



Measuring the Impact of Private EdTech Investment on Digital Capability Development in India: A Conceptual Framework

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Abstract – India has become one of the world's largest EdTech markets, supported by policy interest in digital education, rapid platform growth, and substantial private investment. Yet the impact of this investment is still commonly judged by metrics such as user acquisition, enrolment, or geographic reach. This paper argues that such measures are inadequate because they confuse access with capability. The core problem is not whether private EdTech expands digital access, but how its educational impact should be measured in a context marked by uneven infrastructure, social inequality, and variable institutional readiness. This conceptual paper develops a framework for measuring the impact of private EdTech investment on digital capability development in India. Drawing on recent literature on digital equality, digital exclusion, teacher digital competence, and platformization, together with India-specific policy and system evidence, the paper proposes that impact should be assessed through a sequence of linked dimensions: access, conversion conditions, educational mediation, and capability outcomes. The paper's main argument is that private EdTech investment creates educational value only when digital resources are translated into meaningful learner and teacher capabilities under equitable conditions. The paper contributes to management and education scholarship by offering a capability-oriented measurement model that moves beyond platform scale and toward a more rigorous assessment of educational quality, inclusion, and long-term developmental value.

Keywords - EdTech; private investment; digital capability; educational equity; India; measurement framework.

I. INTRODUCTION

India is an important case for studying the relationship between private EdTech investment and digital capability development because it combines educational scale, market dynamism, and structural inequality. The school system serves roughly 24.8 crore students, while digital infrastructure in schools has improved substantially in recent years. Government releases based on UDISE+ report that the share of schools with computers rose from 38.5% in 2019-20 to 57.2% in 2023-24, and the share with internet access rose from 22.3% to 53.9% over the same period. At the same time, Tracxn describes India as an EdTech ecosystem with around 11,000 active companies and one of the world's most heavily funded EdTech markets by total investment to date. These features make India a useful setting for examining not just whether private EdTech expands reach, but whether investment is converted into meaningful capability.

The problem is that the dominant measures of EdTech success are still too narrow. In investor presentations, market reports, and many policy discussions, progress is often inferred from enrolment growth, platform scale, or app penetration. These indicators are useful for understanding adoption, but they are weak measures of educational impact. UNESCO's 2023 Global Education Monitoring Report is explicit that technology's educational effects are neither automatic nor uniformly positive, and that digital tools must be judged in relation to equity, relevance, and pedagogy rather than presence alone. In other words, access to a platform is not the same as the

ability to use it productively for learning, teaching, or future opportunity.

This distinction is especially important in India because access itself is layered and unequal. ASER 2024 reports that household smartphone access among 14-16 year olds in rural India is high, but individual ownership, task performance, and some forms of use remain differentiated by age, gender, and state. The survey also found that only those adolescents who could physically bring a smartphone to the assessment were asked to complete digital tasks such as setting an alarm, searching for information, locating a video, and sharing it. This means that the country's digital learning landscape cannot be understood by asking only whether a device exists in the household. The more important question is whether learners can reliably use digital tools in ways that build transferable competence.

The research problem for this paper follows directly from that tension. Although the literature on EdTech is now extensive, the measurement of impact remains conceptually underdeveloped. Existing studies provide valuable work on digital exclusion, teacher readiness, low-income platform use, and the inequitable effects of EdTech, but they do not yet yield a coherent measurement model for judging how private investment affects digital capability in unequal contexts. This gap is significant for management research because private EdTech firms are not neutral technology suppliers. They are organizations making strategic decisions about pricing, language, product design, customer segmentation, teacher tools, and monetization. These decisions shape who benefits from digital education and in what way.



This paper therefore asks a more demanding question than whether private EdTech "works." It asks how its impact should be measured. The paper argues that the educational value of private EdTech investment should be assessed through a linked sequence of four dimensions: access, conversion conditions, educational mediation, and capability outcomes. It develops a conceptual framework for this purpose and advances the following research questions: What is wrong with existing access-centered measures of EdTech impact? What dimensions should be included in a more valid measurement model? And how can private EdTech investment be evaluated in a way that is sensitive to inequality, pedagogy, and long-term developmental value?

