INFORMATION SYSTEMS AND PERFORMANCE: THE CASE OF "TOUR DE FRANCE" RACING CYCLISTS

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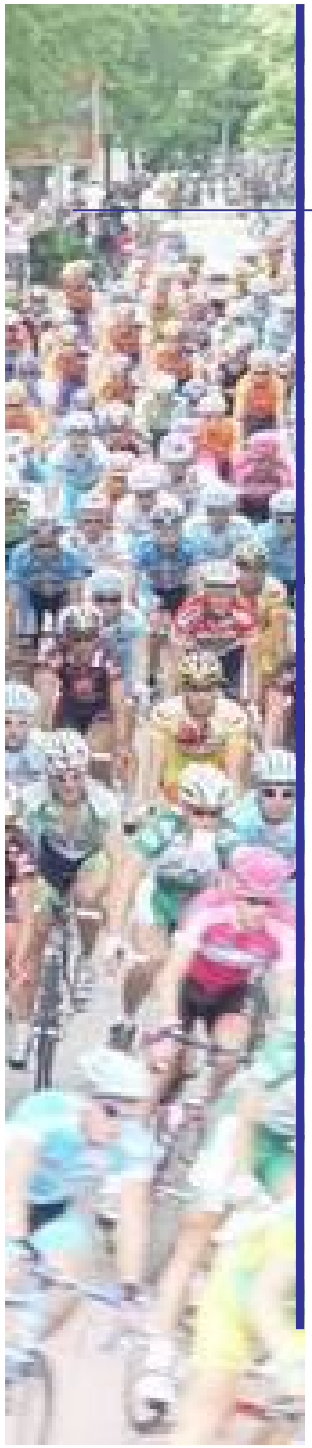
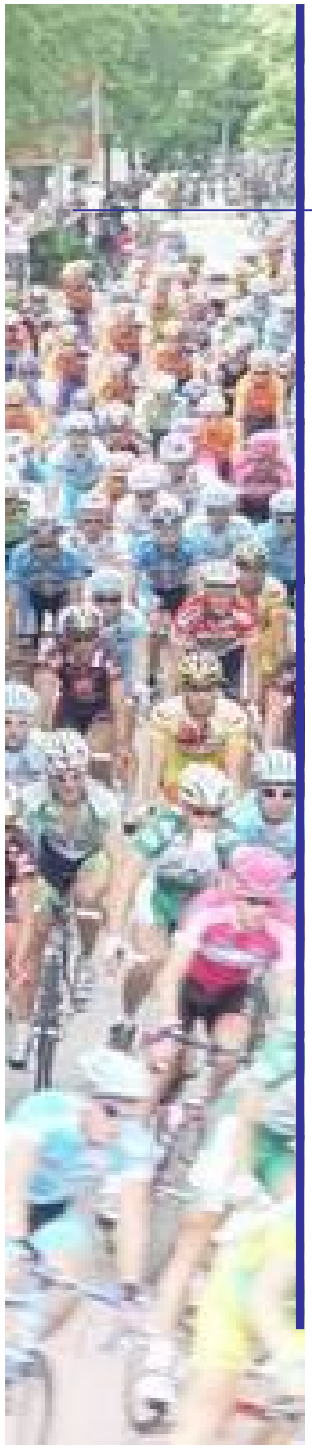
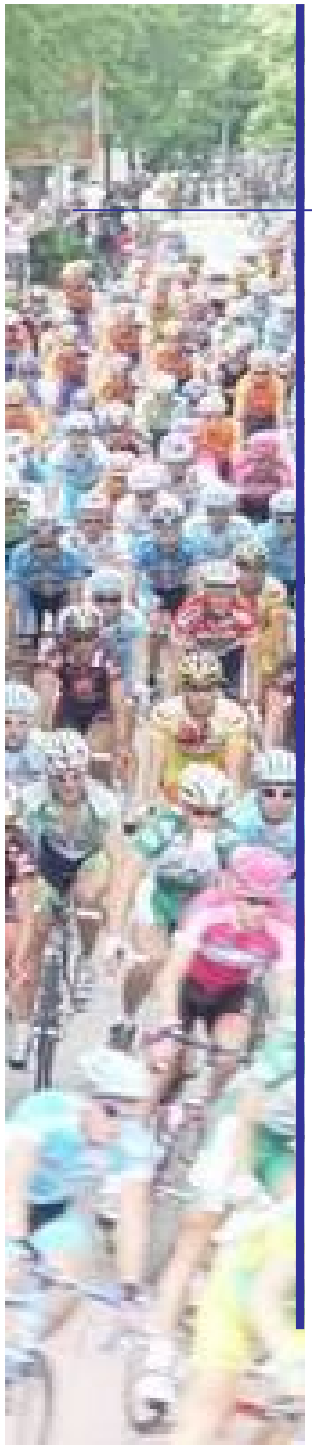


- *"It is true, I'm attached to traditions, but now sprinters climb better than before, and know exactly where to situate the breakaways through their headphones. At my time, it was more diffuse, more difficult to organise the pursuit."*

  Eddy Merckx (March 2007 after Milano-San Remo)

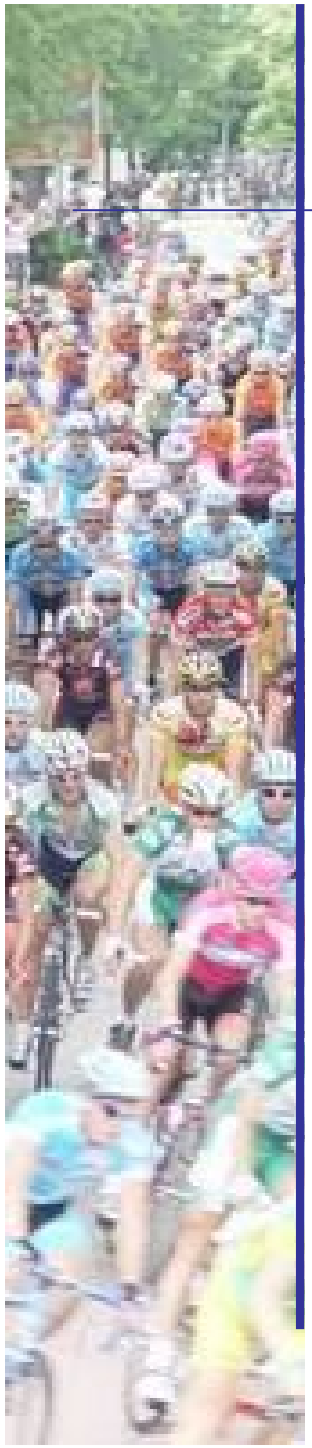


- Do headphones (as information systems) in a cycling competition reduce the quality of the sportive show?
- This research analyses the results of twelve Tour de France competitions in order to compare the gaps at arrival between the riders before and after the introduction of developed information systems.
- Developed information systems for professional cycling include the use of radio links between riders and team managers (headphones), TV screens in the car of team managers, GPS localization for instant measures of gap between riders, SRM,…



