

A Full Software Implementation of the Viable System Model - Abstract

A Software Version of the VSM

Abstract

This talk presents a full software implementation of Stafford Beer's Viable System Model (VSM) as a complete enterprise management system, combining a live demonstration with a discussion of the system's capabilities, the methodologies behind it, and the challenges encountered during development.

The system is a stand-alone desktop application supporting multiple, freely extensible levels of recursion, with real-time connections to the environment via configurable feeds. It manages a wide range of organisational functions: recursion analysis, process management, task coordination, output control, vertical coherence analysis, and audit of key variables.

Connections between the environment and internal systems — and between internal systems themselves — are managed through homeostats built from transducers that use Bayesian decision mechanisms to switch the governing states of processes defining key properties. Where this falls short of covering the full variety of situations, a Pask conversation mechanism is provided to support semantic transduction across boundaries.

The system also operates in a manner comparable to project management, but purpose-built for the VSM. It enables resources with defined work patterns and properties to be assigned tasks, goals, and objectives to achieve specific outputs. This supports resource allocation across manpower, materials, information, and ideas. The system is capable of HR management; stock control; financial costing and analysis; monitoring organisational integrity and viability — including simulation of the organisation's operations through forward time projection, and Monte Carlo sweeps across key variables to monitor viability.

The talk concludes with a discussion of the future roadmap: evolving the system from a desktop application into a distributed system supporting multiple concurrent users and networked deployment across an organisation. A further direction under consideration is a blockchain-based consensus mechanism to support cooperative, multi-stakeholder decision-making — of particular relevance to organisations such as cooperatives, where authority is distributed rather than centralised.

Description

- The programme is a full representation of Stafford Beer's VSM in software, addressing all the theoretical aspects of the VSM.
- The VSM focuses on the viability of a system, that is its ability to survive by adapting to its environment through self-awareness, self-maintenance and the development of its own internal operations. This programme encompasses all these aspects by recognising that an organisation is not a project with a fixed time interval but an ongoing system of processes. It, therefore, recognises the need to capture and integrate all of an organisation's external and internal relationships between its environment, its operations, its states, resources and properties and to constantly work to maintain them in a viable state.
- Unlike many applications of the VSM that attempt to apply the principles of the VSM to an organisation from the top down in abstract, missing much of the detail and functionality of the internal systems, the application works both from the bottom up and the top down simultaneously creating a truly integrated viable system.
- To accomplish the full scope of all of the VSM requirements the programme is designed as a comprehensive enterprise management system. That is it integrates the full functionality of an organisation in one system of records, administration, communications, decisions, values, and beliefs. This not only allows the integration of the system's systems but has the additional benefit of reducing the management of data, information, reporting and administration of the system's organisation.
- The programme is designed to run continually as the bedrock of the organisation's knowledge management. It, therefore, is designed to grow as the organisation's complexity develops and to provide access to the VSM's principles in a way that is, quick usable and comprehensive.
- It is particularly designed for co-operatives, as a distributed decision and control system that allows individuals to build an organisation together through mutual collaboration.
- In traditional management vocabulary it can manage;

- The main and distributed purposes of the organisation, its mission, vision, shared values, beliefs and identity.
- Its reputation management.
- Its manpower resources, including HR management, recruiting, manpower numbers, personnel appraisal, training etc
- The management and administration of its fixed resources. Asset and compliance records.
- Scheduling of all its processes and projects and measurement of output against a baseline, dependencies, resource levelling, a Gantt chart
- Priority management throughout the organisation based on Eisenhower matrix.
- Critical path management.
- Managing the multiple states of an organisation and the impact of different conditions on processes, properties and output
- the management of standards, routines, rituals and protocols, Quality management
- The financial aspects; sales, pay, receipts etc.
- Stock control, including the management of storage spaces, the rate of usage and the rate or resupply.
- Forecasting and risk analysis,
- Vertical cohesion of system beliefs, ideals, values and purposes
- An algedonic signal to alert the system of failure
- Full internal communications, records and report writing.
- Knowledge management,
- The ability to scope the awareness of a tasks full resolve; namely the extent of its planning, preparation, risk analysis etc
- Planning through simulation and a distributed mechanism for mutual collaborative decision making.
- Hence the programme provides a practical application that can be used to manage the total viability of any system, overcoming much of the VSM's abstract nature through the use of a project management style interface that encompasses the full scope of an enterprise.
- It, therefore, also provides a means of teaching the VSM through its practical use, helping users through their day to day interaction to gain familiarity with the concepts of the VSM. As a result it has an extensive context driven help system and multiple interactive examples that function as tutorials.

