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Reviving a ghost in the history of technology: The social construction of the recumbent bicycle

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Abstract

Recumbent bicycles have never truly been associated with international cycling. Conventional safety (upright) bicycles have long been at the center of the cycling world, for both sport and transportation. This is despite the fact that recumbent bicycles are faster, more comfortable, and more efficient than the upright bicycles. The aim of this article is to explain the historical and social perspectives that led to the rejection of the recumbent bicycle by utilizing the theory of Social Construction of Technology (SCOT) and Bijker's two power theory, providing a contrast with the adoption of the safety bicycle.

Keywords

cycling, history, recumbent, Social Construction of Technology

Introduction

The recumbent bicycle offers an intriguing case in the history of technology. From a Whiggish perspective, the fact that the recumbent has never been recognized as a

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legitimate cycling technology is simply baffling. The recumbent holds world records in almost every category in cycling, including, by a huge margin, the record for world's fastest bicycle. Moreover, studies have consistently shown that the recumbent is a superior cycling technology in terms of aerodynamics, biomechanics, and kinematics. But from the perspective of Science and Technology Studies (STS), the fact that the recumbent has not been recognized is equally, if differently, perplexing. The case of the safety bicycle (Bijker, 1995; Pinch and Bijker, 1984) is a classic example for understanding the sociological underpinnings of technological evolution and has led to other cycling case studies in STS (e.g., Rosen, 1993). However, as this research note will illustrate, when we follow the logic of the case of the safety bicycle, the case of the recumbent produces a puzzle. While the case of the safety and the case of the recumbent emerged under ostensibly parallel circumstances, they unfolded in seemingly opposite ways. In both cases, a new cycling technology was introduced and recognized as superior to the dominant cycling technology, in large part in terms of speed. However, while the safety was adopted by mainstream cycling culture, the recumbent was banned from racing events and relegated to the margins of cycling.

We suggest that Trevor Pinch and Wiebe Bijker's (1984) theory of the Social Construction of Technology (SCOT) is useful to understanding the case of the safety bicycle. However, to address the puzzle of the difference between the case of the safety and the case of the recumbent, we require additional tools to capture the workings of a key actor, the Union Cycliste Internationale (UCI). To this end, we make use of two concepts found in Bijker's (1995) work that he never applied to his own analyses of cycling: semiotic power and the micro-politics of power. In this way, we raise the issue of whether robust understanding of the interpretative flexibility of cycling technology requires analysis not only of negotiations between relevant social groups, but also of the workings of power facilitated by *super actors*.

SCOT

According to the traditional formulation of SCOT, a technology becomes the artifact that it is through processes involving relevant social groups, interpretative flexibility, stabilization, and closure. When different relevant social groups interpret a technology in different ways, according to their own particular interests, the technology acquires different meanings, and eventually different shapes. As such, differences of meaning compete for social acceptance, they introduce impermanent phases of interpretative flexibility in the life of the technology. Such phases wind down when an artifact associated with a particular meaning either resolves or dissolves problems associated with the artifact, and that meaning becomes dominant. Diminishment of interpretive flexibility is facilitated by processes of stabilization of the dominant artifact and closure of its meaning.

In the following sub-sections, we use SCOT to analyze the case of the recumbent, beginning with discussions of relevant social groups and interpretative flexibility. We amplify our discussion of interpretative flexibility with Bijker's (1995) concepts of semiotic power and micro-politics of power, suggesting that the case was characterized by a failure of interpretative flexibility, a failure that was facilitated by a super actor in the

case. In this way, we set up a neat summary of the rhetorical closure of the case, which shows that the recumbent does not require a discussion of stabilization.

Relevant social groups

We turn now to the 1930s and 'follow the actors' to identify the social groups relevant to cycling technology. At the time, the success of the safety bicycle had produced a massive market for bicycle business. Moreover, after some breakdown in the idea of cycling as a mode of transportation, depression era economics had produced an upswing in bicycle usage. Thus, a large group of actors – including innovators, investors, industrialists, and laborers – made up the relevant social group of bicycle producers and users.

The mass appeal of bicycles at the time was related to the fact that cycling was meant for everyone – men, women, elders, and children alike. Within the large relevant social group of bicycle users, there were at least three dominant sub-groups, which, as bicycle markets, produced a hierarchy of interests in the cycling world. The introduction of the safety had offered an accessible mode of transportation to the two less-powerful groups: the working class and women. As a result of the safety, the working class experienced more mobility and access to labor (Shrivastsa, 2004). Women, too, owed increased mobility and economic participation to the safety, and they represented a significant market in part because their emancipation had been strongly connected to the bicycle. Given the interests of these two sub-groups, factors like safety and ease of use were integral to the meaning of the bicycle at the time.