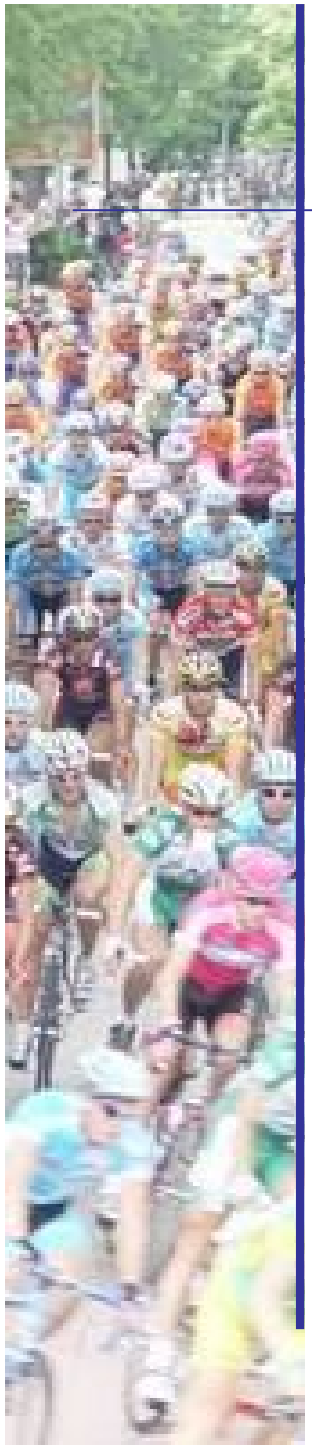
Why is cycling strategic?

- Organizational logic: teammates protect their leader
- Maximization of the physical resources
- Multiplicity and evolution of the objectives
- Coopetition, alliance
- Importance of coordination

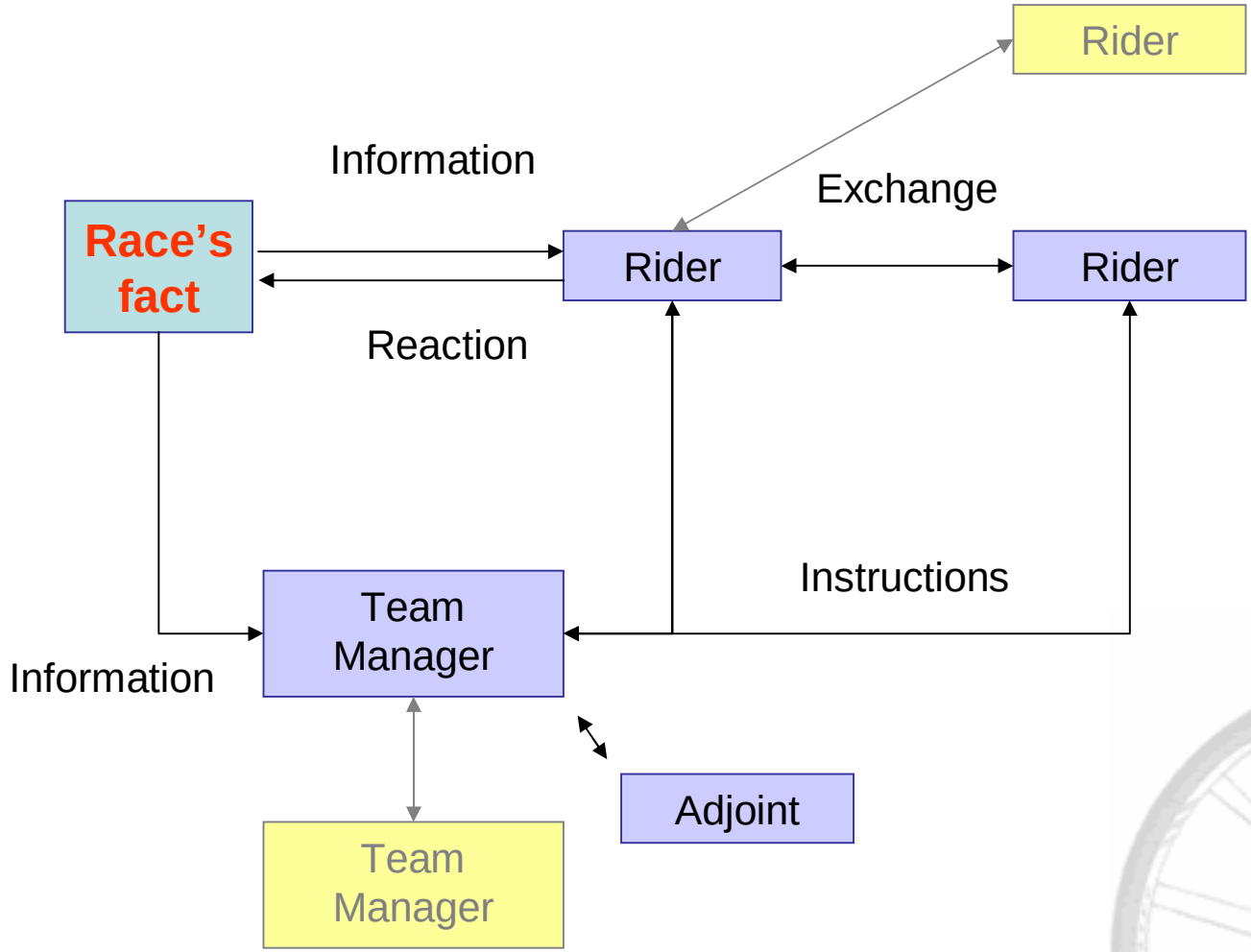


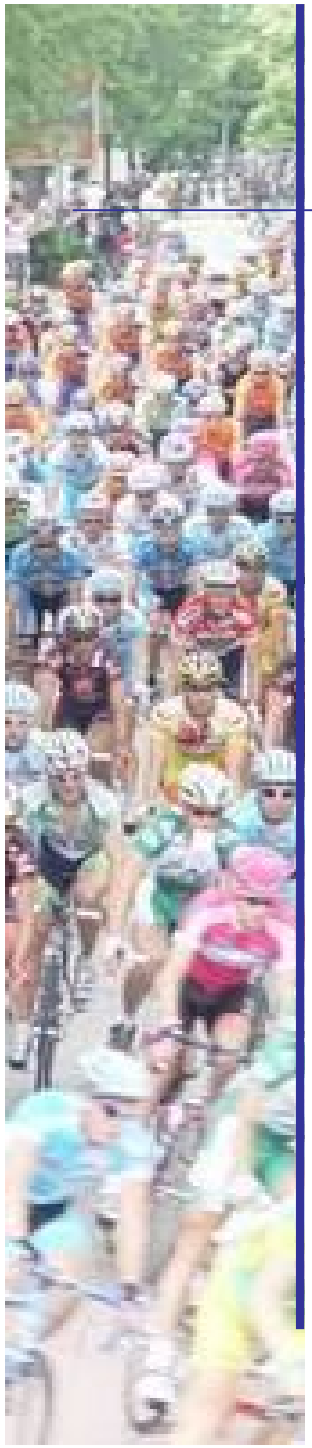
Information Systems in organizational management

- Information systems can be defined as a set of interrelated components that collect, process, store, and distribute information to support decision making and control in an organization.
- Information systems can help organizational actors to analyze problems or to understand complex situations.
- Informational uncertainty decreases with the use of information systems and we can suppose that actions are more rational.
- Literature on information systems assumes that information systems improve decision making, and because organizational actors receive more accurate information on time, they become much faster in decision making.