II. LITERATURE REVIEW

The first relevant debate concerns digital equality. Luo and Liu show that digital equality in education is widely invoked but often poorly defined, and that existing definitions frequently collapse different issues such as infrastructure, skills, and participation into a single vague goal. Their review is important because it demonstrates that any attempt to measure digital impact must first clarify what counts as equality. If equality is treated simply as formal access, then measurement will miss the ways in which digital systems reproduce disadvantage through weaker support, lower usability, or fewer opportunities for meaningful participation.

A second debate focuses on digital exclusion. Passey argues that educational exclusion through digital exclusion has multiple dimensions, including low income, remoteness, disability, and weak access to relevant support structures. This is analytically useful because it reframes exclusion as more than a connectivity problem. A learner can be connected and still be excluded if the device is shared, the data plan is unstable, the platform language is unfamiliar, or the instructional design assumes forms of self-regulation the learner has not been supported to develop. For measurement purposes, this implies that access metrics are necessary but not sufficient.

A third debate concerns digital competence. Falloon's Teacher Digital Competency framework is central here because it moves beyond narrow ideas of digital literacy as technical operation and instead argues for a broader conception that includes ethical, pedagogical, and professional competence. Tondeur and colleagues make a similar move in the HeDiCom framework, which includes teaching practice, empowering students for a digital society, teachers' digital literacy, and teachers' professional development. Together, these frameworks suggest that digital capability should be measured as a multidimensional construct rather than as a checklist of basic technical actions.

This teacher dimension matters because digital capability in education is rarely produced by student-platform interaction alone. Research on teachers' competencies in

technology-enabled assessment in India shows significant gaps in digital literacy, training, and familiarity with relevant digital tools among sampled secondary teachers. While this study is context-specific rather than nationally representative, it is still useful because it points to a recurring problem in the literature: digital education quality depends on teacher competence and not merely on platform availability. Measuring the impact of EdTech investment without measuring educational mediation therefore risks overstating its effect.

A fourth debate concerns platformization and inequality. Macgilchrist, Potter, and Williamson argue that EdTech is not simply a neutral delivery system; it can generate bias, injustice, discrimination, and inequality. Bhatia and colleagues strengthen this perspective through an ethnographic study of low-income communities in India, showing that proprietary EdTech platforms are used within family settings shaped by aspiration, constraint, and social mediation. This is especially significant for measurement because it shows that user metrics capture only a surface layer of what platforms do. The educational value of private EdTech depends on how products are embedded in household and institutional realities.

Taken together, the literature suggests three things. First, access is not an adequate proxy for impact. Second, capability is broader than technical skill and includes pedagogic, informational, communicative, and adaptive dimensions. Third, the effects of private EdTech are mediated by social and institutional context. What remains missing is a measurement model that integrates these insights and is usable for evaluating private EdTech investment in India. That is the specific gap this paper addresses.

III. METHODOLOGY OR CONCEPTUAL APPROACH

This paper is conceptual rather than empirical. Its aim is not to estimate causal effects statistically but to develop a framework for measuring impact more rigorously. The methodological approach is structured conceptual synthesis. It integrates recent peer-reviewed research on digital equality, digital exclusion, teacher competence, and EdTech inequality with authoritative India-specific sources on digital education policy, school infrastructure, adolescent access, and EdTech investment. This approach is appropriate because the problem under investigation is not lack of isolated evidence, but lack of conceptual integration across management and education scholarship. The framework developed here is guided by one core analytical distinction: the difference between resource provision and capability formation. Private capital can fund products, content, algorithms, distribution, and reach. But the educational effect of those investments depends on whether users can convert access into meaningful learning and teaching capability.



In practical terms, this means the measurement model must distinguish between what investment makes available and what learners and teachers become able to do because of it. This move draws conceptually on the capability perspective and on the digital competence literature, while remaining focused on the strategic questions that matter in management research.

