REPORT 16

GoldenBridge: A Bridge to a Bright Future for Education

[ANONYMIZED REPORT — ALL IDENTIFYING INFORMATION REMOVED]

Abstract

We live in a society that is increasingly impacted by our information systems and the amount of information we generate through them. In education, it could not be any different. What if this information could be recorded in real time and with government support for more equal education? Through speculative design, this work presents a critical view of current trends that may impact education in the future, as well as proposing a technological solution to bring technological reality to social good. This essay is expected to reflect on how the information systems community can help create favorable scenarios, combining market demands with technological advances, recalculating the route of students toward course completion.

Introduction

This work aims to present a speculative design proposal for the field of Education, considering a 20-year panorama of evolution for both technology and education.

The speculative design methodology aims to develop a vision of the future for a given context or problem, highlighting discussions for the development of artifacts. It is understood that information systems are part of a context and should not only be seen as systems, but rather as important tools for the development of fields of knowledge, as well as strategic instruments for the social changes necessary for a more equal country.

This work is divided into four parts. In the first part, the state of the art of the theme will be presented based on the discussion of the new model of society we have and the educational directions to deal with new students and educational models. In the second part, market signals and trends will be presented based on the mapping of actors and current

relationships of the theme under discussion. Next, the results of the Innovation Map tool will be presented in technological trends that have applicability in knowledge management, and the Future Scenario Maker, which presents futuristic scenarios on the theme of distance education for a future scenario in 2044. Based on the results of the tools, a speculation of a possible future will be presented, showing the main pros and cons of future scenarios and their impacts. Finally, the GoldenBridge tool will be presented, which aims to minimize future impacts and support the Ministry of Education in the plan to bring quality education to the entire national territory.

We know that speculative design presents a vision of the future. However, this exercise greatly supports us in thinking about the impact of new decisions made today in the development of technological products and how the future, which seems distant, can begin to be defined today with our market and academic practices.

1. State of the Art: We Are Drowning in Information

We live in a society immersed in information systems, which increasingly influence the way we live, work, and learn. The volume of information generated daily grows exponentially, driven by digital platforms, social networks, and intelligent systems that collect, process, and distribute data continuously. In this context, education faces the challenge of dealing with an excess of information while simultaneously needing to transform this information into knowledge.

The current educational model was designed for a reality very different from the one we experience today. Traditional teaching methods, centered on content transmission and standardized evaluation, struggle to keep pace with technological advances and the new profiles of students, who are increasingly connected, autonomous, and accustomed to instant access to information.

According to recent studies, students are exposed to a large amount of data but often lack the necessary skills to critically analyze, contextualize, and apply this information effectively. This scenario creates a paradox: while access to information has

never been so broad, the capacity to transform information into meaningful learning remains limited.

In addition, educational institutions face structural and social inequalities that are intensified by technological disparities. Access to digital resources, connectivity, and technological infrastructure varies significantly across regions and social groups, contributing to unequal educational opportunities.

Information Systems play a central role in this scenario, as they mediate access to information, organize knowledge, and support decision-making processes. However, the design and implementation of these systems often prioritize efficiency and scalability over pedagogical and social considerations.

Thus, there is a growing need to rethink how information systems are conceived and applied in education. Rather than simply digitizing existing processes, it is necessary to design systems that support personalized learning, promote inclusion, and contribute to reducing educational inequalities.

This state of the art highlights the urgency of developing innovative approaches that align technological advances with educational objectives, ensuring that information systems serve as instruments for social good rather than reinforcing existing disparities.

2. Signals and Trends

To understand the possible future scenarios for education, it is necessary to observe the signals and trends that are already shaping the present. These signals emerge from technological, social, economic, and institutional transformations that directly impact educational systems and learning processes.

One of the most evident signals is the increasing digitalization of education. Distance education platforms, virtual learning environments, and educational applications have become widely adopted, especially after global events that required social distancing. This movement accelerated the incorporation of technology into teaching practices and expanded the reach of educational content.