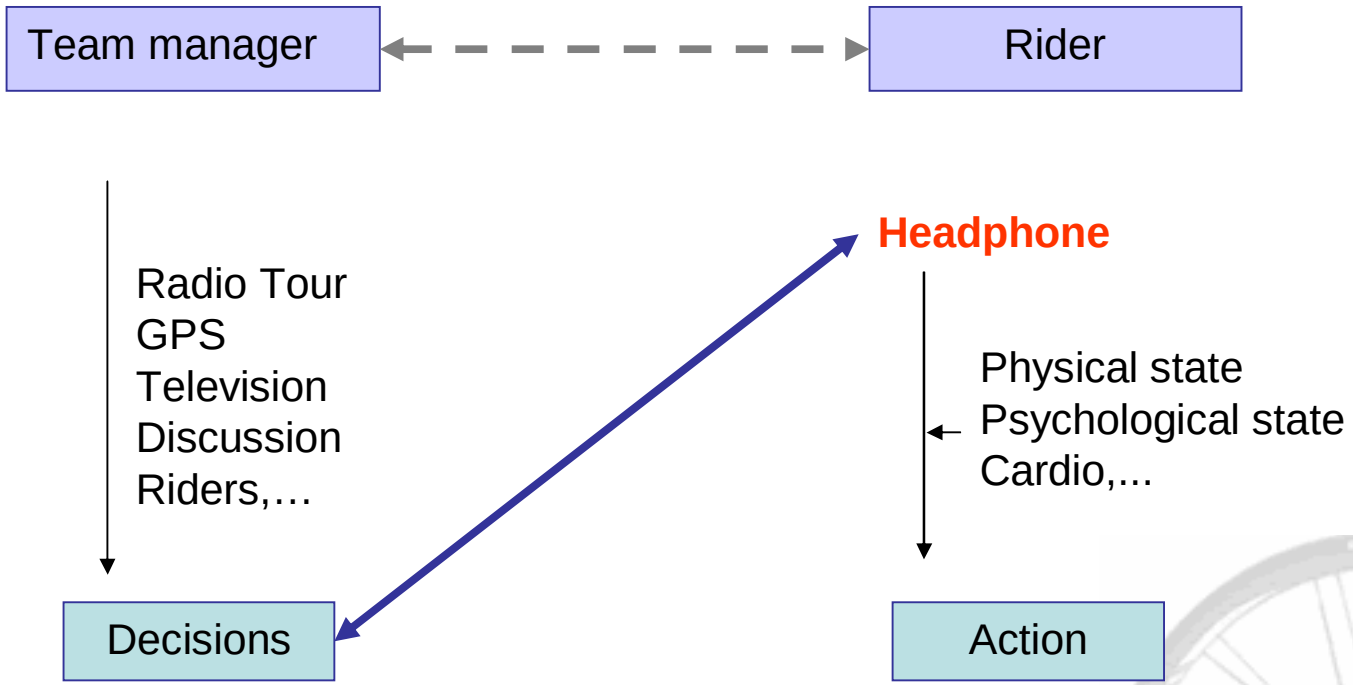


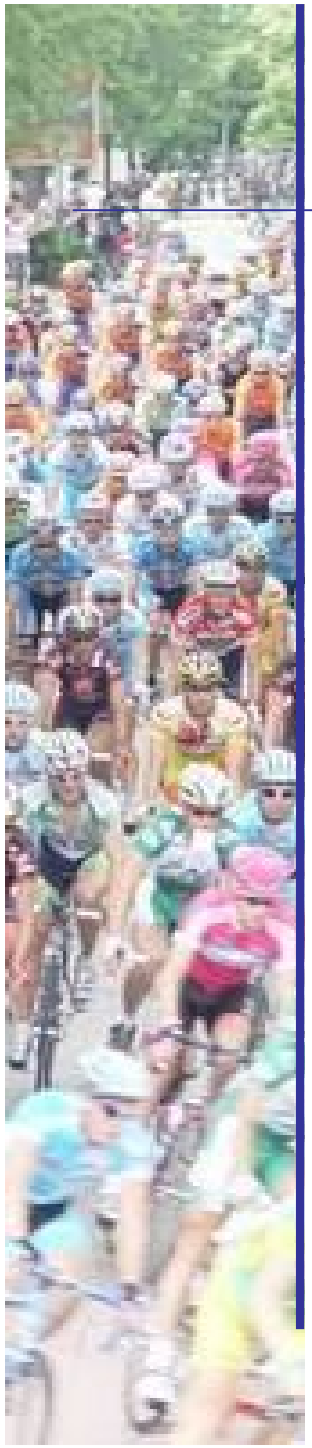
Communication during the race



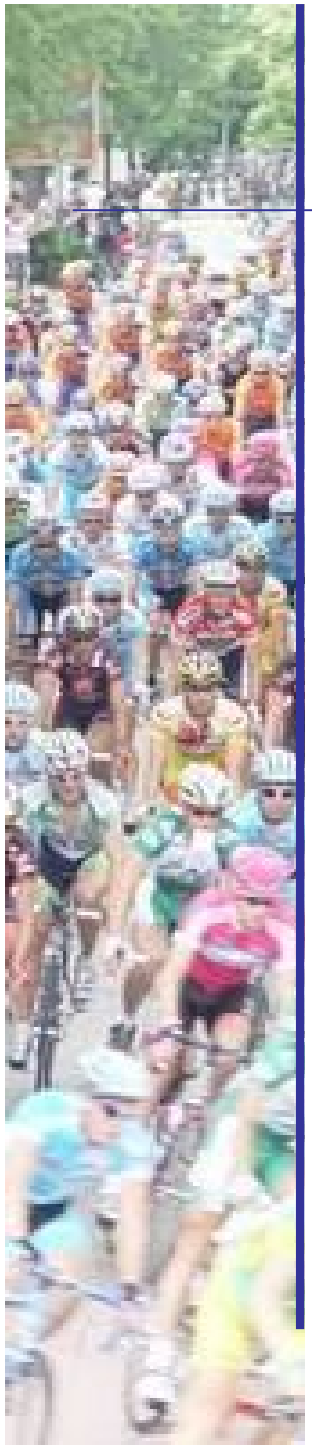


Information System during the race



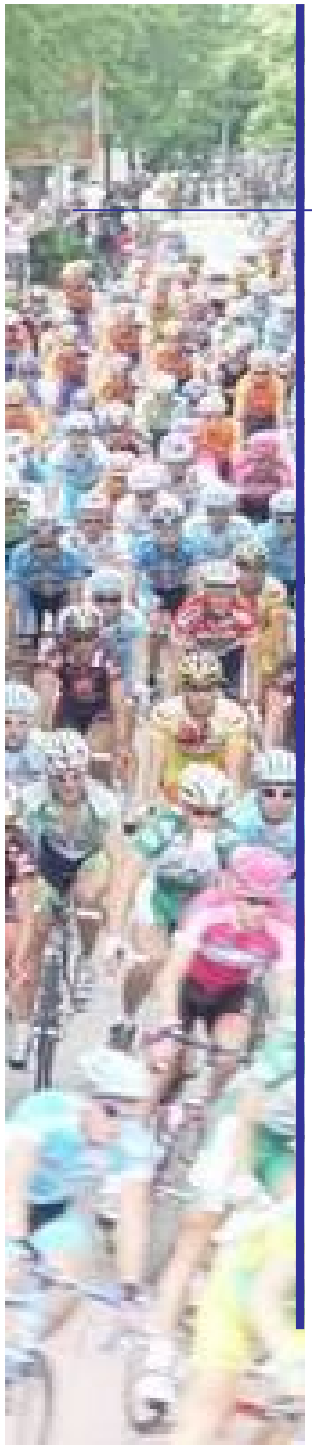


- Our research supposes that cycling teams are similar to organizations as they have formal structures and use resources to produce output (in our case: best individual classification by time).
- During a professional road cycling race, riders have better information at the right time to make a rational decision.
- We can suppose that the use of developed information systems had lead to the reduction of gaps between riders.



Information system and sportive show

- We can suppose that the grouping of riders may reduce the quality of the sportive show.
- This issue is important for the organizing of competitions.
  - Thus, the UCI or the ASO (Tour de France organizer) are examining the possible suppression of headphones in order to permit to create uncertainty during the courses and thus to favour the interest of spectators.