Project Principles

- Implement the Viable System Model following the theories of Stafford Beer as closely as practicable.
- By default, provide an enterprise system to encompass all aspects of any endeavour.
- Build with pure Python using Tkinter for UI, using only the Python Standard Library.
- Exceptionally, use third-party packages that are well-maintained and available via PyPI.
- Keep the UI intuitive and accessible to users unfamiliar with VSM theory.
- Support bottom-up design: allow systems to start simple and grow.
- Provide a comprehensive help and tuition facility.
- Ultimately develop into a distributed application — the current implementation is a learning foundation.

How the VSM Systems are Modelled

The VSM system is modelled on one simple set of principles: ***States have properties - States use resources to undertake processes that change properties***

It is therefore straight forward to adapt this main principle to the VSM Systems to achieve a fully working software version of the VSM that can represent multiple levels of recursion with homeostats, states, processes in all the systems, with System 1 able to undertake tasks, goals and objectives (algenodes), System 2 able to coordinate, maintain routines, administer standards and protocols, monitor cohesion, harmony and ethics, System 3 achieves purpose, coherence, output, emergence, and checks for viability, System 3* undertakes audit, awareness and checks, System 4 monitors external trends and through the user develops plans, risk analysis and anticipation and lastly , System 5 is where beliefs, ideals and values reside and drive the vertical cohesion.

System Functions	"System 5": "Belief", "Ideal", "Value",	"System 4": "Trend", "Plan", "Risk", "Anticipation",
	"System 3": "Purpose", "Coherence", "Output", "Emergence", "Viability",	"System 3*": "Audit", "Awareness", "Check",
	"System 2": "Task", "Coordination", "Routine", "Protocol", "Standard", "Ritual", "Cohesion", "Harmony", "Ethics",	
	"System 1": "Task", "Objective", "Goal", "Heading", "Milestone",	

In some ways this loosely mimics Object Orientated Programming (OOP) that has Objects that have methods that change properties (variables). OOP has similar principles to the VSM in that it requires Inheritance, similar to recursion, Polymorphism, similar to adaptation, and Encapsulation, similar to autonomy. However we must be careful of this simile because although OOP maps well to VSM as a metaphor for modularity and local behaviour with mediated interaction, especially regarding encapsulation, autonomy and polymorphic responses it maps less directly to VSM's core strength, which is explicit modelling of control, coordination, and feedback pathways needed for viability.

- Allow multiple levels of recursion that can be modified at will by adding lower or higher levels at any stage.
- Implement the 6 VSM systems at each level of recursion: S1 Operations, S2 Coordination, S3 Control/Operational management, S3* Audit, S4 Intelligence (environment scanning), S5 Beliefs/Ideals/Values/Identity.
- Provide homeostats, made up of input and output transducers using Bayesian decision processes, between the environment and S1, using a feed from a CSV file to indicate the properties of the environment at any given time interval.
- Provide homeostats/transducers at every level of recursion between all internal systems, to propagate states through the model.
- Provide activities in every system at each level of recursion that are activated by a given state, providing resources with properties that can be modified through work activities.
- Allow activities to change the properties of any state.
- Enable S1 to allocate work to resources using a work schedule.
- Enable S2 to coordinate the activities of S1 through methods of: Coordination, Routine, Protocol, Standard, Ritual, Cohesion, Harmony, Ethics.
- Enable S3 to sum and present the output of coordinated activities and properties and to determine the order of priorities.
- Provide a priority mechanism in S3 at every level of recursion reflecting the importance and urgency of an activity. Importance is derived from S5 policy weights; urgency is derived from state/threshold proximity and algedonic conditions. When no S5 Value governs a process, manual importance uses a fixed 1–9 banded scale — 1–3 Desirable, 4–6 Necessary, 7–9 Essential. S5 governs" when the policy channel overrides it. The Eisenhower Matrix (important/urgent grid) is used as an output display of pre-attenuated variety, not as a manual input tool.
- Enable S3* activities to provide an audit facility of S1 output.
- Provide an algedonic signal to highlight when any property goes out of threshold.
- Enable S4 to monitor trends in the input feed and present results.
- Enable S4 to provide a modelling facility that runs time steps at 15-minute intervals through the whole system to explore how feed input changes states, activates activities, and allocates resources. The facility runs multiple scenarios, possibly using Monte Carlo techniques, to determine the best option. S4 provides a means of anticipating the reaction of the system to different environmental states.
- S5 will be managed by the user but will also be a Bayesian decision maker using the concept of a 3-4 homeostat to decide between S4 simulation run results

