

ESSAY: TECHNOLOGY AND WORK

ENSAIO: TECNOLOGIA E TRABALHO

ENSAYO: TECNOLOGÍA Y TRABAJO



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ABSTRACT: This essay is based on work experience both with trade unions—specifically with the DIEESE Subsection at the Metalworkers’ Union of São Bernardo and Diadema—and within the Department of Production Engineering at the Polytechnic School of the University of São Paulo (USP). Starting with an initial contextualization of DIEESE’s activities and the relationship with unions, the text provides an evolutionary analysis of changes in factories and automotive companies, from just in time and modularization to artificial intelligence, linking these transformations to the economic and social environment as well as to the organized struggles of workers.

KEYWORDS: Productive restructuring. Labor and union action. Automotive industry.

RESUMO: Trata-se de ensaio baseado em experiência de trabalho tanto junto a Sindicatos, mais especificamente junto à Subseção DIEESE no Sindicato dos Metalúrgicos de São Bernardo e Diadema, quanto no Departamento de Engenharia de Produção da Escola Politécnica da USP. A partir de contextualização inicial sobre as atividades no DIEESE e a relação com Sindicatos, o texto analisa evolutivamente as mudanças nas fábricas e nas empresas automotivas, do just-in-time e modularização até a inteligência artificial, relacionando-as com o ambiente econômico e social, e com as lutas organizadas de trabalhadores.

PALAVRAS-CHAVE: Reestruturação produtiva. Trabalho e ação sindical. Indústria automobilística.

RESUMEN: Se trata de un ensayo basado en la experiencia de trabajo tanto con sindicatos — más específicamente con la Subsección DIEESE en el Sindicato de los Metalúrgicos de São Bernardo y Diadema— como en el Departamento de Ingeniería de Producción de la Escuela Politécnica de la USP. A partir de una contextualización inicial sobre las actividades en el DIEESE y su relación con los sindicatos, el texto analiza de manera evolutiva los cambios en las fábricas y en las empresas automotrices, desde el just in time y la modularización hasta la inteligencia artificial, relacionándolos con el entorno económico y social, así como con las luchas organizadas de los trabajadores.

PALABRAS CLAVE: Reestructuración productiva. Trabajo y acción sindical. Industria automotriz.

Essay

This essay is based on a rare and specific professional experience. In 1979, I completed an internship and final undergraduate project at DIEESE—the Inter-Union Department of Socioeconomic Studies—which at the time was headquartered at the São Paulo Woodworkers’ Union, on Rua dos Carmelitas, near Praça da Sé, in downtown São Paulo. At the end of 1978, the scene was dominated by the student and union movements of the period, which were organizing large demonstrations and strikes. Put simply, they were fighting against the dictatorship—or “for democratic freedoms”—and against the rising cost of living, for better wages and working and living conditions.

Those movements changed Brazil and changed my life. In the second semester of 1978, Professor Afonso Fleury taught, in the Department of Production Engineering at the Polytechnic School of the University of São Paulo, the course Administration and Organization, or Organizational Theory, in which, based on the discussion of principles from schools of organization, we engaged in a critical discussion of work organization. Fabio Zamberlan and I convinced our course team to prepare a paper on factory committees, a demand that, in our ignorance, we thought would be a new form of work organization. And so there we were, Fabio and I, at the Metalworkers’ Union of São Bernardo and Diadema, warmly welcomed, attending meetings, talking to people—some of whom I still have the pleasure of meeting today.

We completed the paper, and Fleury did not give us the grade we had expected. Furious, we went to talk to him, and he told us that the work lacked an analytical foundation and that, although the topic was very important, a more serious analysis could not be merely opinion-based; it needed a conceptual and methodological basis. That stayed with me, even though the present text is an essay—not the result of formal research, but rather of professional experience.

At the end of 1978, Fabio, Fleury, another colleague and I went to DIEESE for a meeting Fleury had arranged with Walter Barelli, then DIEESE’s technical director—Barelli would deserve a dossier of his own, given his importance in the struggle for equality and freedom. Barelli listened to Fleury (the three students said little), I would say with a certain strangeness, but also with a cautiously positive reaction to the proposal that we carry out our final undergraduate project on a topic linked to the union movement. To this day, in the Department of Production Engineering at Poli, there is a mandatory final project, associated with an internship, which must be developed in response to a perceived demand from a “client” (an

entity, organization, company, etc.). We were there trying to convince DIEESE to hire us to carry out such a project.