However, the most elevated of the three sub-groups was racers, a group which had a very different primary use for the bicycle, namely, sport. For racers, speed was all-important, and this interest significantly shaped the meaning of the bicycle because racers formed a highly lucrative bicycle market. Bicycle racing was the most successful sport of the first half of the 20th century. As Nye (1989) writes,

> In 1920, eleven football teams that would eventually form the National Football League went on sale for $100 each. One could have bought the entire NFL for $1,100. The better bicycle racers made almost that much – $700 to $1000 – in a good week.

Thus, in the early 1930s in the world of cycling technology overall, bicycle users had strong interests in safety and ease of use, and even stronger interests in speed.

Before 1933, alternatives to the safety were presented from time to time, but they mostly failed to turn the heads of bicycle users. Part of this failure surely stems from the fact that media derision of alternatives began right after the initial boom of the safety in the late 1890s. For example, in 1902 *The Cyclist* published an extremely sarcastic review that criticized the introduction of the first legitimate semi-recumbent by an American named Brown:

> The curiously unsuitable monstrosity in the way of a novel bicycle [is] shown in the single existing example of Mr. Brown's idea of the cycle of the future here illustrated … The surprising fact is that any man in his sober senses could believe that there was a market for this long and heavy monstrosity at the price of a hundred dollars. (Dolnar, 8 January 1902, *The Cyclist*)

However, the pattern of complete rejection of alternatives to the safety changed in 1933, when a mediocre racer, Francis Faure, broke Oscar Egg's 20-year hold on the infamous 1-hour record, while riding the Velocar, a recumbent. Before the race, other riders mocked Faure, saying things like 'Come on Faure, you must be tired and will go to sleep laying down like this, why not sit up and pedal like a man' (Schmitz, 2000). At the finish line, the crowd's reaction was similar to that of the crowd that witnessed the initial display of superiority of the safety bicycle: dominated by shock and anger. However, a small group of people were amazed by the speed of the Velocar, and praised its design. Thus, a new relevant sub-group of bicycle users, recumbent fans, was born, and the case of the recumbent began.

Interpretative flexibility

The puzzling difference between the case of the safety and the case of the recumbent is a difference of how interpretative flexibility functioned in each case. In the case of the safety, interpretative flexibility became an issue in the late 1800s when John Starley introduced his safety bicycle, the Rover. As we discussed in the last sub-section, the safety was safer and easier to use than the high-wheeler, and so it provided a solution to the problem of limited accessibility of cycling technology to social groups like women and the working class. Manufacturers of the high-wheeler tried desperately to preserve the dominant meaning of the bicycle, mainly by promoting the high-wheeler as the 'original' bicycle. However, their efforts failed because the safety clearly demonstrated its superiority in terms of speed on the race-track. Speed was considered a huge advantage, especially to racers.

Let us turn now to the case of the recumbent. Interpretative flexibility of the bicycle was introduced when Faure broke the 1-hour record while riding Charles Mochet's Velocar. Bicycle users read Velocar in two distinct ways: the new recumbent fans saw a more refined, speed-enhancing version of the safety, a *faster bicycle*; the majority of bicycle producers and users saw an *imposter*. Velocar's superiority in terms of speed was undeniable. Thus, if the interpretative flexibility in the case of the safety and the case of the recumbent was strictly analogous, the meaning of the recumbent as faster bicycle would have eclipsed the meaning of it as imposter, and the recumbent would have phased out the safety as the dominant cycling technology. But that is not what happened. Instead, the recumbent quickly became an imposter.

Why did the factor of speed matter so much to interpretative flexibility in the case of the safety, but not in the case of the recumbent? We suggest that the significance of speed was transformed in the latter case, and that this transformation was significantly mediated by one actor, the UCI. To make sense of this point, we employ Bijker's (1995) complementary concepts of semiotic power and micro-politics of power. It is useful to identify the UCI as a hub of semiotic power because from its inception the organization was conferred with authority to shape and fix meanings in the cycling world. The UCI was set up in 1900 in order to impose rules and regulations that could end an international dispute over whether Great Britain should be allowed to enter one or multiple teams in the world championships. Over time, the UCI's governance of cycling began to reflect a concentration of semiotic power within the technological framing of the bicycle. For example, in 1914, the organization banned the use of all fairings that gave cyclists an

aerodynamic advantage, and in this way indicated that it could and would standardize the meaning of acceptable cycling technology.