Before and after Information Systems Introduction

1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005

Television, cardio, headphones, GPS, SRAM,…

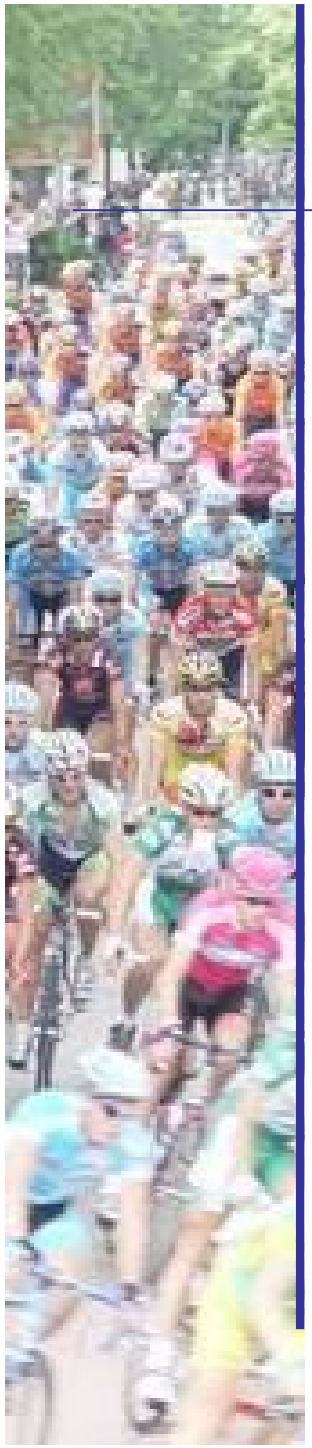
Basical Information Systems

Rare use
Period before IS

Transitional period
(Not taken into account)

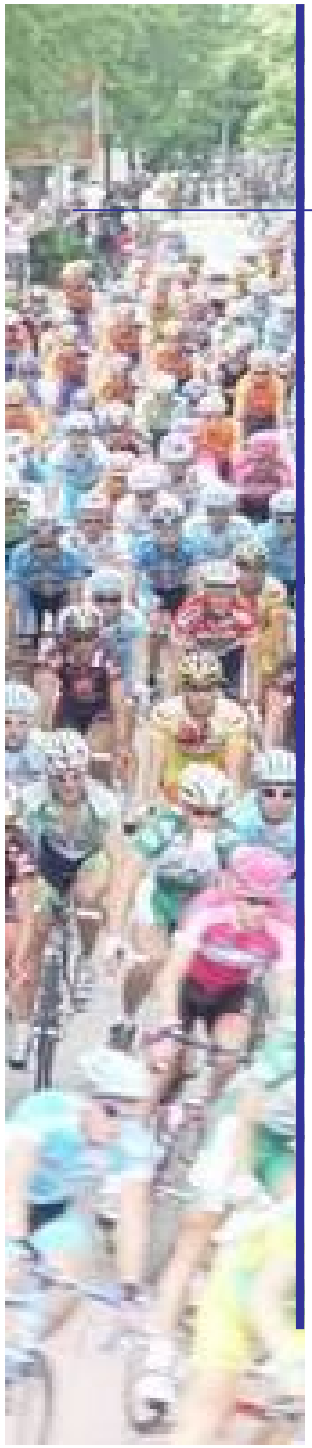
Systematic use
Period after IS

Developed Information Systems



Our assumptions

- We obtained the time for each rider of all stages from twelve Tour de France (245 stages and 40.130 individual times). Tour de France in 1991, 92, 93, 94, 95, 96 had no developed information systems and Tour de France in 2000, 01, 02, 03, 04, 05 had developed information systems.
  - A1- Since the systematic use of developed information systems, sprints are more frequent.
  - A2- Since the systematic use of developed information systems, gaps between riders (finish stage) are less important (time's concentration).



Modeling

Headphone, GPS, Television, ...