In a second meeting with Cesar Concone, then something like a deputy technical director, we were presented with two possible alternatives that were under discussion with the respective unions: a study on working conditions in the chemical industry, and a characterization of banking work. The second option ultimately prevailed, and in early 1979 Fabio Zamberlan and I (Guido, the third student, eventually gave up and followed a more standard career path, so to speak) were registered in the Work and Social Security Card (look it up on the internet: it is a document in which a person's employment records were supposed to be recorded—hiring company, hiring and termination dates, wages, vacation, etc., for each employment relationship) as interns of the Federation of Bank Workers of the State of São Paulo, to carry out a survey characterizing banking work, at the request of the Bank Workers' Union of São Paulo (which covers Osasco and another 15 municipalities in the region).

That is how my trajectory with the union movement began. The final undergraduate project (Zamberlan; Salerno, 1979) became a chapter in a thematic book (Zamberlan; Salerno, 1983) and opened the door to other adventures. After 11 months working in what was then the planning and services area of Banco Itaú, I resigned and went to pursue a master's degree at COPPE-UFRJ. I had a megalomaniacal dissertation idea: to analyze the advance of technical progress over the previous 20 years based on a database on electricity consumption in industry.

The topic did not arouse much enthusiasm among the people at COPPE. With good reason: I did not even really know the origin of the information, how it had been collected, what distortions it contained, and so on. In the midst of this, DIEESE contacted me, saying that it would like to hold a seminar on changes in work in response to a demand from metalworkers' unions. During the discussion, the then president of the Betim Union commented on changes that were being introduced at FIAT—what we would later call work flexibilization, quality control circles, and *just-in-time*—which ultimately gave rise to my master's dissertation and book chapters (Salerno, 1985; 1992; 1993). After several seminars, I was hired under the CLT regime in 1983, the same year I was also hired by USP after a public selection process. From what I inferred, the thinking of DIEESE's technical leadership (Barelli and Cesar) was that, sooner or later, there would be (re)democratization; unions would gain greater power because of mobilizations, the advent of what was then called New Unionism, and its pursuit of workplace organization (which only partially took hold in very few places—São Bernardo was and remains an exception). All of this would lead to the need to understand, analyze, negotiate,

and propose alternatives for how to work—from the pace of an assembly line to alternatives to its abolition.

I became what might be called an organic intellectual, helping unionism understand, analyze, negotiate, and propose changes in production and work. I spent ten years, from 1983 to 1993, working part-time at Poli (mornings) and 30 hours per week at DIEESE (afternoons and evenings). Part of that trajectory was recorded in the DIEESE Bulletin, in the column Production Line, which I wrote monthly, addressing the main changes of the period in a very didactic (I think) and concise way (about one A4 page).

For the purposes of this text, two experiences at DIEESE were fundamental: seminars on work organization and automation, and my assignment to the DIEESE Subsection at the then Metalworkers' Union of São Bernardo and Diadema, where I worked from 1985 to 1991 alongside Osvaldo Cavignato, a former toolmaker and economist, who was the backbone of the subsection for decades. The Union then began systematic work with factory committees to map production processes in order to improve its bargaining power and negotiate work organization and change itself, and I provided the technical support for that work.

At DIEESE, first alone and later with Luis Paulo Bresciani—the second production engineer hired by DIEESE, who eventually succeeded me in the São Bernardo subsection—I worked on themes related to changes in production and work. In 1993, I moved to a full-time position at USP, but I continued to carry out demand-driven activities with DIEESE and with unions, mainly in São Bernardo. Thus, through USP, I organized several editions of the Productive Restructuring Course—Training Program for Union Leaders and Advisors—in the late 1990s, in the wake of the then Brazilian Quality and Productivity Program, as well as many discussion activities on digital transformation, artificial intelligence, and even nanotechnology.

