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From Factory to Platform

A New Blueprint for the Schools of the Digital World

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LAYOUT

Carsten Eggersglüß / Georg Mildenberger

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„The future is already here, it is just not very evenly distributed."

William Gibson

Summary

The legacy school system is deeply shaped by its origins in the industrial age. It is therefore incompatible with the rules of the digital world. This creates a chasm between schools and their societal environment that cannot be closed by conventional repair methods. If the diagnosis of the problem is correct, the solution is obvious: we need to apply the blueprint of the 21st-century information economy to the education sector. This reorganisation can be oriented towards digital platforms as the main enterprises of the new economy.

Platform thinking regards schools as open infrastructures made available to external providers to create a much more comprehensive, diverse and customised portfolio of learning opportunities than is possible in the legacy system. This paper first outlines the key characteristics of the old industrial (school) age and contrasts them with the new paradigm of the digital world. It then presents the most important properties of digital platforms. Finally, it suggests how the architecture of platforms can be transferred to the school system.

1 Background

In Germany, there has been a major effort in recent decades to enhance the equity and excellence of the legacy school system. However, many small advances have not added up to the desired comprehensive improvement in performance. Key performance indicators, such as the achievement gap between children of different social backgrounds or the number of children lacking the basic skills of literacy and numeracy, have stagnated for decades.

At the same time, the school system is confronted with major new challenges such as digitalisation and the integration of AI, as well as demands for deeper learning and the teaching of 21st-century skills.

The situation is exacerbated by shrinking public budgets impeding the conventional strategy of providing additional resources to the system in the hope of producing incremental improvements.

Obviously, the legacy school system suffers from a massive lack of innovative capability, which cannot be remedied by conventional means alone. Critics have repeatedly pointed out that this lack is caused by its origin in the industrial world of the 19th century, and particularly the early 20th-century assembly line production system. In this system, teaching and learning is predominantly provided by analogue means, governed and managed by hierarchical educational bureaucracies, with innovation being regarded as an exception to the rule rather than business as usual.[1] As a result, a chasm has opened up between the school system and the modern information society with its digital technologies, agile organisations and rapid pace of innovation. The inexorable growth of this gap ultimately threatens the very existence of the public school system as we know it.[2]

However, if it is true that the architecture of the school system has adapted to the prevailing pattern of industrial production, organisation and innovation in the past, it is to be expected that this will happen again in the future.[3] In this case, an idea of the school of the future can be gained by transferring the blueprint of the 21st-century information economy to the education sector.

This is good news, as the structure of the highly productive and innovative systems of the digital world is well known. We also know the layout of agile organisations underlying new digital business models. Finally, we know how innovation processes can be significantly accelerated. Now we need to transfer this knowledge to schools in an appropriate way.

If we want schools to teach our children knowledge and skills geared towards the requirements of the digital world, if this is to be achieved much more reliably and equitably and if schools are to be much more adaptive to a world in a constant state of change, their design can be modelled on the blueprint of the new industries of the information economy and, in particular, the most innovative companies and their new form of value creation: digital platforms.

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[1] E.g., Mehta, J. (2013). *The allure of order: High hopes, dashed expectations, and the troubled quest to remake American schooling*. Oxford University Press.
[2] Schleicher, A. (2018). *World class*. OECD Publishing.
[3] The argument draws on research on techno-economic paradigms by Carlota Pérez and colleagues. See e.g., Pérez, C. (2010). Technological revolutions and techno-economic paradigms. *Cambridge Journal of Economics* 34.1, pp. 185–202.

2 The mass schooling of the industrial age

The industrial age of the 19th and 20th centuries was based on the paradigm of "large-scale industry".[4,5] Factories equipped with sophisticated machine systems enabled the mass production of goods of uniform quality, based on the interchangeability of parts, the standardisation of products and processes, and a comprehensive division of labour. The dominant production method of the industrial age was the assembly line, as it originated in 1913 at Ford's Highland Park Plant.

The early automobile manufacturers sought to integrate all important sub-functions in one company, from the manufacture of individual components to the assembly of end products to the transport to the dealer. Running these highly complex systems required hierarchically organised bureaucracies with strict boundaries separating them from the outside world. In these large corporations, different types of tasks were handled in specialised departments, with top-down control from a central office. Innovation processes followed the paradigm of a linear "waterfall model". Product development took place in successive sequences that had to be worked through step by step, with the interim results being passed on from one department to the next.

This system prevailed due to its superiority over conventional methods of craftmanship. Productivity increased massively. The quality of the standardised products was often much higher than individually handcrafted items; at the same time, prices fell continuously. In the long term, a massive growth in productivity resulted in higher wages both for white-collar employees and blue-collar workers, with the latter now able to purchase their own products. In industrial societies, mass production made possible an increase in living standards that was historically unprecedented.

