Data Layer is the foundation of the system. Without adequate data organization, any higher-order evaluation becomes unstable. In the immigration context, relevant data is both diverse and unevenly structured. It typically includes at least three categories.

The first category is applicant profile data. This includes education, employment history, occupational field, professional rank, publications, awards, patents, leadership roles, salary level, entrepreneurial activity, and evidence of sector-specific impact. Some of these variables are easily standardized, while others require interpretive classification. For example, a doctoral degree can be coded clearly, but professional influence may require more nuanced evaluation.

The second category is policy and pathway data. Each immigration channel has its own threshold logic, documentary expectations, and adjudicative emphasis. Some pathways focus on job offer and employer sponsorship; others emphasize independent merit, exceptional ability, labor market value, or national interest contribution. Pathway data must therefore include both formal eligibility requirements and practical assessment dimensions.

The third category is case and contextual data. This includes comparative historical cases, frequently observed evidence strengths and weaknesses, timing issues, changes in processing practice, and broader environmental factors such as sector demand or policy reform. Even when exact adjudication outcomes are not always publicly transparent, contextual data can still help identify patterns of feasibility and risk.

A major challenge at the Data Layer is heterogeneity. Some data is quantitative, some qualitative; some stable, some dynamic; some directly relevant, some only indirectly informative. A useful system must therefore perform not only data collection but also data normalization. This may involve converting narrative achievements into evidence categories, classifying experience by relevance, or assigning policy variables to comparable analytical fields.

3.3 Evaluation Layer: Translating Data into Analytical Judgments

The Evaluation Layer performs the core interpretive function of the system. Its role is to convert heterogeneous input data into a structured assessment of feasibility, risk, and strategic fit. This is the stage at which the system moves beyond information storage and begins to support actual decision-making.

A practical evaluation framework should include at least four analytical dimensions. The first is eligibility correspondence, which measures how well an applicant's profile aligns with the explicit criteria of a pathway. The second is evidentiary sufficiency, which assesses whether the applicant can support the claimed qualifications with persuasive documentation. The third is comparative competitiveness, which considers how strong the profile appears relative to the implied standards of approval. The fourth is procedural and strategic risk, which examines factors such as timing, document gaps, or overreliance on weak evidence.

To make the discussion more concrete, Table 1 presents an example of conceptual risk categories within the Evaluation Layer.

Table 1 Main risk dimensions in immigration decision evaluation

Risk Dimension	Main Content	Possible Impact
Eligibility Risk	Weak match between profile and pathway criteria	Unsuitable category selection
Evidence Risk	Insufficient or unconvincing supporting materials	Lower persuasiveness of case
Policy Risk	Regulatory or adjudicative uncertainty	Instability of expected outcome
Timing Risk	Delayed filing or incomplete preparation schedule	Missed opportunities or rushed case
Strategy Risk	Overemphasis on weak factors, poor case positioning	Reduced overall competitiveness

The value of the Evaluation Layer lies not in claiming perfect prediction, but in making hidden weaknesses visible before a filing decision is made. An applicant may appear generally qualified but still face serious evidentiary

risk. Another may have moderate qualifications but excellent pathway fit. Structured evaluation helps differentiate these scenarios.

This layer may also incorporate weighted scoring, rule-based logic, or scenario comparison. For example, a system

might compare whether an applicant is better positioned under a merit-based pathway or an employer-driven route. Even if final legal judgment remains external, internal strategic judgment becomes more disciplined and transparent.

3.4 Decision Layer: Recommendation, Comparison, and Strategy Formation

The Decision Layer is the output-oriented component of the architecture. It uses the structured results of the Evaluation Layer to produce actionable recommendations. These outputs may include pathway prioritization, document preparation strategy, evidence strengthening suggestions, and timing recommendations.

At this stage, the system should not merely state whether an applicant is “qualified” or “not qualified.” That kind of

binary conclusion is too simplistic for complex immigration systems. A more useful output is comparative and strategic. For example, the system may conclude that one pathway offers stronger long-term potential but requires more evidence development, while another is procedurally simpler but less aligned with the applicant’s strengths.