All right, but what has changed from the 1980s to the present? Technology, the social, political, and economic environment, business strategies, and the weakening of unions and collective action in general. That is no small matter...

When changes began in bank branches with the introduction of computer terminals at teller stations, and the resulting rationalization of back-office operations through the spread of more real-time computing², the volume of banking work declined. Yet there was not much upheaval, because the labor market quickly absorbed the former bank workers. Today, the situation might be different.

² Until then, mainframe computers, which became widespread in banks starting in the 1970s, updated balances overnight based on written entries recorded in printed listings showing the previous day's position.

The logic of accumulation explains a great deal. If treated broadly—that is, as the need to accumulate simultaneously in such a way as to ensure that accumulation will continue—it explains almost everything in a moment of weak collective action. The major logic behind bank automation was to obtain a real-time financial position so that the financial institution could invest money quickly—which generates profitability in times of high real interest rates. Industrial restructuring had two pillars. The first, from the standpoint of accumulation, was the reorganization of activities, with outsourcing and the reduction of inventories of materials and work in process, which improved financial indicators such as return on capital, since less capital is required (important for improving stock-market position and competing for resources and investments) and capital turnover improves—less capital tied up in inventories or production. From the standpoint of control (seeking to ensure the continuity of accumulation), there was the emptying out of factories and their relocation to places with lower wages and fewer union demands, kinds of *greenfields*, alongside changes in legislation, such as those that favored cooperatives, including labor cooperatives.

So-called outsourcing has a real impact on companies' activities and on work. Large corporations, with few exceptions, became leaner, because they carry out fewer activities in each of their factories, purchasing parts and subsystems or modules and services from third parties. Much of the workforce also comes from third parties, reducing payrolls and making labor allocation more flexible—an enduring corporate dream. The association with any type of mechanization or automation potentially amplifies these results.

Potentially? Yes, nothing is guaranteed. Companies become more vulnerable when they outsource, even while controlling product designs and the supply chain. Inventories have a financial cost—the opportunity cost of capital, since it is allocated to inventory rather than invested elsewhere where it might yield returns, such as in a financial product—and a physical cost, such as space and insurance. But they can also be considered a buffer, a reserve for unforeseen events. For example, if a machine breaks down, or if a supplier delays delivery, regardless of the reason, a company operating *just-in-time* may have its production halted. This was the logic that guided process mapping by activists at the São Bernardo Union and led to actions that became known as popcorn strikes and wildcat actions (ABC Metalworkers' Union, 1984; 2022; Grün *et al.*, 1987—the only academic text I know on the subject). An internet search shows very little academic production on these operations, and almost always using the term to discuss some union actions mainly by teachers/professors, which does not fit the logic of a popcorn strike very well, since there is no physical production chain and no sequence that

creates a bottleneck. A direct search yielded only the ABC Metalworkers' Union website, and a question to ChatGPT (there is AI for you, folks!) returned the works of Anner (2011), Cruz (2008), Guinossi (2019), and Romão (2010), which deal only marginally with the subject—and this after three search refinements, including theses and dissertations. That is very little for such an important topic.

Contrary to what Castro (1986, *apud* Guinossi, 2019) regards as a “rotating strike,” which would be the successive stoppage of several workers one at a time, the popcorn strike as practiced in automakers and other companies in the ABC region of São Paulo is broader, involving the stoppage, even if only for a few hours, of company sectors, with an impact that is greater the more that sector represents the bottleneck of the company or production chain. With low inventories, overall production is halted, even if only a few workers are on strike. In a sense, the famous strike at Scania in 1978 was a strike in the toolmaking shop, which ultimately halted all production because of the lack of technical support for its continuation. It is an operation that requires excellent knowledge of the production process and a great deal of organization in the workplace—perhaps that is why it is so rarely used effectively.

What was the organization of the automotive industry like, and what is it like now?

The automotive industry in Brazil, being basically composed of subsidiaries of companies headquartered in other countries—that is, with decision-making centers abroad—introduces changes according to the evolution of their parent companies, adapted to local conditions. Perhaps the only exception to a change produced here was VW's modular consortium in Resende and its adapted successors, the industrial condominiums.

