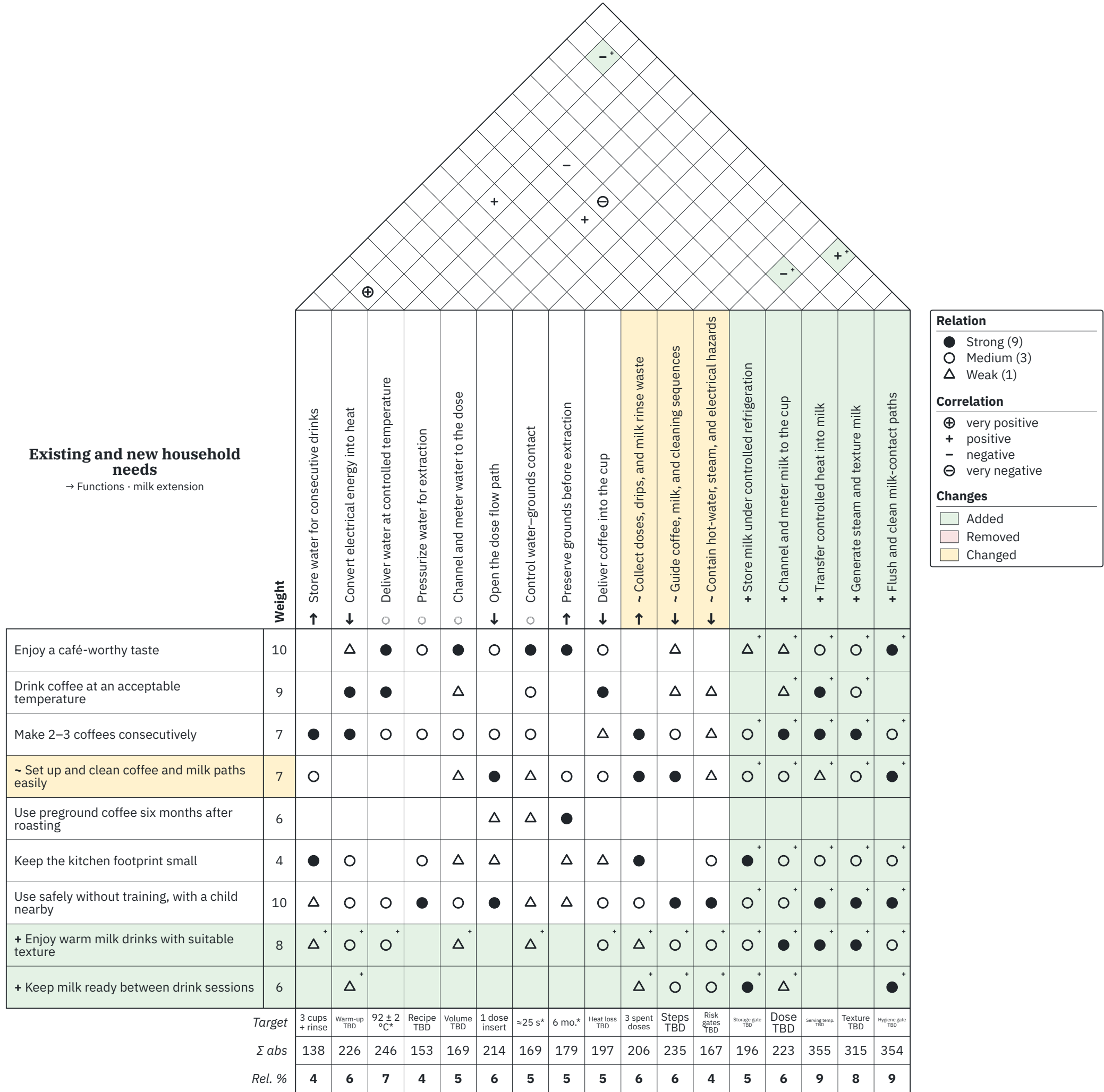


Detailed coffee study · integrated milk extension

This full deployment extends coffee-data.typ. It is separate from the compact teaching model in milk-options.typ. All judgments and targets remain provisional.



Detailed deployment · component consequences

Functions · redeployed priorities → Existing and new components		Rel. %	Water tank and refill interface	~ Coffee heater and coordinated thermal sensing	Pump and pressure-limiting path	Flowmeter and water circuit	Dose chamber, opener, and seals	Sealed dose and barrier packaging	Coffee outlet and cup support	~ Drip tray, dose container, and rinse capacity	~ Controller, milk sequence, and cleaning interface	~ Housing, steam protection, and shared power budget	+ Refrigerated milk reservoir and sensor	+ Milk pump, valves, and removable tubing	+ Steam generator and thermal protection	+ Steam–milk mixer and outlet
~ Store water for consecutive drinks	3.7	●			△						△	△				
~ Convert electrical energy into heat	6		●								● 3→9	● 3→9			● ⁺	
~ Deliver water at controlled temperature	6.6		●	△	○	△					●	△			△ ⁺	
~ Pressurize water for extraction	4.1				●	○	○				○	○				
~ Channel and meter water to the dose	4.5	△		○	●	○	△				●				○ ⁺	
~ Open the dose flow path	5.7			△		●	●				△	○				
~ Control water–grounds contact	4.5			○	○	●	●	●	△		●					
~ Preserve grounds before extraction	4.8							●								
~ Deliver coffee into the cup	5.3				△	○			●		△	△				○ ⁺
~ Collect doses, drips, and milk rinse waste	5.5						○	△	○	●		△		△ ⁺	△ ⁺	○ ⁺
~ Guide coffee, milk, and cleaning sequences	6.3	○					○	△	△	○	●	○	○ ⁺	○ ⁺	○ ⁺	○ ⁺
~ Contain hot-water, steam, and electrical hazards	4.5	△		○	●	○	●	△	○	○	●	●	○ ⁺	○ ⁺	● ⁺	● ⁺
+ Store milk under controlled refrigeration	5.2										○ ⁺	○ ⁺	● ⁺	△ ⁺		
+ Channel and meter milk to the cup	6								△ ⁺	△ ⁺	● ⁺	△ ⁺	○ ⁺	● ⁺		○ ⁺
+ Transfer controlled heat into milk	9.5	△ ⁺	△ ⁺		○ ⁺						● ⁺	○ ⁺		○ ⁺	● ⁺	● ⁺
+ Generate steam and texture milk	8.4	○ ⁺	△ ⁺	○ ⁺	○ ⁺					△ ⁺	● ⁺	○ ⁺		○ ⁺	● ⁺	● ⁺
+ Flush and clean milk-contact paths	9.5	○ ⁺				△ ⁺				● ⁺	● ⁺	△ ⁺	● ⁺	● ⁺	○ ⁺	● ⁺
Σ abs		124.1	158.4	141.6	198.8	215.8	155.9	94	181.3	634.1	248.7	182.4	235.5	328.5	355.5	
Rel. %		4	5	4	6	7	5	3	6	19	8	6	7	10	11	