Technological and societal transitions are generally understood as a shift in the dominant paradigm (Geels 2010). A new paradigm – meaning a new idea or technology - has to oust the existing, established old paradigm in order to become dominant. Understanding the triggers of a regime shift is key to stimulate a sustainability transition (Zeppini et al 2014).

From a diffusion perspective, the new paradigm has to diffuse in a population where the old paradigm is dominant. A critical mass of adopters is usually needed for a population to switch from an old paradigm to a new one (Arthur 1989, Bruckner et al 1996). Thus, a traditional explanation for a paradigm shift is a high concentration of adopters of the new paradigm in the overall population.

Nonetheless, a paradigm shift usually requires several tries to be successful. That is say, several candidate paradigms fail to become dominant, before one successfully replaces the old paradigm. A usual justification is that the process of trial-and-error echoes an exploring process where new candidate paradigms learn from the failure of the previous ones (Lissoni 2005). The candidate paradigm that replaces the old regime has to be better than the ones who failed and good enough to become dominant.

In this paper we suggest that new technologies, ideas, social norms, that succeed in replacing an old one might not be better than previous attempts, but might just arrive at the right time. Every new paradigm diffuses to a small amount of people, gradually shattering the ground of advocates of the old regime. Agents experience a social reinforcement in adopting the same paradigm of their friends. At some point, the population is fragmented between several candidate paradigms and the old regime. In such circumstances, the social reinforcement for the old paradigm has weakened. A new paradigm that comes in that moment can find the right conditions to diffuse and replace the old regime, without being intrinsically better than the previous ones. This comes in contradiction with the critical mass explanation, as the trigger of a transition is rather a “critical fragmentation”.

We analyze this hypothesis with a model of repeated diffusion processes for a population embedded in a social network. We model diffusion in a percolation framework (Solomon et al 2000) that represents a word-of-mouth communication in a social network (Campbell 2013). All paradigms have essentially the same intrinsic value, although the population perceives them as different due to social influence. Agents update their perceived value of a paradigm with its diffusion among their friends compared to the number of friends that still remain in the old regime. Thus, diffusion is driven by local social influence (Lopez-Pintado 2008).

We find conditions under which our model reproduces realistic patterns of regime shift. The first condition concerns the intrinsic value of paradigms. If this value is too low, a new paradigm can never become dominant, no matter what the conditions at its arrival are. On the other hand, paradigms with a very high intrinsic value will immediately replace the old regime, without a need for previous failed trials. The most realistic scenario of several attempts preceding a successful transition requires that such intrinsic value be near to the percolation threshold of the network. A second condition is that for a transition to occur new paradigms need to have some advantage over older ones in order to attract adopters of failed paradigms. Otherwise, the population remains fragmented over different paradigms, none of which can become dominant. Finally, the diffusion process needs a moderate level of social reinforcement. If social reinforcement is too low, the number of advocates of a paradigm is irrelevant for its diffusion. On the other hand, too much social reinforcement can lead to a herd movement where all the adopters of a paradigm jump to the next arriving paradigm, without allowing for a fragmented population.

In conclusion, this paper posits a new explanation of societal or technological transitions different than trial-and-error or critical mass. We suggest that a new paradigm becomes dominant by arriving at the right moment, instead of being better than failed attempts. The right moment, in this case, is after several failed paradigms have fragmented the social base of the old paradigm. Such fragmented population of adopters of different competing options causes a shift of the percolation threshold of the network towards lower values. The trigger of regime shifts is thus a “critical fragmentation” of the population, rather than a critical mass of adopters of the new paradigm.

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