Let us place this in time.

The automotive industry took shape in Brazil through the explicit policy of the Juscelino government, which attracted multinationals to produce here, in a movement that stifled the local companies of the time through tax differentials, incentives, and other mechanisms (Salerno, 2012). This means that, from the outset, the main decision-making centers have been abroad.

The pattern of the first multinational factories was to use old equipment, already depreciated in their countries of origin, as a way of sending resources abroad even before production began. A little bird told me—that is, I have no way to prove it—that some companies did not even retrieve part of the machinery they had imported from their headquarters, leaving

it at the port because of its condition. Collor may have had some reason to call the cars of his presidential period (1990–1992) “carts.”

This industrial lag did not prevent the automotive industry from growing in times of locally protected production of products designed abroad. Companies in the 1970s and 1980s were vertically integrated, some producing their own seats, with teams of seamstresses making the upholstery. VW had close to 40,000 workers in São Bernardo in 1980; today it has around 8,000 (Fraga, 2022; VW Brasil 70 anos).

Part of this high vertical integration can be justified by the limitations of the supporting productive fabric, such as suppliers of parts and services. Another part can be justified by the transfer of resources from here to headquarters through the incorporation of processes and equipment that had already been fully depreciated, in accounting terms, at the source. Yet another part can be explained by the idea of not sharing gains, incorporating margins across much of the production chain.

But then came the oil crisis—the one at the end of the 1970s—the end of the so-called economic miracle of the dictatorship, when growth ended and inequality remained; the changing national and international landscape; the end of the gold standard as the backing for the dollar, which generated great uncertainty; and rising interest rates, which limited investments and increased the required return on invested capital. All of this coincided with the strikes in the ABC region, home to the automakers and many auto-parts companies, along with demonstrations against the dictatorship. It was a more uncertain scenario for businesses accustomed to a captive market, labor controlled economically through wages and socially through repression, incentives, and low interest rates.

The way of producing and organizing production was questioned. In some European countries—Germany, France, Italy—and to a lesser extent in the United States, a workers’ movement emerged questioning the form and pace of work. Alain Tanner’s film *Jonah Who Will Be 25 in the Year 2000* (*Jonas qui aura 25 ans en l’an 2000*) shows a scene of a worker arriving by bicycle at a factory and passing by a wall near the entrance gate, where the graffiti reads “freedom ends here.” Negotiations over the pace of production lines emerged in the United States and in the dominant countries of Europe; semi-autonomous groups appeared in Volvo factories in Sweden and Mercedes factories in Germany; Italy passed laws on training and factory councils; workplace representation expanded; and sociotechnics—work with greater autonomy—spread across the Nordic countries, including Denmark, Norway, and Sweden.

Repression and, so to speak, the lesser development of the productive forces inhibited such manifestations against traditional—Taylorist/Fordist—forms of work in Brazil, which only occurred locally at the end of the 1980s. The so-called New Unionism included among its demands workplace organization and the creation of factory committees (Rodrigues, 1997). Companies' pressure to intensify work in order to meet increased production within the same facilities placed even greater pressure on labor (Humphrey, 1980).

The relationship between CUT metalworkers and their German counterparts (IG Metall) and Italian counterparts (FIOM/CGIL and, to a lesser extent, FIM/CISL) showed that in Germany and Italy there was enormous union investment in analyzing and negotiating changes and the status of work—the titles of the works are revealing (Ciborra; Lanzara, 1985; Garibaldo, 1988; Marchisio, 1988, 1990; Studio Giano, 1992). Between 1987 and 1988, Editora Vozes published a set of textbooks on work and innovation from FIOM-CGIL training courses. Factories were changing, and unions with a presence in the workplace perceived the change and sought to intervene in it. I do not speak German and am not familiar with the German union-based literature, but I know it exists from events and short courses I attended in that country with CUT metalworkers.