+

Developed Information Systems

+

Centralization of decision
Reduce Uncertainty

+

Improvement of coordination and better allocation of resources

+

Sprints of the bunch are more frequent

Concentration of rider's time

A1

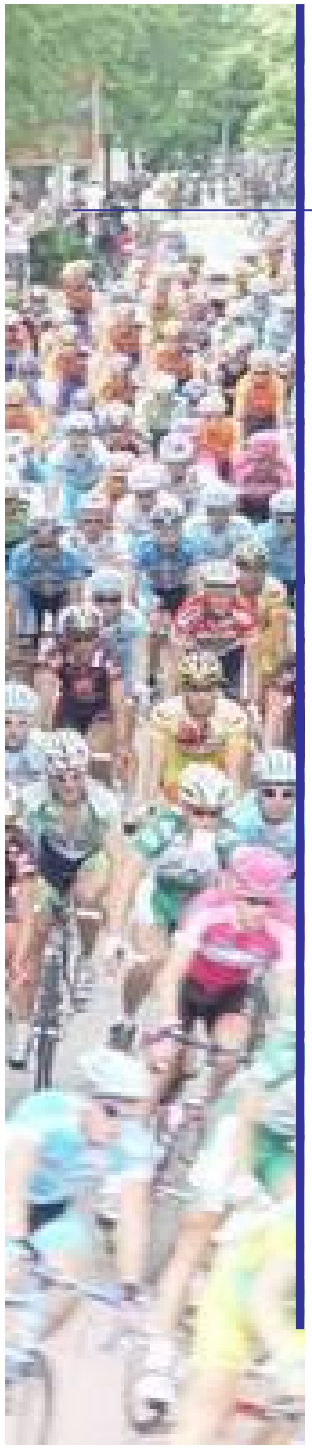
A2

\-

+

Quality of the sportive show

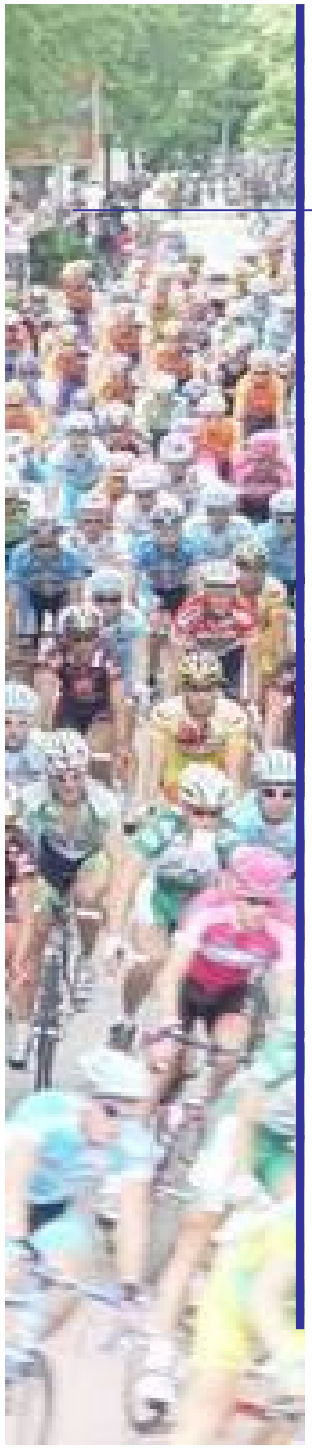
\-



Stages
(before IS / after IS)

245 stages during two periods

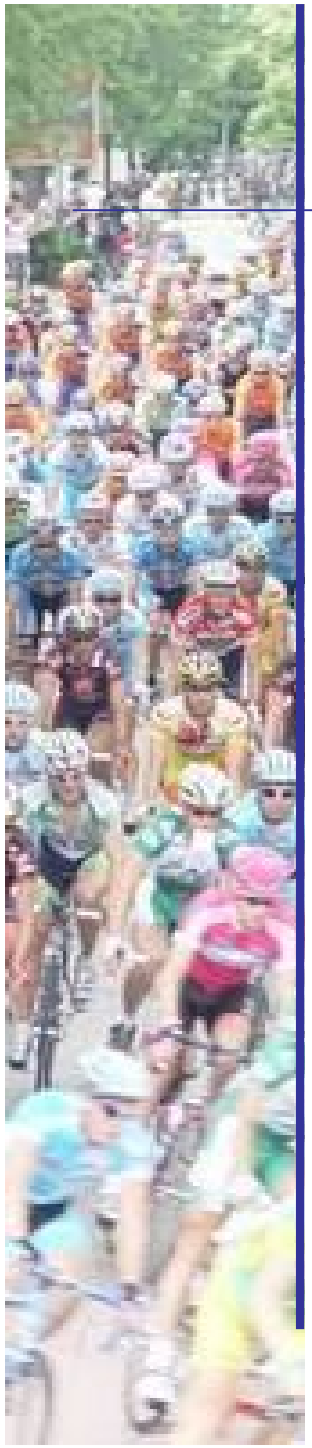
- All stages (125/120)
  - Team Time Trial
  - Individual Time Trial (18/16)
  - Road race - Mass-start stages (107/104)
    - Flat stages (62/57)
    - Middle mountain stage (15/13)
    - Mountain stages (30/34)
  - Flat finish (88/84)
  - Mountain finish (19/20)



Method

- We counted the number of sprints of the bunch to win the stage between two periods (before and after developed information systems) and we compared the results through a Chi-square test (A1).
- We measured rider's time dispersion for each stage and we calculated the coefficient of variation (ratio of the standard deviation to the mean expressed as a percentage) for the first thirty riders of each stage.
- We had to compare results between two periods for each type of stage (mountain, flat stage, individual time trial,…) with an independent-sample T Test procedure (A2).

Results

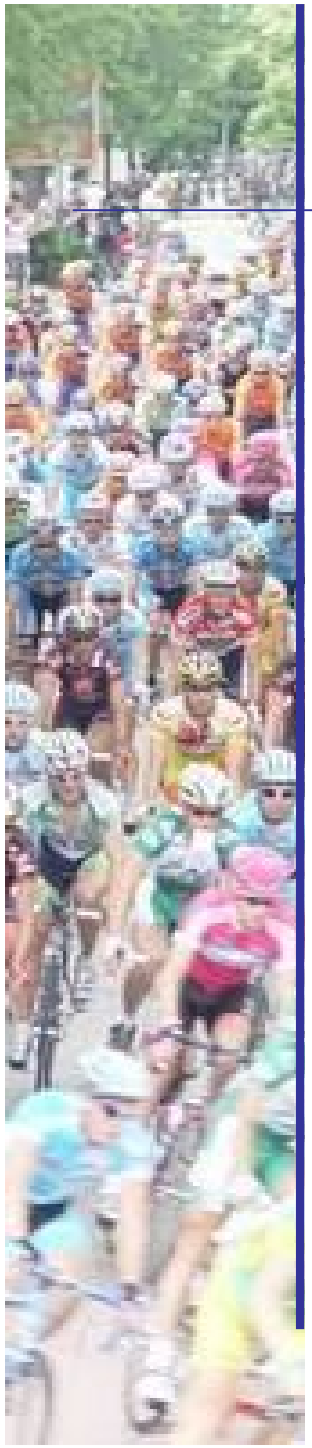


A1

- Our results show that contrarily to assumptions, the introduction of developed information technology did not improve stage finishes for the sprint of the bunch.

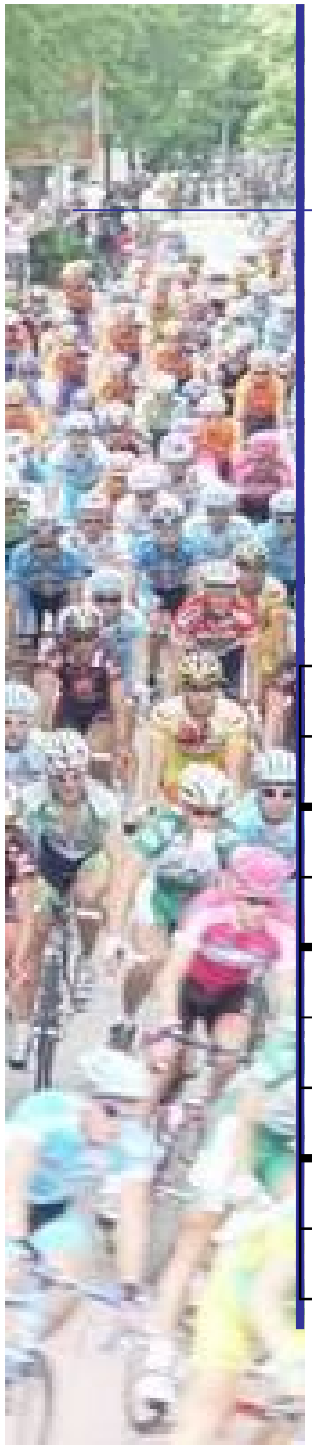
	Type		
	No sprint (success from an escape group)	Sprint (success from the bunch)	Total
Before IS	29	33	62
Frequency	*46,77%*	*53,23%*	*100%*
After IS	24	33	57
Frequency	*42,11%*	*57,89%*	*100%*
	53	66	119

