

Risk perception and risk management in Aztec Mexico

Lessons learned for the future of risk modelling

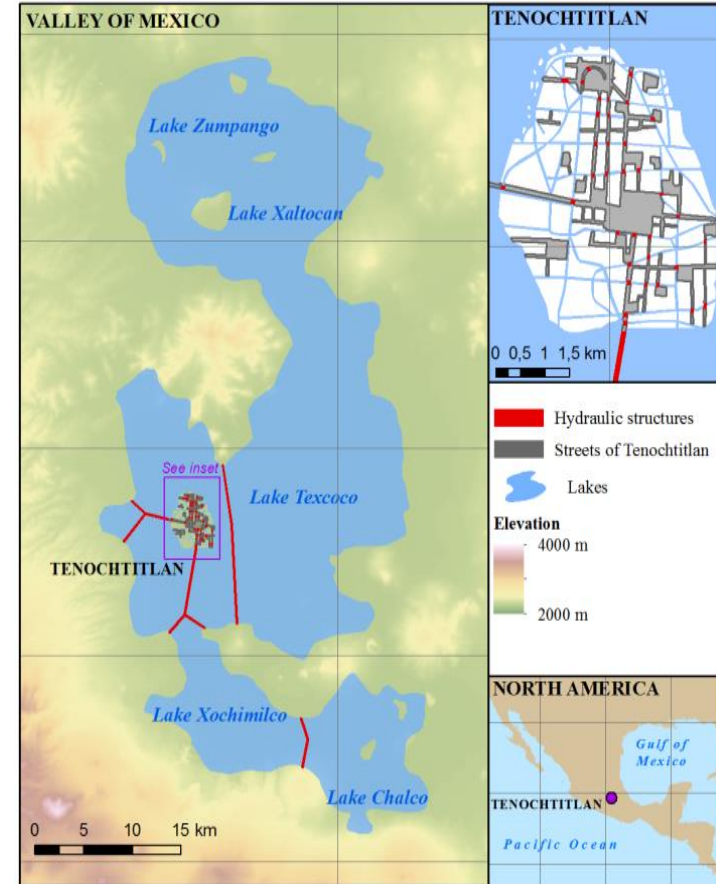
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Aztec civilization

- Dominant culture in Mexico & Central America
- Military oriented
- Good public sanitation
- 1st epidemic Europeans from Cuba
- Compulsory and universal strict education
- Still a young civilization (200 years old)

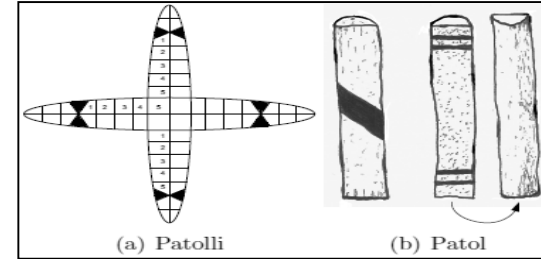
Estimated population of Mexico-Tenochtitlan and Mesoamerica around 1519

	5 th percentile	Mean	95 th percentile
Tenochtitlan	63,000	296,000	850,000
Aztec Empire	1,000,000	13,000,000	30,000,000



Games of chance

- Board for gaming
- Bet on the outcomes of “ballgame”
- Fray Diego Durán: “they [gambled] their homes, their corn granaries, their maguey plants. They sold their children in order to bet and even staked themselves and became slaves to be sacrificed later if they were not ransomed”
- In Europe astragalli were used
- De vetula (≈1200) first evidence to try to organize the outcomes of throwing 3 dice and adding up the outcomes

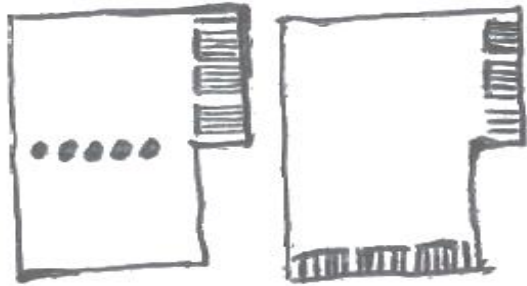


*Quot Punctatura, et quot Cadentia ha
beat quilibet numerorū compositorum.*

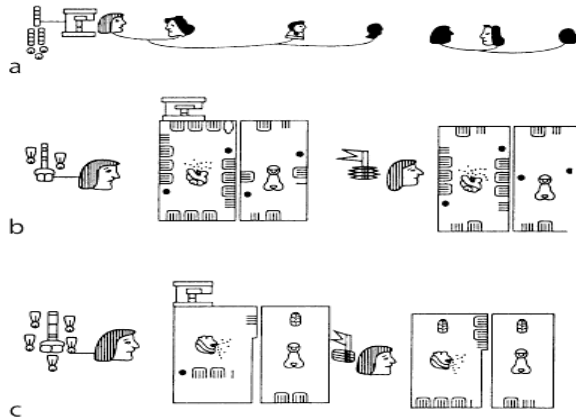
3	18	Punctatura	1	Cadentia	1
4	17	Punctatura	1	Cadentia	3
5	16	Punctaturæ	2	Cadentia	6
6	15	Punctaturæ	3	Cadentia	10
7	14	Punctaturæ	4	Cadentia	15
8	13	Punctaturæ	5	Cadentia	21
9	12	Punctaturæ	6	Cadentia	25
10	11	Punctaturæ	6	Cadentia	27

Latin poem De Vetula (~1250?)
by Ovid pseunonim (Richard de Fournival?)
Taken from Kendall (1956)