However, this system also obviously had several major disadvantages. For example, mass production permitted the manufacture of a limited product portfolio only. Henry Ford is said

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[4] A term coined by Karl Marx, in the original "*Große Industrie"*. See Boes, A., et al. (2016). Von der „großen Industrie" zum „Informationsraum". Informatisierung und der Umbruch in den Unternehmen in historischer Perspektive. In: A. Doering-Manteuffel et al. (Eds), *Vorgeschichte der Gegenwart. Dimensionen des Strukturbruchs nach dem Boom.* Vandenhoeck & Ruprecht, pp. 57–78.

[5] The following account is based on Womack et al. (2007), *The Machine that changed the World*. Simon & Schuster; and Nye (2015), *America's Assembly Line*. MIT Press.

to have declared: “any customer can have a car painted any colour that he wants, so long as it is black.” Also, work on the assembly line with its standardised work routines proved very exhaustive for employees.

With a poorly skilled workforce working at high speed, defective products were inevitable, which had to be laboriously reworked after completion, and reject rates were high. Innovation processes typically required long and complicated planning procedures based on rigid decision-making structures that limited opportunities to react to changing environmental conditions. Redesigning complex factories was difficult, time-consuming and expensive.

The structural similarities between the legacy school system on the one hand, and the industrial production system on the other, are unmistakable – both in terms of advantages and disadvantages. While the adoption of the industrial model of schooling is usually regarded as being inappropriate to education, it actually represented a major societal advance. Prior to the educational revolution of the 19th and 20th century, most children only received a basic education. Students of different ages attended one-room schoolhouses and were taught by a single teacher with little, if any, professional qualification. The adoption of the industrial model in terms of the standardisation of content, processes and staff, as well as the centralised administration by educational bureaucracies, was the prerequisite for a massive expansion of education for all children, while at the same time sharply increasing its quality. The historical merit of this system is to be seen in an enormous increase in education for the whole population.

However, these advantages came at a high price. As in industry, expansion was only possible by means of a high degree of standardisation. To this day, a small number of different types of schools teach a limited range of subjects that was determined a long time ago. Individual needs and interests play hardly any role in this system because it lacks the resources and capabilities necessary to cater for them. Like the industrial trusts of the past, the legacy school system finds the organisation of innovation difficult; larger adjustments require extreme effort. Finally, although the system adopted key structural and organisational features of the industrial world, it was unable to automate teaching itself, which is why the system remained comparatively expensive.

3 Digital platforms and their characteristics

Since the 1980s, a revolution has taken place in the corporate world. The once dominant paradigm of the industrial age has been replaced by the information economy: a new kind of system that creates value based on digital information and communication technologies. The new technologies render possible new business models, which in turn require new forms of organisation and are accompanied by new methods of innovation.[6] Digital platforms are the dominant business and organisational model of this world.

In recent decades, digital platforms have become the building blocks of a wholly new economic sector: the platform economy. Today, platform firms such as Alibaba, Alphabet, Amazon, Apple, Meta and Microsoft are among the largest, most successful and most valuable companies in the world. At the same time, platform-based business models are increasingly diffusing across traditional industries and platform thinking is spreading far beyond the economic realm.[7] But what exactly are platforms and what distinguishes them from conventional corporations and their legacy business models?[8]

Industrial firms function like pipelines, organising the creation of value as a linear process. They convert material inputs (e.g., components from suppliers) step by step into a final product that is more valuable than the raw material from which it is made.

The value creation of digital platforms, on the other hand, is based on the creation of spaces for interaction between external producers and customers, enabling the exchange of goods and services. Key components of platforms are the (technical) infrastructure, created and endowed with a set of rules by its provider, as well as an ecosystem consisting of external developers of products or services on the one side, and their customers on the other.

This shift has far-reaching consequences for the scope and diversity of the portfolio of products, organizational design, the role of customers and the system's ability to innovate.

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[6] Boes, A. et al. (2016).
[7] Tiwana, A. (2014), *Platform Ecosystems*. Morgan Kaufman.
[8] The following account is based on Parker et al. (2017), *Platform Revolution: How Networked Markets Are Transforming the Economy and How to Make Them Work for You*. Norton & Company. pp. 6ff.

For example, a product such as the iPhone merely provides the technical basis for many different apps. In contrast to the old industrial world, most apps are not created by Apple, but by a host of external developers. This results in a much larger, more diverse and more flexible product portfolio than any single company could ever produce. At the same time, the gatekeeper function exerted by the corporate headquarters of conventional firms that decides on a limited product portfolio is largely eliminated and replaced by the decisions of customers. In other words, the range of products in the app store reflects the preferences of end users rather than the decisions of Apple's top management.