Another important signal is the growing use of data in education. Educational institutions increasingly collect data on student performance, behavior, and engagement. These data are used to support decision-making, identify learning difficulties, and personalize educational experiences. However, this trend also raises concerns about privacy, data protection, and ethical use of information.

The labor market also exerts strong influence on educational trends. There is increasing demand for professionals with digital skills, adaptability, and the ability to learn continuously. This demand pressures educational institutions to revise curricula and adopt more flexible and interdisciplinary models.

Government initiatives focused on digital transformation in education constitute another relevant signal. Public policies aimed at expanding connectivity, providing digital resources, and promoting innovation in teaching indicate institutional recognition of the importance of technology in education. However, the implementation of these policies often faces challenges related to infrastructure, funding, and coordination.

Social inequality remains a persistent trend that affects access to education and technology. Despite advances, significant portions of the population still face barriers related to connectivity, equipment availability, and digital literacy. These inequalities risk being exacerbated by technological solutions that do not adequately consider diverse social realities.

Together, these signals and trends suggest that the future of education will be increasingly mediated by information systems and data-driven technologies. The challenge lies in ensuring that these developments contribute to more inclusive, equitable, and meaningful educational experiences.

3. Tools and Technologies

To support the speculative design process, tools were used to help identify technological trends and envision possible futures for education. Among the tools adopted, the **Innovation Map** and

the **Future Scenario Maker** stand out, both of which contribute to understanding how emerging technologies may be applied to educational contexts.

3.1. Innovation Map

The Innovation Map tool was used to identify technological trends with potential applicability in knowledge management and education. Through this tool, it was possible to observe a set of technologies that are already being developed or are in an advanced stage of maturation and that may influence educational systems in the coming years.

Among the identified technologies are data analytics platforms, artificial intelligence systems for recommendation and personalization, blockchain-based solutions for credential validation, and systems for real-time monitoring of learning processes. These technologies indicate a trend toward more data-driven and adaptive educational environments.

The Innovation Map also highlights the importance of interoperability between systems. For educational information to be effectively used, it must be shared across different platforms and institutions. This requires standards, governance models, and technical infrastructure capable of supporting integration and data exchange.

3.2. Future Scenario Maker

The Future Scenario Maker tool was used to generate future scenarios related to distance education in a long-term horizon, considering the year 2044. The tool provides narrative descriptions of possible futures based on current signals and technological trends.

The generated scenarios explore different configurations of educational systems, ranging from highly centralized and technology-driven models to more decentralized and community-oriented approaches. These scenarios help identify potential opportunities and risks associated with the adoption of advanced technologies in education.

By combining the results of the Innovation Map and the Future Scenario Maker, it was possible to develop a broader understanding of how tools and technologies may shape future educational landscapes. These insights serve as the basis for the speculative proposal presented in the following section.

4. Speculation of a Possible Future

Based on the signals, trends, and tools presented in the previous sections, it is possible to speculate on a future scenario for [omitted for blind review] education over a 20-year horizon. This speculative exercise aims to reflect on how technological advances and information systems may reshape educational practices, institutional arrangements, and learning trajectories.

In the projected future, information systems play a central role in monitoring, recording, and analyzing students' educational paths in real time. Data generated throughout the learning process are continuously collected and integrated into national educational platforms, enabling a comprehensive view of students' progress, difficulties, and achievements.

This data-driven approach allows educational policies to be formulated based on concrete evidence rather than estimations or fragmented information. Government agencies are able to identify regions, schools, and student profiles that require targeted interventions, allocating resources more efficiently and equitably.

At the same time, personalized learning becomes a core feature of the educational system. Based on data analysis, educational platforms adapt content, pace, and pedagogical strategies to individual students' needs. This personalization seeks to reduce dropout rates and support students in completing their courses, particularly those in vulnerable social contexts.