The Main Application

VSM Recursions & Activities

File

Recursion	Display Name	Priority
Meta System		
System 5	S5 Beliefs	1
System 4	S4 Anticipation	1
System 3	S3 Coherence	1
System 3*	S3* Audit	1
System 2	S2 Cohesion	1
System 1	S1 Operations	1

SystemEnvironmentAll ResourcesAll Capabilities

Processes for VSM System: S1 Operations

Recursion	VSM System	Homeostat	System State	Process Name	Type	Pri
Meta System	S1 Operations	S1 Homeostat	Ok	Advanced Report Writin	Task	
"	"	"	"	Intro Course	"	
"	"	"	"	Heading	Heading	

RecursionVSM SystemProcess

DetailsNotesResource AllocationWork Schedule

Description:

Advanced Report Writing Course

1. Syllabus

• 3 Weeks of report purposes

• 1 Week of official reports

Name: Advanced Report WritinType: TaskCondition: DormantTags: #Tags...

Heading: (none)

Start: 01-06-2026 09:00End: 30-06-2026 09:00Duration (Md): 21.0Effort (Md): 42.0Man Days Avail: 21

Capability: Normal WeekExc...Type: ASAPConstraint: dd-mm-yyyy HH:MM

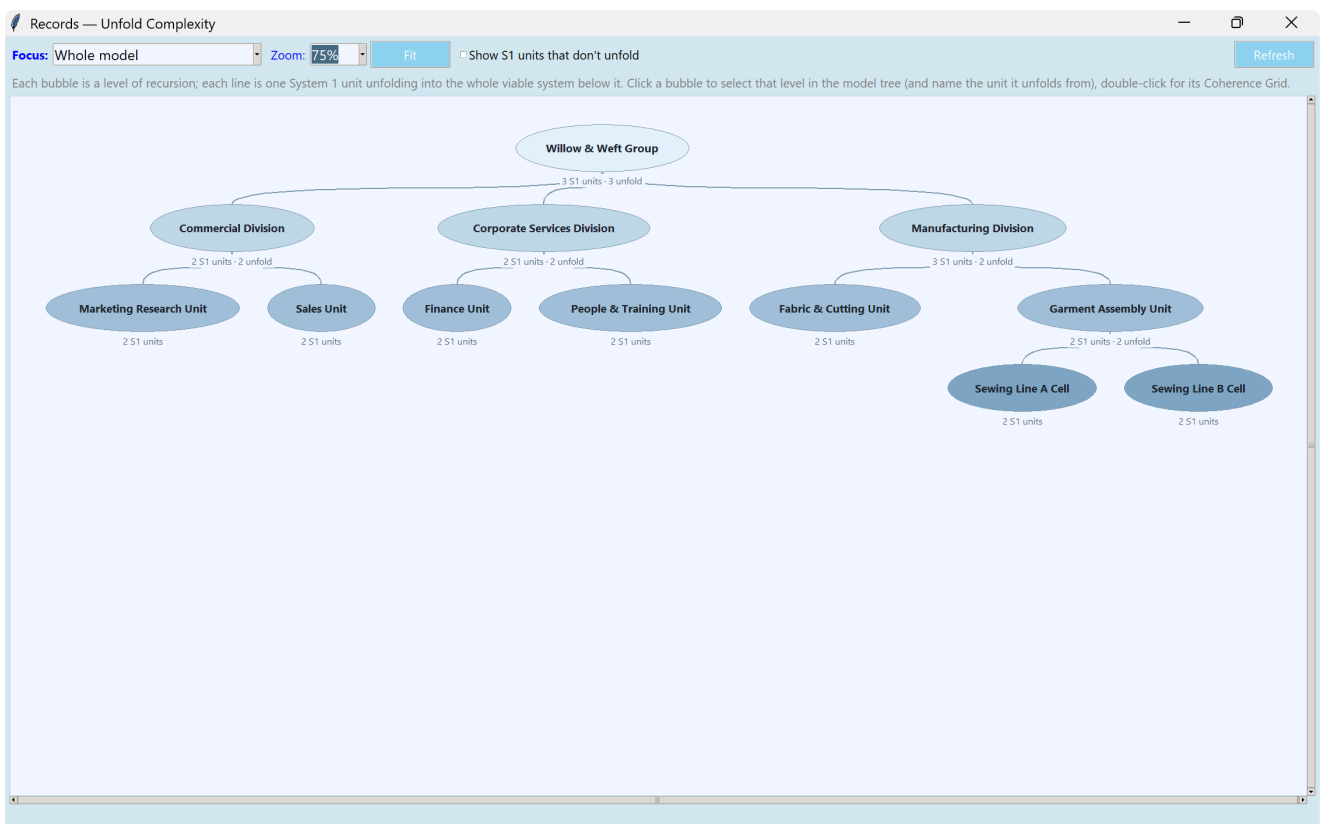
Priority:Urgency:Urg/Imp:Assign%:Qual%:Done%:

Homeostats: S1 HomeostatStates: [S1 Homeostat] Ok[S1 Homeostat] Too Cold[S1 Homeostat] Too Hot

LogicActionGridLinksLogCal

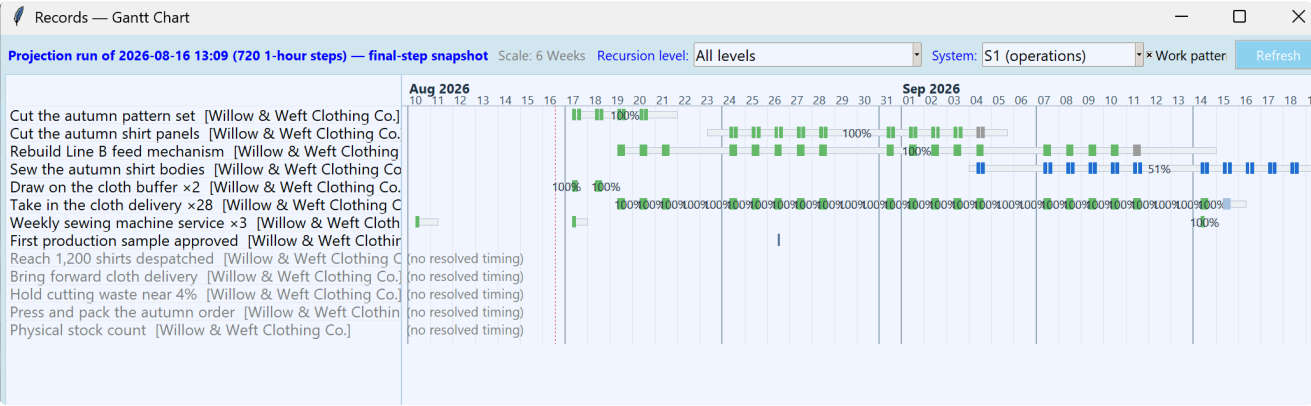
Cancel

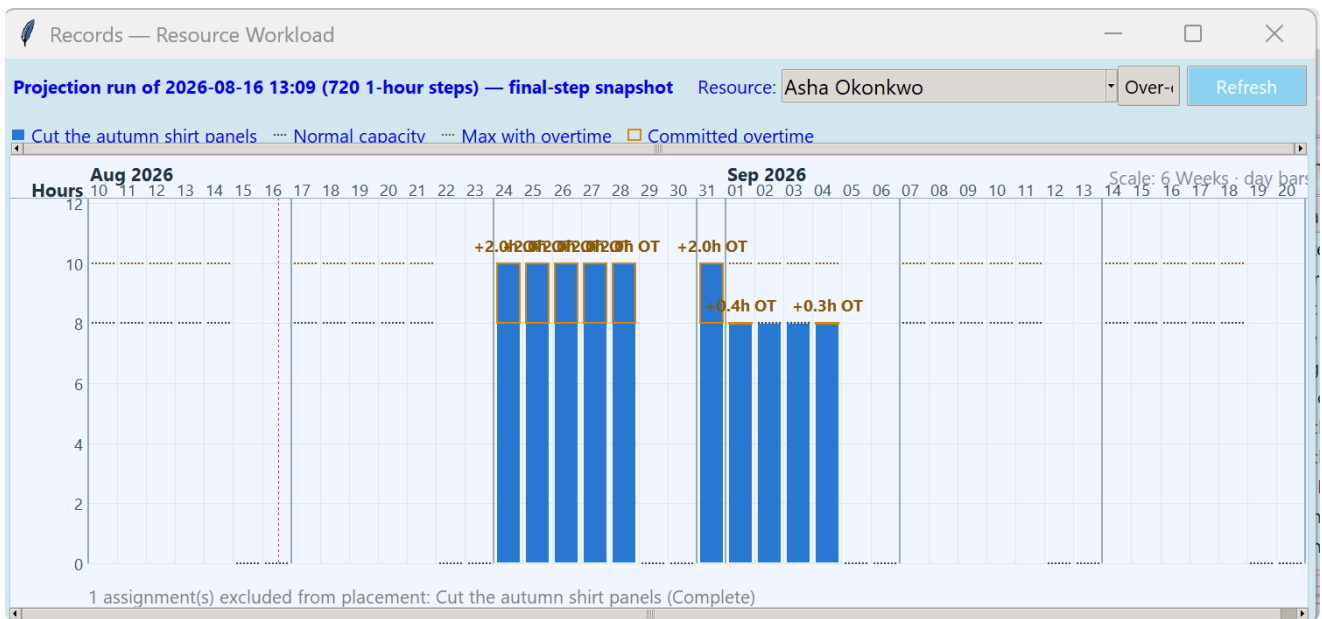
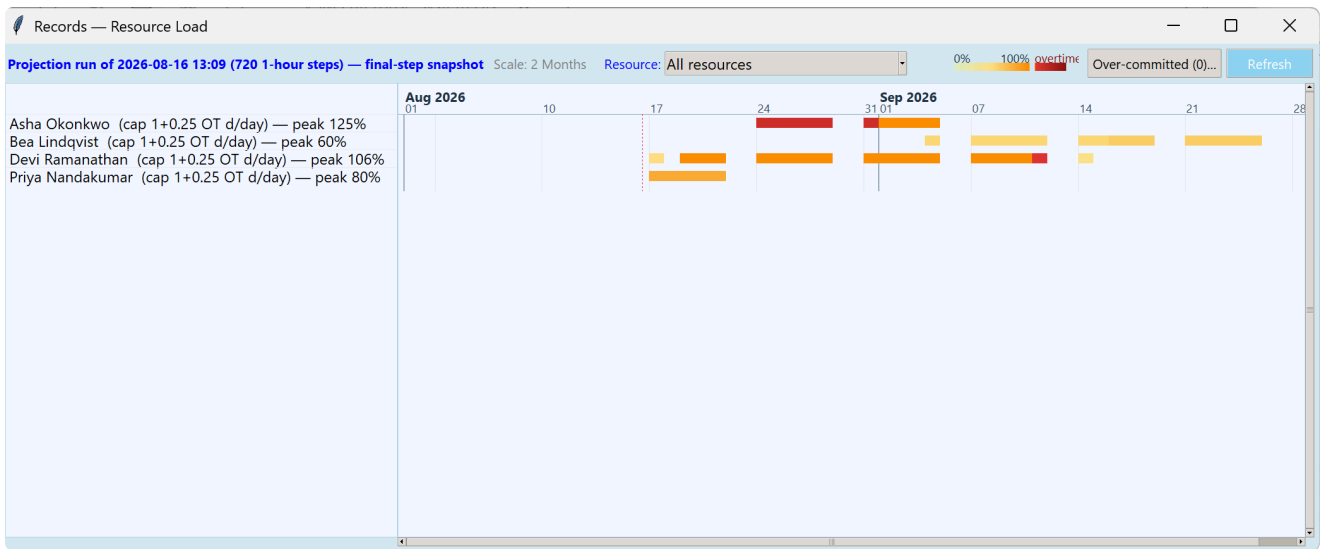
Levels of Recursion