This mixture—crisis of capital plus crisis of labor—created a situation of dispute and change. And change came, altering the way companies and production were organized. What were the main lines of change in automakers and large auto-parts companies from the mid-1980s onward? In response to the economic-financial crisis and the crisis of labor, companies began to deverticalize their activities, outsourcing them; introducing process-improvement systems, such as what were then called quality-control circles; reorganizing activities to speed up production flow; and reducing inventories. And, of course, automation—but automation does not seem to have been the driving force; it was quite localized. The difference between automaker factories in Brazil and in Europe was visible, and I had the opportunity to visit automotive factories in Germany, France, England, and Italy. Some labeled the changes “Toyotism,” in contrast to “Fordism.” They saw “Toyotism” even in elementary education, which does not make much sense—I do not like that claim, but that is for another occasion.

Automakers innovated in Brazil, which was rare. VW had an agreement with Ford that gave rise to Autolatina. Under the agreement, one company could produce cars derived from the other's platforms. Ford had a truck and bus chassis unit in the Ipiranga neighborhood of the city of São Paulo; VW did not. Since VW had local product engineering, it soon designed a truck/bus chassis assembled from supplier parts, and began producing it at the Ford Ipiranga

plant (Salerno, 1994). With the end of Autolatina, VW, which had a large order for its urban-bus chassis, needed a factory. But it had no constraints on investment. And so, in November 1995, the Modular Consortium was born in Resende, Rio de Janeiro, characterized by production being carried out entirely by suppliers inside the VW factory. Each supplier produced its module wherever it wished, and painting and final assembly were carried out in Resende. This reduced the automaker's investment needs and shared risks with selected suppliers. A quite radical experiment had been inaugurated, one that had previously been attempted unsuccessfully in Europe (Marx; Zilbovicius; Salerno, 1997).

The experience spread, adapted to passenger vehicles in the so-called industrial condominium, in which key suppliers produced modules—not isolated pieces or parts—based on the Resende experience and delivered them directly to the assembly line, operated by the automaker, only moments before use. The name “condominium” arose because key suppliers set up operations inside the automaker's fence, completing production there or simply sequencing modules for delivery to the line (Salerno, 2001; Zilbovicius *et al.*, 2002). The specialized press abroad reported that Chrysler invested in Campo Largo, Paraná, only 32% of the total amount that would have been necessary for an integrated factory to produce the Dakota pickup (Automotive Industries, 1988), while Dana supplied a rolling chassis with more than 300 components assembled on it—the frame itself, axles, differential, suspensions, steering system, brakes, fuel tank, wiring/electrical installations, and wheels/tires—representing around 30% of the vehicle's cost (Salerno; Dias, 2005).

I dare say that production modularization, industrial condominiums, and the consortium had a much greater impact on the transformation of automakers in Brazil than automation itself. This was no longer merely outsourcing the sewing of seat covers, but outsourcing complete and complex modules that had previously been the responsibility of automakers, such as the instrument panel and amenities—sound system, glove compartment, air conditioning, and so on—and other less visible components. Alongside modularization, there was a significant reduction in the number of auto-parts companies through mergers and acquisitions, usually by multinational companies. To mention one of the best-known cases, Metal Leve was acquired by the German group Mahle.

Automakers around the world did their homework. Toyota became the model to be pursued, and *just-in-time* became the standard, with or without industrial condominiums (Salerno, 1985). Production changed. Automation itself exacerbates the issue, but the

foundation is the reorganization of production: *just-in-time*, industrial condominiums, and the like.

This drive to reduce inventories of materials, work in process, and finished goods placed pressure on the system. Any error, any deviation, could paralyze production. That is where approaches to quality control at the source—the idea that one workplace should not “export variability”—become logical (Salerno, 1999; 2009). Once again, this diagnosis of vulnerability is what led to popcorn-type actions—easy to say, difficult to do. Difficult because it requires workplace organization, whether formal or clandestine. And therein lies an immense weakness of Brazilian unionism, which for many years has abandoned, with the usual honorable exceptions, that demand and that struggle.

Automation only has effects if it enters into a rationalized base; otherwise, it simply produces inappropriate things more quickly. And in automakers, *just-in-time* is today’s gold standard of efficiency and rationalization, associated with modular deliveries.