The relationship with the customer is changing, too. In the industrial world, it usually ends with the delivery of a product. In the digital world, suppliers and customers often remain in permanent contact, mediated by digital data streams. This way, products can be altered while they are in use. Analysing the data produced by users serves as the basis for the continuous improvement of existing products and the development of new ones.

Platforms also relinquish control over the resources required for production and innovation – e.g., land and buildings, machines, personnel and intellectual property – replacing them with control of access to the platform. Hence, the most important task of platform management is no longer the organisation and perfection of internal production processes, but setting the standards for access to the platform, thus determining the design of the products and services that complement it.

Compared to the corporations of the old industrial world, the organisational form of digital platforms has changed, too. It is characterised by more open boundaries vis-à-vis the outside world. The hierarchical control of bureaucratic, siloed organisations has been replaced by firms composed of independent cross-functional business units in which autonomous teams are constantly working on the creation of innovations through agile methods. In tech companies, innovation no longer disrupts familiar routines of work; it becomes routine itself.

As a result, due to their modular architecture, platforms exhibit a high degree of flexibility, allowing them to constantly adapt to changing customer preferences and fast-paced technological change. In the old industrial world with its complicated machine systems, all the individual components are closely interlinked. This is why large industrial organisations find it so difficult to cope with change processes. Digital platforms, on the other hand, have a

modular structure. Individual functions can be added, changed or switched off without changing the basic structure of the platform.

Moreover, innovation processes are no longer organised by the platform companies alone. Their main task is to create optimal framework conditions that make it easy for the members of their ecosystem to develop and exchange new products and services. Instead of controlling both their own production and the firms in their supply chain, they need to orchestrate the contributions of independent app developers. However, platforms may also choose to integrate their own products and services. A company like Apple deliberately equips the iPhone with proprietary apps, such as the camera software or location services.

However, the development of a well-functioning platform is by no means an easy task. For example, openness of access can lead to a loss of quality. Hence, apps to be included in the app store are subject to a certification process. Nevertheless, some apps in the store function poorly or lack security. The increase in variety can also result in confusion and fragmentation. Platform management must therefore seek to control the quality of independent providers and their products without undermining diversity and flexibility.

4 School as platforms: opportunities, challenges and open questions

Designing schools as platforms would have major potential advantages. It could result in far more diverse learning environments and, as a result, a much closer alignment with students' individual interests and needs. The modularisation of learning programmes would massively increase the flexibility and innovative capacity of the system, facilitating the emergence of specialised providers well equipped to initiate long-term processes of continuous improvement. The mobilisation of external providers has the further potential advantage of tapping into a large new pool of potential teachers, thus counteracting the problem of staff shortages in the education sector.

However, the organisation of schools as platforms also results in far-reaching challenges. Of course, not just any provider can gain access. Opening schools must therefore be accompanied by appropriate accreditation and quality control procedures, as has already been standard procedure for textbooks and learning materials. Many new providers and new types of content also entails the risk of further fragmentation and arbitrariness. Hence, curation and control

procedures are required, but these must not be too restrictive if the new openness is not to be unduly limited.

In organisational terms, the orientation towards digital platform companies amounts to ending the model of teachers as lone wolves, switching instead to work in heterogeneous teams made up of teachers, social workers, educational researchers and designers of innovative learning environments (to name but these). At school level, the aim would be the transfer of isolated single schools into school networks with high degrees of autonomy.

The overarching goal of these changes would be the creation of a school system that no longer regards innovation as an exception to the rule and change as a threat to functioning routines. Instead, the ability and willingness for continuous improvement would become the new normal. In this scenario, change processes are no longer organised as standalone projects, but as "missions".[9] Implementation would not remain the task of education bureaucracies. Instead, it would be organised by specialised innovation agencies, following the paradigm of open innovation that emerges out of the interplay of a multitude of stakeholders both inside and outside a firm's boundaries.

Obviously, the changes outlined above raise very fundamental questions about the future role of existing educational administrations. In addition, the shift from bureaucratic control to the governance of ecosystems and the idea of open and continuous innovation as the new normal require a cultural change that is anything but easy to organise.

This tentative first attempt to outline the concept of school as a platform shows that it is not limited to a new way of organising schools' relationships with external service providers. Rather, it lies at the core of a comprehensive transformation that will ultimately capture and reshape all components of the legacy school system. But how can such a disruptive kind of innovation be set in motion in a field that is rather hostile to innovation and strewn with the wreckage of so many previous change initiatives?