The paper proceeds by identifying recurring themes across the literature and reorganizing them into a measurement logic. Four themes appeared consistently: infrastructure and platform access, social and material conversion conditions, teacher and institutional mediation, and multidimensional capability outcomes. These four themes become the core measurement dimensions in the proposed framework. The framework is not presented as a final scale, but as a conceptual architecture that can guide future empirical work, due diligence, policy evaluation, and comparative case analysis.

IV. RESULTS OR ANALYSIS

The main result of the paper is a conceptual measurement framework for evaluating the impact of private EdTech investment on digital capability development in India. The framework is built on four linked dimensions.

The first dimension is access. This includes the conventional measures most often used in EdTech discourse: device availability, internet access, school ICT infrastructure, platform enrolment, subscription counts, lesson completion, and user penetration. These measures are not useless. In fact, they remain essential because capability cannot develop without some degree of access. NEP 2020 itself recognizes both the importance of technology and the need to ensure equitable use. Likewise, UDISE and ASER data confirm that access varies across institutions and households and must therefore remain part of any serious measurement exercise. The conceptual problem arises only when access is mistaken for impact rather than treated as its first layer.

The second dimension is conversion conditions. This is where most existing measurement approaches are weak. Conversion conditions refer to the factors that determine whether formal access becomes practical, sustained, and educationally meaningful use. These include individual device ownership, affordability of data and subscriptions, language fit, electricity, quiet study space, parental support, gendered control over phone use, and low-bandwidth usability. This dimension is critical in India because the same platform can produce very different outcomes in a well-resourced urban household and in a low-income or rural context where devices are shared and connection is unstable. Measuring impact without conversion conditions creates systematic overstatement.

The third dimension is educational mediation. This refers to the organizational and pedagogic processes that shape how digital tools are actually used in educational settings. It

includes teacher digital competence, professional development, curriculum alignment, assessment design, classroom routines, leadership support, and institutional integration. This dimension matters because platforms do not teach in isolation. Even highly individualized digital systems are interpreted, scaffolded, resisted, or amplified by educators and institutions. If teachers are not confident in digital pedagogy, if schools treat platforms as add-ons, or if assessment systems do not reward meaningful digital work, then the impact of private EdTech investment is likely to remain shallow.

The fourth dimension is capability outcomes. This is the dimension the paper argues should be treated as the primary indicator of impact. Capability outcomes are broader than usage statistics. They include operational capability, such as the ability to navigate tools reliably; informational capability, such as searching, evaluating, and using digital information; communicative capability, such as sharing, collaborating, and participating safely; pedagogic capability, especially for teachers using digital tools to explain, assess, and differentiate; and adaptive capability, meaning the ability to transfer competence across contexts rather than functioning only within one proprietary platform. These outcomes are more demanding to assess, but they are also closer to what educational development actually means.

These four dimensions form a sequence rather than a list. Private investment first expands possible access. That access then encounters unequal conversion conditions. It is further shaped by educational mediation. Only after these stages do meaningful capability outcomes emerge. This sequence matters because it explains why access gains and capability gains do not always move together. A platform can grow rapidly in user numbers and still show weak capability effects if the conversion and mediation stages are neglected. Conversely, a smaller-scale intervention may generate stronger educational value if it is designed for low-resource settings, aligned to pedagogy, and supported by teacher development.

On this basis, the paper proposes three analytical claims. First, the impact of private EdTech investment should be measured as a conversion process rather than a direct outcome of funding. Second, the validity of impact claims depends on whether they include indicators from all four dimensions rather than only the first. Third, the best measure of success is not scale alone but capability under conditions of equity. These claims are important because they change both what researchers should study and what managers and investors should report.