Khi 2 value : 0,262 – not significant effect



A1

- Sprints are a little more numerous but the difference is not significant
- Centralization does not allow a more important effectiveness of the team of sprinters
- A1 is not validated

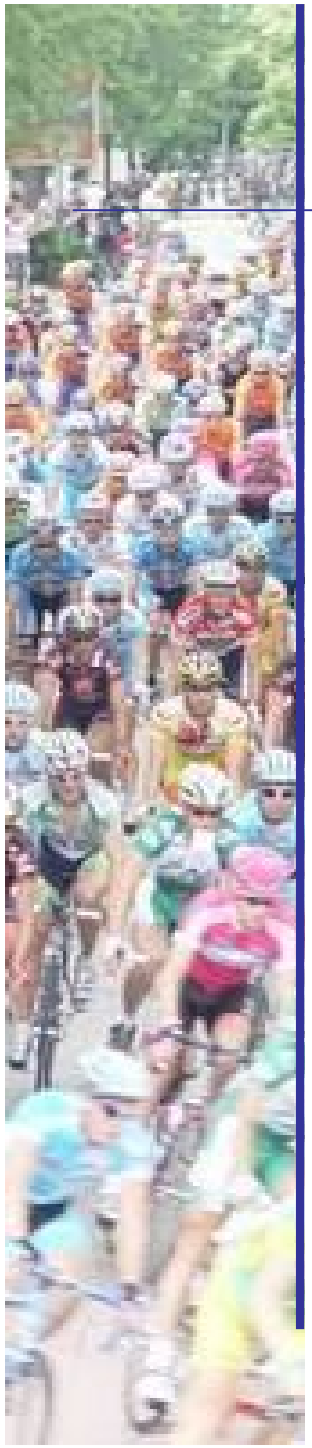


A2

- Our results show that contrarily to assumptions, the introduction of developed information technology did not lead to squeeze up the gaps between riders

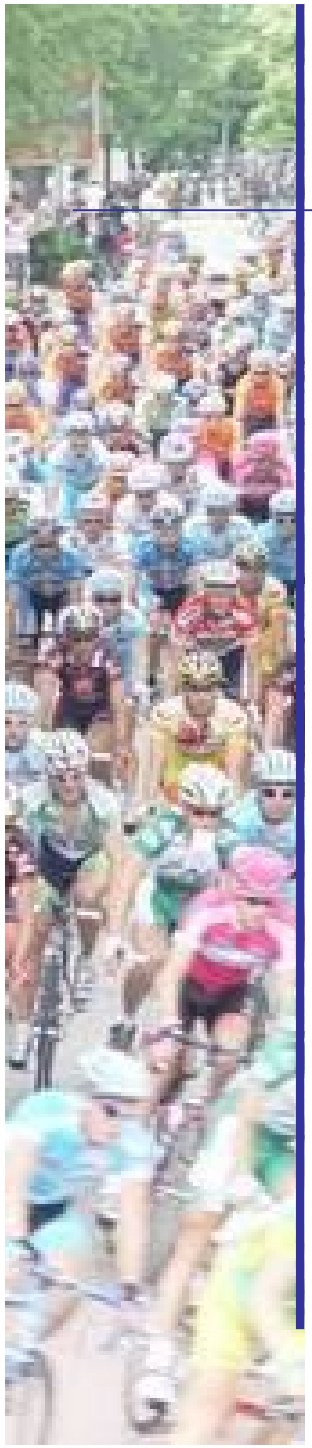
Coefficient of variation for the first thirty riders of each stage

	n	CV before IS	n	CV after IS	Sign	Result
Total	125	0,65	120	0,78	Ns	Dispersion
Ind.Time Trial	18	1,94	16	1,77	Ns	Concentration
Road race	107	0,44	104	0,63	**0,1**	**Dispersion**
Flat stage	62	0,22	57	0,55	**0,05**	**Dispersion**
Middle mountain	15	0,76	13	0,82	Ns	Dispersion
Moutain stage	30	0,72	34	0,68	Ns	Concentration
Flat finish	88	0,35	84	0,6	**0,1**	**Dispersion**
Mountain finish	19	0,85	20	0,76	Ns	Concentration



A2

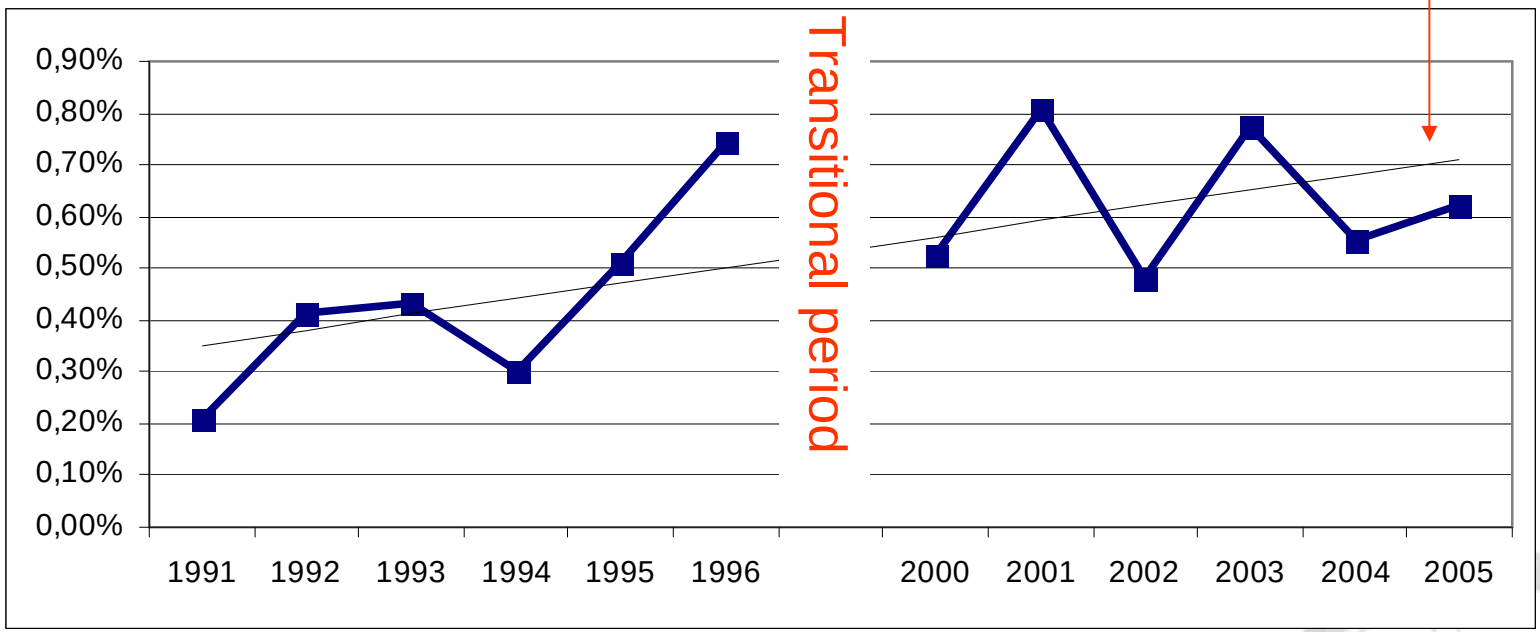
- More time dispersion for the road races (Flat stages and Flat finishes)
- But dispersion is not valid for crucial stages (Mountain stages and Mountain finishes: major shifts in the general classification)
- A2 is not validated