The Decision Layer may therefore provide at least three types of outputs. The first is pathway ranking, which compares multiple immigration options based on overall fit. The second is strategy recommendation, which identifies the most important actions needed to strengthen the case. The third is scenario planning, which allows the applicant to consider different timelines or preparation sequences.

As shown in Figure 2, immigration decision support can be conceptualized as a sequential process beginning with applicant input and ending with pathway recommendation.



Figure 2 Immigration decision flow

3.5 Integration Difficulties

Although the three-layer model is conceptually clear, practical implementation remains challenging. Policy standards change. Data may be incomplete or difficult to standardize. Similar credentials may carry different significance in different pathways. Moreover, some core qualities, such as originality, influence, or future contribution, are difficult to reduce to mechanical scoring.

For this reason, the proposed architecture should be understood as a support framework rather than a deterministic machine. Its goal is to improve clarity, consistency, and comparative reasoning, not to eliminate the need for professional interpretation.

4 Applications and Practical Value

4.1 Improving Decision Efficiency

One of the clearest advantages of a data-driven immigration decision system is improved efficiency. In conventional practice, applicants often compare pathways in an unsystematic manner. They collect scattered information, consult multiple opinions, and revise their plan repeatedly as new information appears. This process is costly in both

time and attention.

A structured system shortens this cycle by organizing the comparison process from the beginning. Instead of asking broad questions such as “Which visa is best?”, the applicant can assess pathway options through defined dimensions: eligibility match, evidence readiness, strategic risk, and timing feasibility. This reduces repetitive uncertainty and makes the decision process more manageable.

Efficiency here should not be understood narrowly as speed alone. A decision made too quickly may still be poor. The more meaningful form of efficiency is reduction in unnecessary trial-and-error. A structured system helps applicants avoid spending months preparing for a pathway that is only weakly aligned with their actual profile.

4.2 Strengthening Case Preparation

Another major application lies in case preparation. Immigration outcomes often depend not only on raw qualifications, but also on how those qualifications are translated into evidence. Applicants frequently possess useful strengths yet fail to present them strategically. Conversely, some may overinvest in weaker materials because they lack a framework for prioritization.

A data-driven system can improve this process by iden-

tifying which parts of the profile are most relevant to a specific pathway and which gaps are most damaging. This allows for more efficient evidence planning. Rather than collecting documents indiscriminately, applicants can focus on high-value materials and develop supporting narratives around the strongest dimensions of the case.

This function is particularly important for merit-based pathways, where documentary interpretation plays a larger role. In such contexts, the system supports not just decision selection but the internal structuring of the case itself.

4.3 Supporting Advisors and Institutions

Although the discussion often centers on applicants, structured decision systems are also valuable for advisors, educational institutions, recruiters, and migration-related organizations. For advisors, systematized evaluation can improve consistency across consultations and reduce over-reliance on personal intuition. For institutions that support international talent, such systems can help identify which candidates are most suitable for specific channels or what preparation support they may need.

From an organizational perspective, this matters because immigration support often operates under capacity constraints. A structured model allows multiple cases to be assessed through a comparable framework, making service delivery more stable and scalable.

4.4 Enhancing Talent Allocation Efficiency

At a macro level, the broader significance of immigration decision systems lies in talent allocation. If qualified individuals are more accurately matched to pathways, the mobility system as a whole becomes more efficient. Misalignment is reduced. Unnecessary procedural loss declines. The relationship between talent profile and policy demand becomes clearer.

This matters for destination countries because immigration systems are often expected to support strategic sectors such as technology, healthcare, research, advanced manufacturing, and entrepreneurship. If talented applicants fail to access the right pathways because the decision environment is opaque, then the system underperforms not only for the individual but also for the economy.

Data-driven decision systems can therefore be seen as soft infrastructure for talent mobility. They do not create

talent, but they can improve the process through which talent is recognized, positioned, and directed into suitable legal channels.

4.5 Broader Economic Implications

The economic implications of efficient talent mobility extend beyond immediate labor supply. High-skilled migrants often participate in innovation-intensive activities, contribute to patenting and research, and strengthen international knowledge networks [12]. Better immigration decision-making can therefore have downstream effects on productivity, firm competitiveness, and institutional renewal.