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[9] For an example see Thümler, E. (2022). *Mission: Education for the 21st Century*. How Innovation Policy Could Accelerate the Transformation of the German School System. CSI Working Paper, Heidelberg University.

5 Towards schools as platforms

Despite all its challenges, the platform approach is not only theoretically suitable as a blueprint for the future design of schools. In important respects, schools *are* already platforms. If we look at the school system through the platform lens, we can see an increasing number of large and small initiatives that are already working on bringing the building blocks of digital platforms into schools. However, many existing programmes correspond to the principles of platforms, too. These are by no means digital formats only. Examples of the platform character of schools include among others:

- When the staff of a private music school provides music lessons to school children, enabling them to play instruments in their school's orchestra.
- When a school offers a tutoring programme for literacy or numeracy instruction run by an external provider.
- When schools make use of extracurricular learning locations, such as TUMO centers or maker spaces.
- When school buildings are used for additional purposes such as adult education or sports clubs.

However, many examples of the direct provision of services tend to be found on the periphery of schools, in subjects of secondary importance, or in experimental projects and limited niches. This needs to change. The idea of school as a platform requires both the services of external education providers and the operating procedures of tech companies to be moved from the periphery to the centre of schools. Obviously, this transition cannot take place overnight. It requires a long-term perspective and can only be achieved in small incremental steps. But which steps come first? To trigger the transformation, the following three areas of work are of particular importance:

1. This paper outlines the contours of school as a platform. The next step is conceptual work. The architecture of an educational platform system should be described in detail to gain a better and much more nuanced understanding of how a school could be organised as a platform. This requires answers to the following questions:

What will the future relationship between (public) platform operators and (public as well as private) providers look like? Which services will remain the responsibility of public actors, which tasks fall in the domain of external providers? How should the quality assurance of the new providers and the curation of new services be organised? How will teachers' roles change, what competences will they need in the future and what does this entail in terms of professional training?

2. The development of a strategic plan outlining how the path towards school as a platform could be designed. This requires answers to the following questions:

What are the key levers that might trigger the transformation? In which fields of action is progress most likely to be achieved? Should the platformisation of schools focus on instruction as the heart of schooling, or are activities at the periphery of schools a better point of departure? Should transformation be realised in incremental steps, aiming at the continuous expansion of existing platform similarities? Or would it be better to go all in right from the beginning, aiming to develop a coherent model to be fielded and developed to maturity in a laboratory school?

3. Precautions are needed to ensure that school as a platform does not become a gateway to an unrestrained economisation of education. This requires answers to the following questions:

How can public and private contributions to education be realigned in smart and responsible ways, seeking to maximise opportunities and minimise risks? What mechanisms can ensure that the upcoming transformation not only contributes to an increase in innovative capacity, but also to equal opportunities in the school system?

6 Conclusion and outlook

In important ways, schools are already platforms, and platform thinking is not wishful thinking. Driven by the rise of EdTech companies and many large and small school transformation initiatives, the school system of the digital world is emerging before our eyes. It will lose all resemblance to standardised assembly line production. Instead, it will be modelled on the most advanced information technology industries. If we look at successful platform companies, we can see the outlines of the schools of the future.

This is good news for those working to transform the legacy school system. If we know the contours of the new school system we are moving towards, education policy and practice, academia, business and civil society can align their actions accordingly. In the future, it will be easier to tell whether new initiatives are merely prolonging the status quo or contributing to the transformation that is coming.

However, it is by no means certain that the result of this development will be a better and fairer school for all children, rather than a more attractive school for the wealthiest customers of a privatised system. This is why it is so important to formulate a new education policy based on the scenario developed above. Instead of tinkering with the old system, policymakers should ensure that they are on the side of the future, actively shaping the coming social change. They should set in motion a development that not only aims to massively increase the innovative capacity and performance of schools, but also seeks to achieve greater equality of opportunity and to counteract a deepening division of society.

If the assumption is correct that schools will eventually be caught up in the digital revolution that is taking place globally and in all sectors of society, a disruptive transformation will profoundly reshape education, whether we like it or not. If we refuse to embrace this change, severe consequences may follow. The rules of the game for the school of the future will then be rewritten by commercial providers of education services acting independently of education authorities. If, on the other hand, we seize the opportunity to actively shape the change, this will open up great new opportunities to develop the equitable and excellent school system of the 21st century.

Acknowledgements

I would like to thank Andreas Boes, Eileen Egbert, Tobias Ernst, Joshua L. Glazer, Georg Mildenberger, Donald Peurach and Michael Voges for their most helpful and constructive comments on this paper.

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