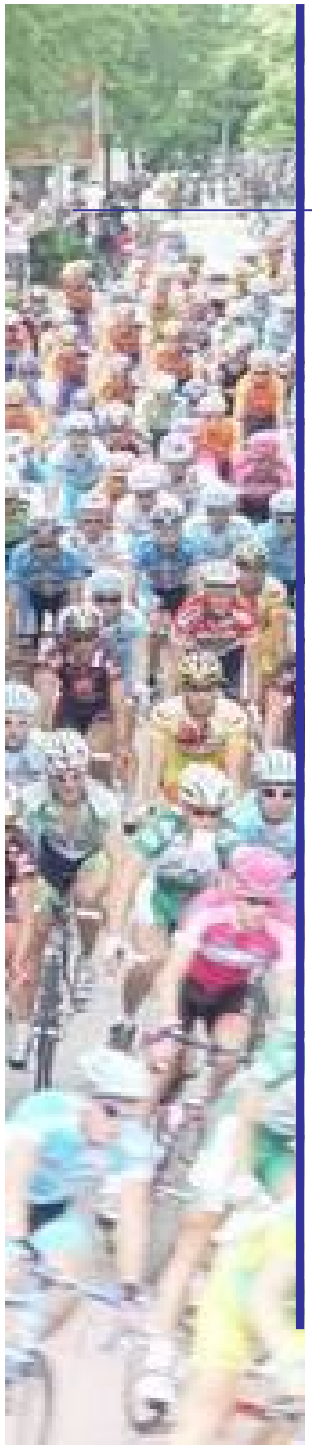
Evolution of average dispersion

(coefficient of variation average by year - first thirty riders of each stage)

Tendancy: dispersion increases

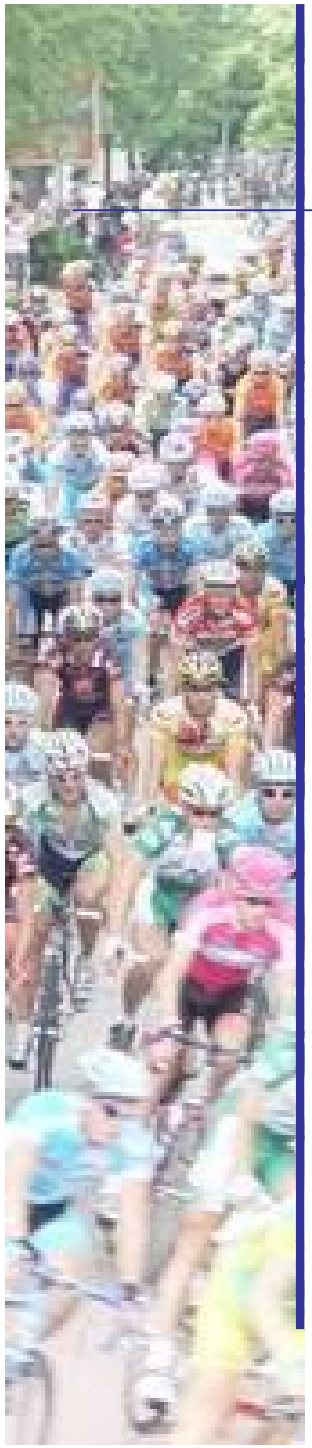


Before **After**

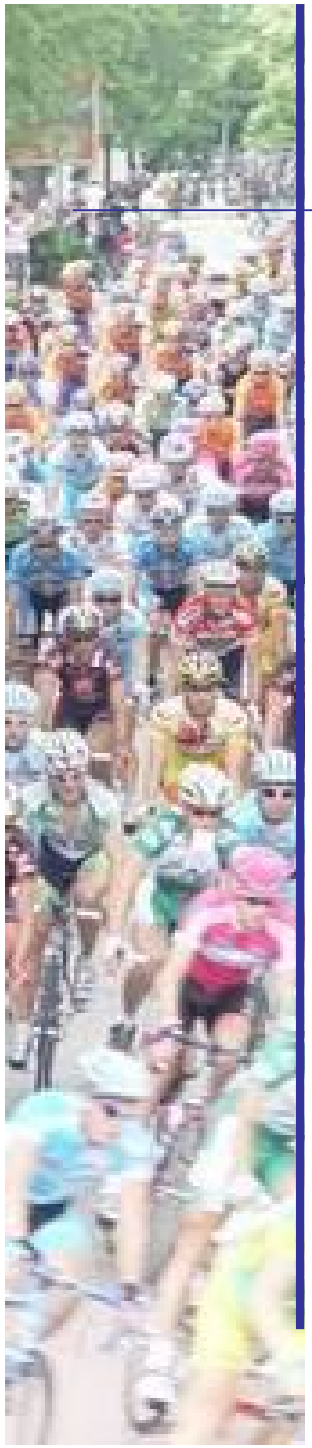


Headphones are not guilty…

- Do headphones (as information systems) in a cycling competition reduce the quality of the sportive show?
  - Our results show that this is not the case (taking only into account the gaps at arrival).
  - Thus, the suppression of headphones would not improve the show.

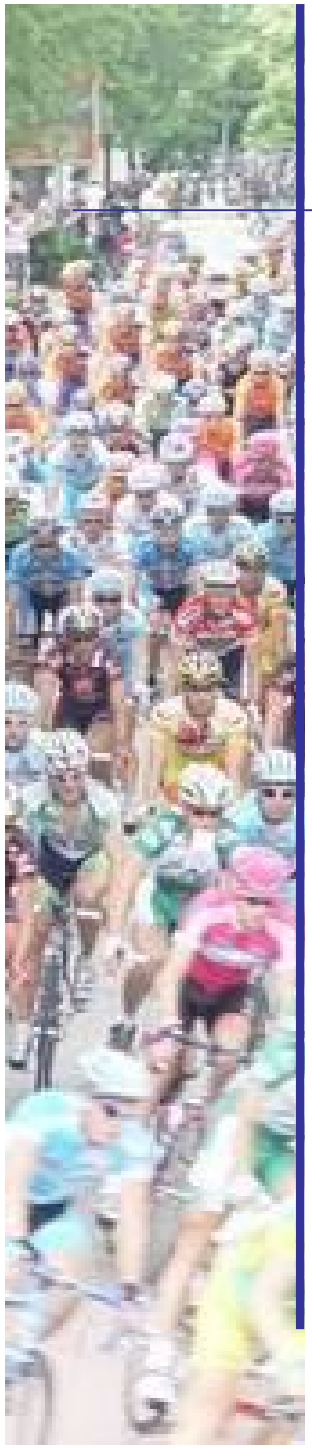


- If general dispersion increases, this is due to liberty given to non dangerous riders - for their general classification - during non dangerous stages for their general classification.