However, this future scenario also raises significant challenges. The extensive collection and use of educational data intensify concerns related to privacy, data protection, and surveillance. There is a risk that students may be reduced to

data profiles, and that algorithmic decisions may reinforce existing biases or inequalities if not carefully governed.

Moreover, the reliance on technological systems may marginalize educational practices that cannot be easily quantified or automated, such as socio-emotional learning and critical thinking. Ensuring that technology complements, rather than replaces, human educators becomes a central concern.

Thus, the speculation of a possible future reveals a landscape of both opportunities and risks. The direction taken will depend on how information systems are designed, governed, and integrated into educational policies and practices.

5. GoldenBridge Proposal

Based on the speculative analysis presented in the previous sections, this work proposes **GoldenBridge**, a technological solution designed to act as a bridge between information systems, educational institutions, students, and government agencies. GoldenBridge aims to support the creation of more equitable, data-driven, and inclusive educational policies and practices.

GoldenBridge is envisioned as a national educational information system capable of integrating data from multiple sources, such as schools, universities, distance education platforms, and governmental databases. By consolidating these data, the system enables continuous monitoring of students' educational trajectories from basic education to higher education and professional training.

One of the main objectives of GoldenBridge is to identify students at risk of dropping out. Through real-time data analysis, the system detects patterns associated with academic difficulties, absenteeism, and socio-economic vulnerability. Based on these insights, GoldenBridge can trigger alerts and recommend targeted interventions, such as tutoring programs, financial assistance, or pedagogical support.

GoldenBridge also aims to support personalized learning pathways. By analyzing students' performance and interests, the system can suggest courses, learning resources, and educational

opportunities aligned with individual profiles. This functionality seeks to guide students toward successful course completion and better alignment with labor market demands.

From an institutional perspective, GoldenBridge provides decision-makers with dashboards and analytical tools that support evidence-based policy formulation. Government agencies can use these insights to allocate resources more efficiently, evaluate the impact of educational programs, and design long-term strategies to reduce inequality.

Despite its potential benefits, the proposal recognizes significant challenges. Implementing GoldenBridge requires robust data governance frameworks, clear rules for data sharing, and strong protections for privacy and security. Transparency and accountability mechanisms are essential to ensure that data are used ethically and that students' rights are preserved.

GoldenBridge is presented as a speculative artifact rather than a finalized technical solution. Its purpose is to stimulate reflection on how information systems can be leveraged for social good in education, highlighting both the promises and the risks of large-scale data-driven approaches.

6. Final Considerations

This work presented a speculative design proposal for the future of [omitted] education, considering a long-term horizon and the growing influence of information systems on learning processes. By identifying signals and trends, exploring technological tools, and speculating on possible futures, it was possible to reflect on how educational systems may evolve in response to social and technological changes.

The speculative exercise highlighted the potential of information systems to support more equitable and data-driven educational policies, particularly through real-time monitoring of students' trajectories and the identification of risks related to dropout and academic failure. At the same time, it emphasized the importance of carefully addressing ethical, institutional, and social challenges associated with large-scale data collection and algorithmic decision-making.

The GoldenBridge proposal was introduced as a speculative artifact designed to illustrate how integrated educational information systems could contribute to reducing inequalities and supporting students throughout their educational journeys. Although speculative, the proposal underscores the need for robust governance frameworks, transparency, and accountability to ensure that technological solutions serve the public interest.

As limitations, this work is based on speculative scenarios that may not capture all real-world complexities. The effectiveness of the proposed solution depends on factors such as political will, institutional capacity, and societal acceptance. Future work could involve empirical studies, stakeholder engagement, and interdisciplinary collaboration to further explore the feasibility and implications of similar initiatives.

In conclusion, speculative design proved to be a valuable approach for anticipating challenges and opportunities in the intersection of education and information systems. By envisioning alternative futures, it becomes possible to inform present-day decisions and contribute to the development of educational technologies that promote inclusion, equity, and social good.

References

(Omitted for blind review)