In addition to changes in the production system itself, there are changes in the automobile itself that affect production, the number of hours required to produce the vehicle and, therefore, indirectly—the relationship is not linear—the need for labor. For example, an automobile from the 1970s and 1980s could have as many as 5,000 weld points. In the 2000s, there were 2,500 or fewer. Larger stamped parts mean fewer weld points. There is no longer a chassis, but rather an integrated body. Bumpers, which used to be metallic, became plastic. Plastic content replaced metal content, because production time is much faster, and therefore plastic is far more present in today’s automobile than in one from the 1970s or 1980s. The content of electronics and sensors is much greater, automating internal functions, diagnostics and, so to speak, passenger services, such as air-conditioning control, windshield-wiper activation, and others—there was no embedded electronics in the 1970s. Without electronics, there would be no flex-fuel system, which allows any combination of gasoline and ethanol.

If we compare a car with an internal-combustion engine to one with an electric motor, we see that the electric vehicle has far fewer parts, and the labor required for production is lower.

In other words, there are sources of change and rationalization in product design, in the organization of the company, production, and work, and in the technology of the production process itself, understood broadly, from design to procurement, manufacturing, sales, and after-sales.

Digital transformation and artificial intelligence

In the 2000s, there was an explosion of what came to be called “digital transformation,” which is nothing more than the introduction of some new digital technologies, but in an interconnected, interlinked way. For example, there is an artificial-vision system for selecting seedlings to be planted. The system “sees” each seedling as it passes along a conveyor belt, compares it with a database (images) of what would constitute a good seedling, and either accepts or rejects each candidate seedling. The subsequent savings are significant. The system selects based on statistics that define the characteristics of seedlings that grow faster and have a greater chance of developing well after planting, among other things. This reduces the risk of planting seedlings that are, let us say, less efficient. Just as with seedlings, a similar system can select pieces and parts, or analyze products in an automaker, in a biscuit factory, and so on. In practice, there are many artificial-vision systems for quality control of parts, whether purchased or produced.

The possibilities are enormous. Anything grounded in data and historical records is subject to being modeled by some artificial-intelligence algorithm. There are maintenance-support systems using smart glasses that show the maintenance worker where the problem is, how the machine should be disassembled, and so forth. Finio and Donie (2026), from IBM, also consider, still in maintenance, that AI can indicate where and when to perform predictive maintenance, based on indicators emitted by equipment sensors, enabling action before problems occur. There are systems for “optimal” adjustments of production parameters, quality control, and scenario simulation regarding changes in production. Natural-language models and generative AI can “learn” from previous data and code for product research and customer service (that hell to which we are condemned as service users). There are collaborative robots that work alongside people. And much more.

Within that “much more,” there is a threat to work that is today considered more highly skilled, such as *software* programming, including the programming of CNC (Computer Numerical Control) machine tools, robots, programmable logic controllers, and similar equipment. It can also have an impact by helping to eliminate hierarchical levels, since information can flow more easily to higher levels.

But these are possibilities. The adoption of new technologies does not occur linearly. Factories change in leaps, in a kind of quantum effect. They change mainly when a new unit is created, or when investment is made for a new vehicle platform. Then the leap is visible; it is

less visible in already established factories that have been producing a product line for some time, because there is a rigidity of existing routines that inhibits change (Gilbert, 2005; König; Graf-Vlachy; Schöberl, 2021). And change costs money; it is not always worthwhile in the short term.

If we add changes in the factory to changes in the location of factories, we amplify the effects on work. Obviously, these are social relations; there is no determinism. But it is also impossible to deny that the introduction of a new technology, or even the possibility of its introduction, conditions the possibilities for organizing work and for how work is done. For example, a machine may have a chair attached to a control terminal, which suggests that there will be a person operating it there, inhibiting possible group work. (Semi-)autonomous group work was once a demand of the Mercedes Workers' Factory Committee in São Bernardo, for example. The same occurs with *software*. In the 1990s, Unilever designed in Brazil a factory that operated 24 hours a day, with work organized in groups, without supervisors, without maintenance personnel, and without quality-inspection personnel. Technically trained operators handled the work. But when the company ordered a supervisory control system for its laundry-detergent production tower (powdered soap), the engineering firm that was most technically appealing offered a system with passwords for supervisors, laboratory heads, inspection-sector heads... Unilever had to negotiate with the supplier so that it would adjust the system to the form of organization it intended to introduce (Salerno, 1999). But normally, companies buy a piece of equipment and receive, along with it, a form of division of labor.