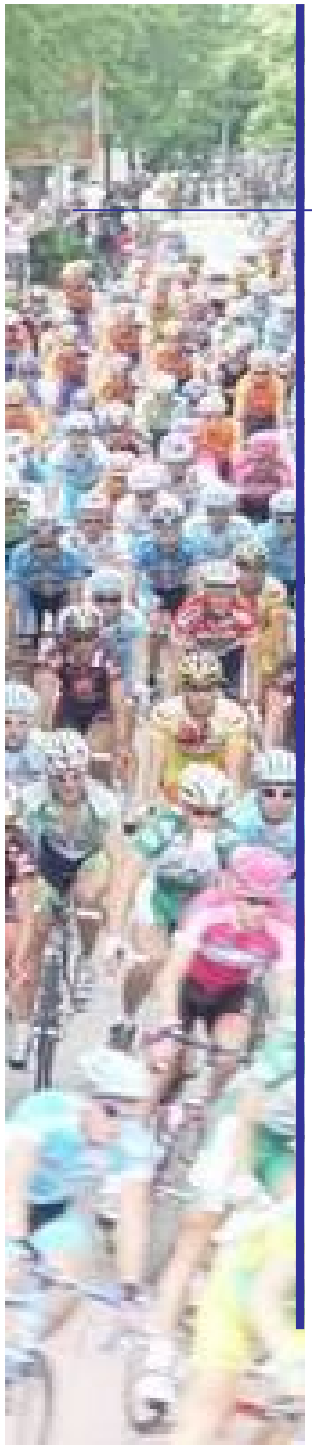
Breakaway's case

- Breakaway
  - When a group of riders breaks away from the front of the bunch
  - Flat stages
- For both periods:
  - Same victory rate (44%)
  - More participants (+2,5)
  - Higher gap with the bunch
- There is a better management of the effort… for the bunch



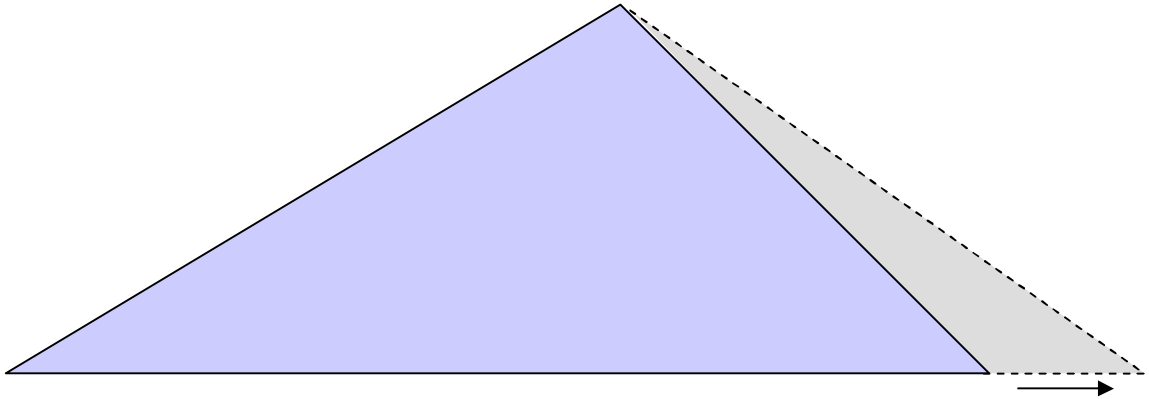
Conclusion

- The management of the effort of the leader’s teammates is more effective.
- In other words, we can analyze this perspective as a rationality improvement (Simon)



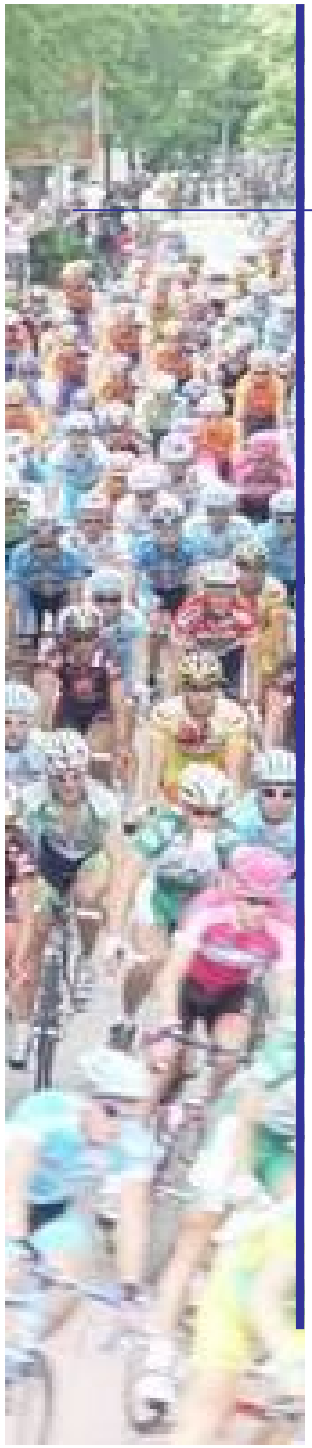
Information systems and area of rationality

Limits related on competences, the practices



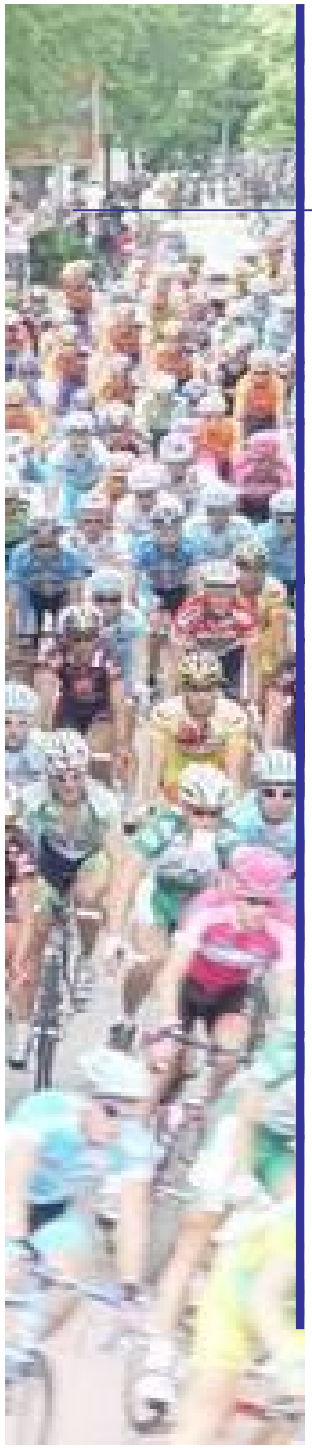
Limits related on the values, the objectives

Limits related on knowledge, information



Conclusion

- We can understand these results through the structurationist point of view.
- It is not the technological determinism in the use of information technology that shapes an emergent use of technology but the interaction between technology and organizational actors



Limits

- Other effects
- Complexity of Information Systems
- Need of a qualitative study