By the 1930s, after a 40-year period of stabilization of the safety bicycle, semiotic power in the cycling world still revolved around the imposition of rules and regulations by the UCI. It is likely that the organization had complex interests in the safety bicycle. Undoubtedly, the UCI was under pressure from the majority of bicycle producers, who, in light of the recent upswing in bicycle usage, had sensitive manufacturing and labor interests in the safety. It is also likely that the UCI viewed potential identity or shape changes to the meaning of cycling dangerous to the cycling world as a whole. We suspect that the UCI prioritized supporting the cycling world as a whole, as opposed to supporting promising new innovations in cycling technology, and that its approach was to exploit the function of its regulative authority as a channel of semiotic power.

The micro-politics of power in the case of the recumbent are unique. The recumbent could not be faulted according to UCI rules and regulations, either on the rules of racing or on the requirements of the standardized bicycle. Indeed, Mochet had designed the Velocar around UCI standards. However, on 3 February 1935, at the 58th Congress of the UCI, the recumbent's status as a bicycle was successfully challenged. Many members who vehemently rejected the status of the recumbent offered very little explanation for their position. The main exception was the head of the UCI, French Secretary General Paul Rousseau, who proclaimed that there was not so much a problem with the recumbent itself, as there was with the UCI's specifications around the standard dimensions of the bicycle. The UCI went on to publish a new definition of 'bicycle', in terms of standard dimensions, that effectively ruled out the recumbent's status as a bicycle and protected the safety bicycle. The move also annulled all of the Velocar's records, and prohibited the recumbent from competing in any later world championships. Thus, we have an example in the history of technology in which an actor changes its rules of engagement in order to survive.

In theory, the UCI could have taken a neutral stance on new cycling technologies that met the prescribed standards, allowing technology to 'evolve' with the introduction of advancements in relevant factors, like speed. As our analysis suggests, the case of the recumbent was politically complicated by an array of historically specific factors and social interests. We have also suggested that the significance of speed as the key term of the interpretative flexibility of the bicycle shifted over the course of the two cases, in ways that require further analysis of power. For the safety, speed was an advantage, but the case of the recumbent began precisely because speed became a term of threat. The UCI did not participate in intergroup negotiations over the meaning of speed, but rather made speed irrelevant as a term of interpretive flexibility of the bicycle. The extreme nature of the workings of power in the actions of the UCI suggests that the organization was at the very top of the hierarchy of all the actors in the case of the recumbent. On this basis, we construe the UCI as a *super actor*.

Rhetorical closure

The rejection of the recumbent as a bicycle provides a paradigmatic example of a successful rhetorical closure in the social construction of a technological artifact. Rhetorical

closure occurs when the relevant social groups cease to perceive a need for an alternatively designed version of a dominant technology. In the case of the recumbent, the UCI's super actor status allowed it to achieve rhetorical closure in one swift semiotic move: By defining the bicycle in terms that undermined the significance of speed as a term of interpretative flexibility, the UCI ensured that the socially relevant groups perceived the design of an alternative to the safety as an imposter. As a result, Mochet was only able to sell 800 Velocars, and the recumbent was a commercial failure (Schmitz, 1994). The recumbent did not have a chance to go through a stabilization period, and the safety continued on with its original process of stabilization.

Conclusion

We have identified the case of the recumbent as an example from the history of technology that, like the case of the safety, offers a fruitful site of SCOT analysis. Additionally, we have proposed to revive the ghost of the recumbent by bringing the workings of the UCI to the fore, using Bijker's two-sided theory of power. Our goal is both to provoke further STS analysis of the recumbent, and also to suggest a way of amplifying the use of SCOT in cycling examples.

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References

Bijker WE (1995) *Of Bicycles, Bakelites, and Bulbs: Toward a Theory of Sociotechnical Change*. Cambridge, MA: MIT Press.

Dolnar, H (1902). An American stroke for novelty. *The Cyclist* (January 8): 20.

Nye P (1989) *Hearts of Lions: The History of American Bicycle Racing*. New York: W.W. Norton & Company.

Pinch TJ and Bijker WE (1984) The social construction of facts and artefacts: Or how the sociology of science and the sociology of technology might benefit each other. *Social Studies of Science* 14(3): 399–441.

Rosen P (1993) The social construction of mountain bikes: Technology and postmodernity in the cycle industry. *Social Studies of Science* 23(3): 479–513.

Schmitz A (1994) Why your bicycle hasn't changed for 106 years. *Technical Journal of IHPVA* 11(3): 4–8.

Schmitz A (2000) *Human Power: The Forgotten Energy*. Coventry: Hadland Books.

Shrivastsa P (2004) A socio technological history of bicycles. Presented at the International Cycling History Conference. 1–4 September. Available at: http://paulshrivastava.com/Research%20Publications%20Directory%5CA%20Socio-%20Technological%20History%20of%20Bicycles.pdf (accessed on 23 November 2014).

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