Mathematical sophistication



(a) 2016 in Aztec notation (b) 2016 in Aztec notation



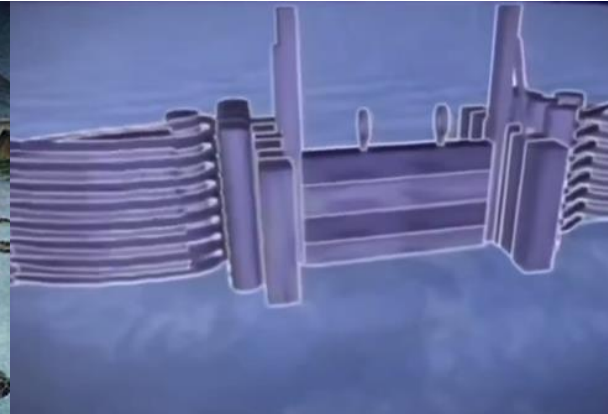
- Aculuas (Texcoco) knowledge of zero
- Accurate & comparable to the European of the time. Especially in geometry
- System on base 20
- Used for cadastral & taxation purposes
- Tribute more important than agriculture
- Did they have a similar concept of probability as the European one of the time?

$$20^2 + 20^2 + 20^2 + 20^2 + 20^2 + 5 + 5 + 5 + 1 = 2016.$$



- Large scale land reclamation technique (polders)
- High productivity
- Fundamental in expansion of the empire

- 1st European map of Tenochtitlán (Nuremberg 1524)
- Some of these “still survive”
- Nezahualcóyotl dike: Flood control, movable gates for navigation, separate salted from fresh water
- One of the most advanced hydraulic engineering systems at the time
- Constant (flooding) risk



The sun rise problem

- “There would be the probability expressed by .5352, that the odds for this (sun rising) was not greater than 1.600,000 to 1; And the probability expressed by .5105, that it was not less than 1.400,000 to 1”(Bayes and Price, 1763)
- “Placing the most ancient epoch of history at five thousand years ago, or at 1826213 days, and the sun having risen constantly at the interval at each revolution of twenty four hours, it is a bet of 1826214 to one that it will rise again tomorrow. ”(Laplace, 1902)



Human sacrifice for the Aztecs was not inspired by cruelty or hatred. It was a response -the only one that they could conceive- to the instability of a world in constant threat. To save the world and humanity blood was required: the victim was not an enemy to be eliminated, rather a messenger that is sent to the gods invested with a dignity almost divine"(Soustelle, 1970)

- How is it possible that the same culture that developed such engineering wonders as part of a **rational risk management** strategy included human sacrifice as part of the same strategy?
- Probabilistic risk analysis as basis for rational risk management

Climate change



As a public and policy issue, climate change boils down to four overarching issues:

1. climate is changing
2. people are causing climate to change
3. the societal consequences of climate change are highly uncertain but include the potential for serious impacts
4. there are numerous policy options for climate change risk management, most of which are well characterized



Donald J. Trump ✓
@realDonaldTrump

 Follow

The concept of global warming was created by and for the Chinese in order to make U.S. manufacturing non-competitive.

- Keep using to the best of our capabilities mathematical (probabilistic) reasoning since it's a solid foundation for Risk Management

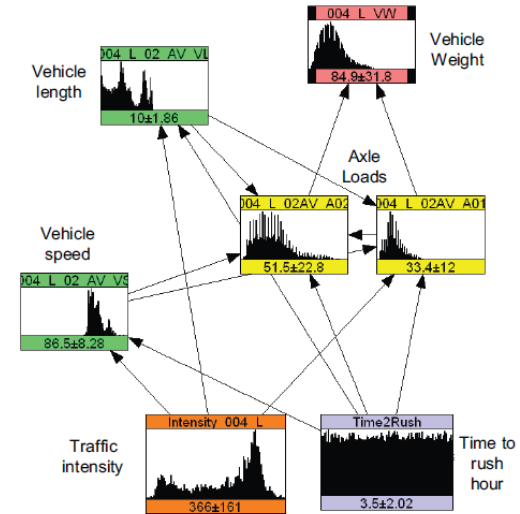
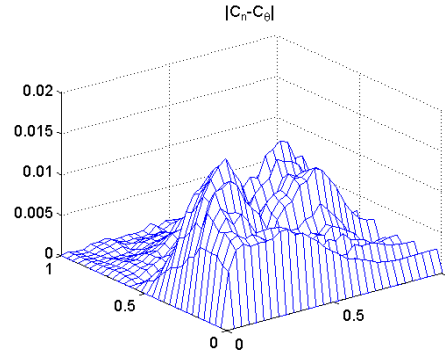
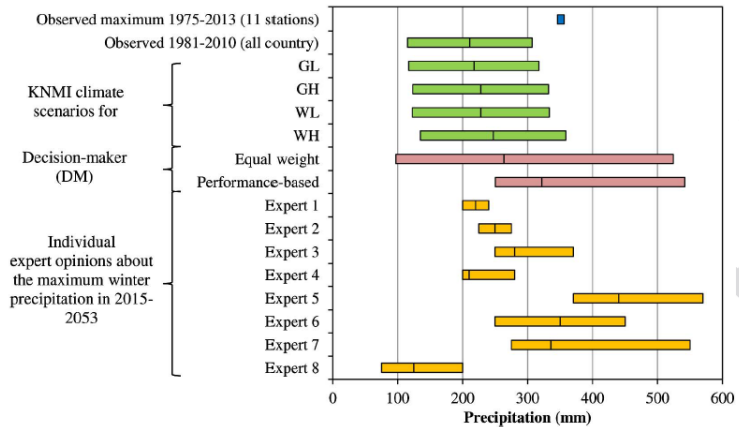


Figure 2.2: BBN for the WIM system including only two axle vehicles.



Thank you