Of course, no decision tool by itself guarantees positive macroeconomic outcomes. Yet if data-driven systems improve the quality of migration matching, reduce avoidable rejection based on poor strategy, and support better case preparation, then they indirectly strengthen the functioning of talent-oriented migration regimes. In this sense, immigration decision systems should be viewed not only as individual planning tools but also as components of a broader economic governance framework.

5 Critical Analysis and Main Limitations

5.1 Data Quality and Incomplete Inputs

The first major limitation concerns data quality. A decision system is only as reliable as the data it receives. If applicant profiles are incomplete, exaggerated, poorly documented, or inconsistently classified, the analytical output will be weakened from the start. Similarly, if pathway requirements are simplified too aggressively, subtle but important distinctions may be lost.

This problem is especially serious in immigration because many core variables are difficult to quantify precisely. Professional influence, originality, leadership significance, or future contribution often require judgment rather than mere counting. A system that relies too heavily on superficial indicators may generate outputs that are orderly but misleading.

5.2 Policy Change and Regulatory Instability

The second limitation is policy variability. Immigration

systems are dynamic. Eligibility rules are revised, procedural interpretations evolve, and documentary emphasis may shift over time. A pathway that appears strategically attractive under one policy environment may become less favorable under another. This means that decision systems must be continuously updated if they are to remain relevant.

In practical terms, this introduces maintenance challenges. A static database of pathway requirements may quickly become outdated. A system that presents old assumptions with high confidence can create false certainty. Therefore, data-driven immigration systems require not only technical design but also ongoing policy monitoring and interpretive revision.

5.3 Model Bias and Overstandardization

Another concern is model bias. Any evaluative framework reflects choices about what variables matter, how much weight they receive, and how qualitative distinctions are represented. If the model is built on narrow assumptions or biased case samples, it may systematically favor certain profiles and undervalue others.

This is not a hypothetical issue. Many applicants do not follow conventional career trajectories. Some have interdisciplinary backgrounds, non-linear careers, or achievements that are significant but difficult to translate into standard categories. An overly standardized system may misclassify such profiles as weak simply because they do not fit expected patterns.

This suggests that decision systems should retain a degree of interpretive flexibility. Standardization improves consistency, but too much standardization may suppress legitimate complexity. The challenge lies in designing systems that are structured without being rigid.

5.4 Privacy, Security, and Ethical Governance

Immigration analysis often involves highly sensitive personal information, including employment history, educational records, financial data, publication records, and legal documentation. A data-driven system that stores and processes such information must therefore address privacy and security concerns seriously.

The issue is not limited to technical data protection. Ethical governance is equally important. Applicants should understand how their information is being used, what kinds of inferences the system makes, and where the limits of

those inferences lie. If a recommendation system becomes opaque, users may place too much trust in outputs they cannot interpret. In that sense, transparency is not only a technical principle but also an ethical requirement.

5.5 The Continuing Role of Human Judgment

A final limitation is the persistent importance of human judgment. Immigration decisions are rarely reducible to pure mechanical logic. Interpretation matters. Narrative matters. Context matters. A profile that appears borderline in one analytical framework may become persuasive when its significance is articulated properly. Conversely, a profile that scores well on paper may still fail if the evidentiary narrative is poorly structured.

For this reason, data-driven systems should be understood as decision support rather than decision replacement. Their most valuable role is to clarify options, identify risk, and structure comparison. Final strategy, however, still benefits from contextual understanding and professional judgment.

6 Conclusion

This paper examines the conceptual foundation and practical value of data-driven immigration decision systems in the context of global talent mobility. As high-skilled migration becomes increasingly important for economic growth and innovation, applicants face growing challenges due to complex policies and fragmented information. To address this, the study proposes a three-layer framework—Data, Evaluation, and Decision—which structures immigration decision-making as a systematic analytical process.

The analysis highlights that such systems can enhance decision efficiency, improve case preparation, and support both applicants and institutions in optimizing talent allocation. However, limitations remain, including data quality issues, policy uncertainty, model bias, and privacy concerns. Importantly, immigration decisions still require human judgment, as contextual interpretation and evidentiary nuance cannot be fully standardized.

Future research should focus on refining evaluation indicators, expanding empirical validation, and examining system performance across different policy environments. As global competition for talent intensifies, improving im-

migration decision systems will become increasingly important for both individual applicants and broader talent governance.

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