The framework also has a practical measurement implication. It suggests that private EdTech firms should not be evaluated only by market-facing indicators such as monthly active users, gross revenue, or customer acquisition efficiency. They should also be evaluated by whether they reduce conversion barriers, support teachers, and produce stronger digital capabilities among users. For



instance, a platform that lowers bandwidth requirements, supports multiple languages, provides strong teacher dashboards, and improves users' ability to search, evaluate, and communicate digitally may be more educationally valuable than a faster-growing platform optimized mainly for exam preparation and premium conversion.

V. DISCUSSION

The paper makes two linked contributions to management-oriented conference research. The first is conceptual. It argues that private EdTech investment should not be measured through business growth indicators alone because education is a socially mediated domain where value depends on human capability, not just digital delivery. This is not an argument against commercial metrics; firms need them. It is an argument that such metrics are incomplete if the goal is to understand educational impact. For management scholars, this reframes impact evaluation from a question of scale to a question of capability conversion.

The second contribution is methodological. By separating access, conversion conditions, educational mediation, and capability outcomes, the framework offers a more discriminating way to evaluate the effects of private EdTech investment. This allows researchers to ask sharper questions. For example, if a platform shows wide adoption but weak educational outcomes, is the problem low-quality design, low teacher competence, poor language localization, unaffordable data use, or weak institutional integration? Existing one-dimensional measures cannot answer this. The proposed model can.

The framework also helps explain a tension in the existing literature. Some studies and policy narratives present EdTech as an enabler of inclusion because it lowers barriers of distance and time. Others emphasize how EdTech can reproduce or intensify inequality. These positions are often treated as opposites, but the framework developed here suggests they can both be true. Private EdTech can increase access while still producing unequal capability outcomes if those with stronger conversion resources benefit more. In a context like India, where connectivity is improving but remains uneven, and where school infrastructure, household resources, and teacher readiness differ sharply, this is likely to be a common pattern rather than an exception.

For conference audiences in management, one further implication is especially important: the framework changes what counts as a high-quality EdTech business model. A strong EdTech firm is not simply one that scales quickly; it is one that can convert investment into durable user capability. That requires choices about affordability, localization, teacher support, and product usability that may not maximize short-term growth but may create stronger long-term legitimacy, resilience, and public value. In this sense, the paper suggests that capability-oriented strategy may be a competitive asset rather than a purely normative aspiration.

The framework also matters for policy and public-private partnerships. NEP 2020 explicitly frames online and digital education in terms of ensuring equitable use of technology. If that commitment is taken seriously, then public systems should not judge private EdTech partnerships by platform reach alone. Procurement, partnership design, and evaluation should ask whether digital initiatives reduce conversion barriers, strengthen teacher capability, and produce measurable improvements in digital competence. This does not eliminate the role of private capital, but it does require different accountability standards.

VI. CONCLUSION AND FUTURE WORK

This paper has argued that the impact of private EdTech investment in India cannot be measured adequately through access or adoption metrics alone. The central conceptual claim is that digital capability development is a conversion process. Investment may expand access, but whether it creates educational value depends on the conversion conditions learners face, the pedagogic and institutional mediation that follows, and the multidimensional capabilities that ultimately emerge. This is the paper's main contribution: a capability-oriented measurement framework that is better aligned with educational reality than conventional market-facing indicators.

The implications are practical as well as theoretical. For researchers, the framework offers a more rigorous basis for empirical work on EdTech impact. For managers and investors, it suggests that market scale should be complemented by measures of capability formation, teacher support, and reduction of conversion barriers. For policymakers, it offers a way to evaluate whether private EdTech contributes to public educational goals rather than merely to digital expansion. In all three cases, the core principle is the same: access matters, but capability is the more meaningful unit of impact.

Future work should test and refine the framework empirically. Comparative studies across Indian states, school types, and EdTech segments could examine whether the four dimensions operate differently in K-12 schooling, test preparation, higher education, and professional upskilling. Researchers could also build and validate survey instruments or mixed-method evaluation tools for each dimension. A particularly important next step would be to design capability indicators that are robust enough for managerial reporting but sensitive enough to capture inequality and pedagogy. That is the challenge if the field is to move beyond celebrating digital access and toward measuring genuine educational development.

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