In short, judging by the way things are going—or rather, by the way the electric car is going—unions are being fragmented while companies are global; and if the struggle continues, it seems to be getting harder.

REFERENCES

- ANNER, Mark S. **Solidarity Transformed: Labor Responses to Globalization and Crisis in Latin America**. Ithaca: ILR - Cornell University Press, 2011. Available at: <https://dokumen.pub/qdownload/solidarity-transformed-labor-responses-to-globalization-and-crisis-in-latin-america-9780801460579.html>. Accessed in: 30 Mar. 2026.
- AUTOMOTIVE INDUSTRIES. Modular Mania. **Automotive Industries**, [S. l.], nov. 1988.
- CASTRO, Pedro. **Greve: fatos e significados**. São Paulo: Ática, 1986.
- CIBORRA, Claudio; LANZARA, Giovan F. (org.). **Progettazione delle nuove tecnologie e qualità del lavoro**. Milano: Franco Angeli, 1985.
- CRUZ, Hélvia L. **Condições de construção histórica do sindicalismo docente de educação básica**. Orientador: Sadi dal Rosso. 2008. Tese (Doutorado em Sociologia) – Departamento de Sociologia, Universidade de Brasília, Brasília, 2008.
- FINIO, Matthew; DOWNIE, Amanda. Como a IA está sendo utilizada na manufatura? **IBM Think**, 2026. Available at: <https://www.ibm.com/br-pt/think/topics/ai-in-manufacturing>. Accessed in: 31 Mar. 2026.
- FRAGA, Antônio. **Volkswagen comemora 69 anos e mais de 24 milhões de veículos**. ACidade ON, 2022. Available at: https://www.acidadeon.com/tudoep/tudo-auto/volkswagen-comemora-69-anos-e-mais-de-24-milhoes-de-veiculos/?utm_source=chatgpt.com. Accessed in: 1 Apr. 2026.
- GARIBALDO, Francesco. **Lavoro, innovazione, sindacato**. Genova: Costa & Nolan, 1988.
- GUINOSSI, Viviane B. F. **Conflito, resistência e solidariedade na história da educação pública paulista: um estudo sobre a ocupação da Alesp pelos professores durante a greve de 1993**. Orientador: Carlos Bauer de Souza. 2019. Dissertação (Mestrado em Educação) – Programa de Pós-Graduação em Educação, Universidade Nove de Julho (Uninove), São Paulo, 2019.
- GRÜN, Roberto; ZILBOVICIUS, Mauro; FERRO, José R. Novas estratégias patronais e novas respostas operárias: a operação vaca brava. **Cadernos DEP**, São Carlos, v. 1, p. 2-56, 1987.
- HUMPHREY, John. Operários da indústria automobilística no Brasil: novas tendências no movimento trabalhista. **Estudos Cebrap**, São Paulo, n. 23, p. 81-163, 1980.
- MARCHISIO, Oscar; FIOM CGIL TERRITORIALE DI BOLOGNA (org.). **Frammenti di innovazione: come analizzarli, come negoziarli**. Milano: Franco Angeli, 1988.
- MARCHISIO, Oscar; FIOM CGIL TERRITORIALE DI BOLOGNA (org.). **Frammenti di Sindacato: dai casi ai contratti**. Milano: Franco Angeli, 1990.

MARX, Roberto; ZILBOVICIUS, Mauro; SALERNO, Mario S. The modular consortium in a new VW truck plant in Brazil: new forms of assembler and supplier relationship. **Integrated Manufacturing Systems**, [S. l.], v. 8, n. 5, p. 292–298, 1997. DOI: 10.1108/09576069710179742.

RODRIGUES, Iram J. **Sindicalismo e Política**: a trajetória da CUT. São Paulo: Scritta, 1997.

ROMÃO, Frederico L. Da “greve geral de massas” à “greve vaca brava”. **Revista Espaço de Diálogo e Desconexão**, Araraquara, v. 3, n. 1, p. 1-10, 2010. DOI: 10.32760/1984-1736/REDD/2010.v3i1.4395.

GILBERT, Clark G. Unbundling the structure of inertia: Resource versus routine rigidity. **Academy of Management Journal**, [S. l.], v. 48, n. 5, p. 741–763, 2005. DOI: 10.5465/amj.2005.18803920.

KÖNIG, Andreas; GRAF-VLACHY, Lorenz; SCHÖBERL, Markus. Opportunity/threat perception and inertia in response to discontinuous change: replicating and extending Gilbert (2005). **Journal of Management**, [S. l.], v. 47, n. 3, p. 771–816, 2021. DOI: 10.1177/0149206320908630,

SALERNO, Mario S. Produção, trabalho e participação: CCQ e kanban numa nova imigração japonesa. In: FLEURY, Maria T.; FISCHER, Rosa M. (org.). **Processo e relações de trabalho no Brasil**. São Paulo: Atlas, 1985. p. 179-202.

SALERNO, Mario S. Modèle japonais, travail brésilien. In: HIRATA, Helena (org.). **Autour du modèle japonais**: automatisation, nouvelles formes d’organisation et de relations de trabalho. Paris: L’Harmattan, 1992. p. 305-328.

SALERNO, Mario S. Modelo japonês, trabalho brasileiro. In: HIRATA, Helena (org.). **Sobre o “modelo” japonês**: automação, novas formas de organização e de relações de trabalho. São Paulo: EDUSP, 1993. p. 137-152.

SALERNO, Mario S. **Projeto de Organizações Integradas e Flexíveis**: processos, grupos e gestão democrática via espaços de comunicação-negociação. São Paulo: Atlas, 1999.

SALERNO, Mario S. The characteristics and the role of modularity in the automotive business. **International Journal of Automotive Technology and Management**, [S. l.], v. 1, n. 1, p. 92-107, 2002. DOI: 10.1504/IJATM.2001.000029.

SALERNO, Mario S. Reconfigurable organisation to cope with unpredictable goals. **International Journal of Production Economics**, [S. l.], v. 22, n. 1, p. 419–428, 2009. DOI: 10.1016/j.ijpe.2009.06.015.

SALERNO, Mario S. Inovação tecnológica e trajetória recente da política industrial. **Revista USP**, São Paulo, n. 93, p. 45–58, 2012. DOI: 10.11606/issn.2316-9036.v0i93p45-58.

SALERNO, Mario S.; DIAS, Ana Valéria C. The development of modularity and niche product design in Brazil. In: LUNG, Yannick (ed.). **Company strategies and organisational**

evolution in the automotive sector: a worldwide perspective. Frankfurt: Peter Lang, 2005. p. 443-459.

VW BRASIL 70 ANOS: você dirige nossa história. Volkswagen do Brasil, 2023. Available at: <https://www.vw.com.br/pt/volkswagen/volkswagen-do-brasil.html>. Accessed in: 1 Apr. 2026.

ZAMBERLAN, Fabio L.; SALERNO, Mario S. Racionalização e automatização: a organização do trabalho nos bancos. In: FLEURY, Afonso; VARGAS, Nilton (org.). **Organização do trabalho:** uma abordagem multidisciplinar. São Paulo: Atlas, 1983. p. 172–194.

ZAMBERLAN, Fabio L.; SALERNO, Mario S. **O Trabalho nos bancos**. 1979. Trabalho de Formatura (Graduação em Engenharia de Produção) – Escola Politécnica, Universidade de São Paulo, São Paulo, 1979. Available at: https://www.researchgate.net/publication/325989462_O_TRABALHO_NOS_BANCOS_-_Trabalho_de_Formatura_apresentado_a_Poli_USP. Accessed in: 31 Mar. 2026.

ZILBOVICIUS, Mauro; MARX, Roberto; SALERNO, Mario S. A comprehensive study of the transformation of the Brazilian automotive industries. **International Journal of Automotive Technology and Management**, [S. l.], v. 2, n. 1, p. 10-23, 2002. DOI: 10.1504/IJATM.2002.000054.

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