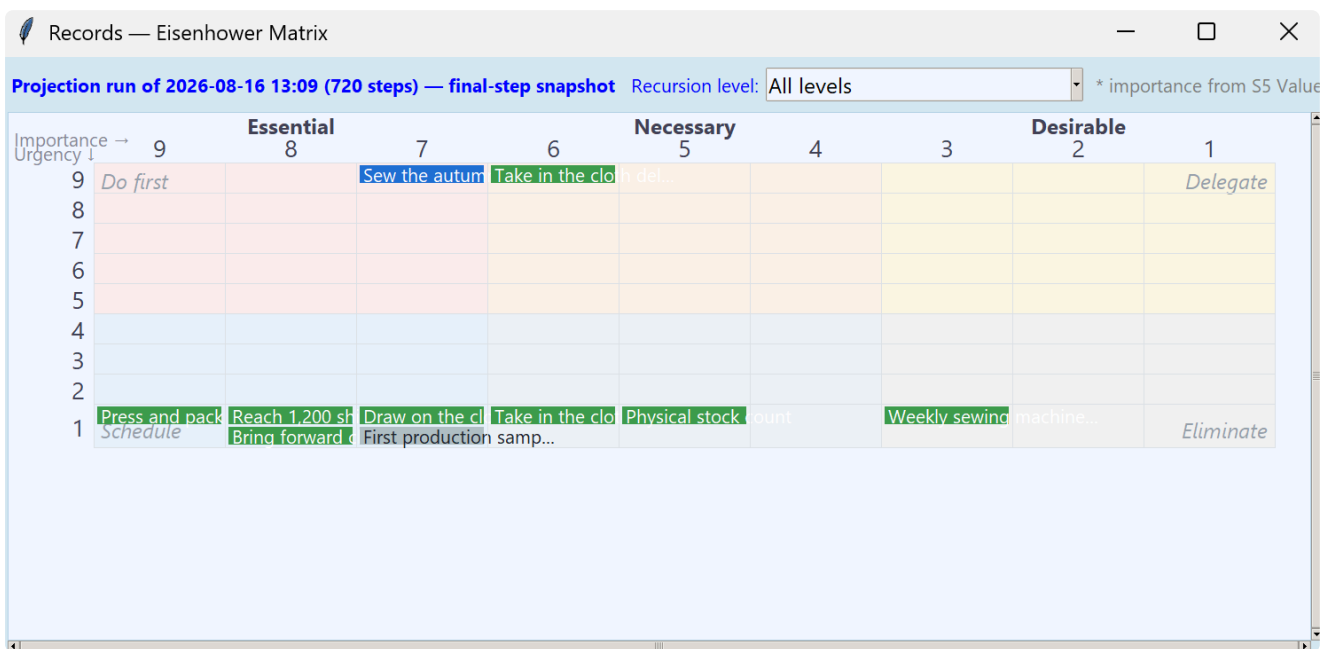
Recursion	Display Name	Priority
Recursion X		
System 5	S5 Beliefs	1
System 4	S4 Anticipation	1
System 3	S3 Coherence	1
System 3*	S3* Audit	1
System 2	S2 Cohesion	1
System 1	S1 Recursion X Ops1 -> Recursion Y1	1
System 1	S1 Recursion X Ops2 -> Recursion Y2	1
Recursion Y2		
System 5	S5 Beliefs	1
System 4	S4 Anticipation	1
System 3	S3 Coherence	1
System 3*	S3* Audit	1
System 2	S2 Cohesion	1
System 1	S1 Recursion Y2 Ops1 -> Recursion Z3	1
System 1	S1 Recursion Y2 Ops2 -> Recursion Z4	1
Recursion Z4		
System 5	S5 Beliefs	1
System 4	S4 Anticipation	1
System 3	S3 Coherence	1
System 3*	S3* Audit	1
System 2	S2 Cohesion	1
System 1	S1 Recursion Z4 Ops1	1
System 1	S1 Recursion Z4 Ops2	1

Project Management Gantt Chart





Priority Management Eisenhower Grids



Readiness Management

Readiness Grid — what we know, what could stop us, what has, and what we are doing

Recursion level: Cutting Room

Centred on: All work at this level

Current model (live database)

Gaps...

Refresh

Right-click a chip to set its coordinate, to link a control to a risk, or to answer a constraint · right-click a cell to record a constraint or mark it cleared · double-click a risk for its controls

	Information	THE SITUATION Risk	Constraint	THE RESPONSE Task	
OP Operate	· prepare	Lays are marked from the docket width	✓ 1 Cloth arrives short of the lay	← Roll 4508 ran 1.4 m short of the lay	Mark the lay
				← Roll 4471 ran 2.1 m short of the lay	✓ Measure the roll before cutting
	· deliver	Roll is 150 cm face width	✓ 1 Seams outside tolerance	Only one cutting table	Cut the Thursday order
		Lay this order from the roll end inwards	⚠ 1 Shade varies between rolls		
NM Norm	· prepare	[S2] Fibre composition labelling	⚠ Labelling declaration not filed before despatch	■ Labelling approval office closed until the 9th	Write the shade-matching SOP
	· deliver	[S2] Seam allowance standard	not examined	not examined	not examined
		[S2] Shade-matching SOP			
AD Administrate	· prepare	not examined	cleared	not examined	⚠ Agree what the cut sheet records
	· deliver	not examined	not examined	not examined	Keep the cut sheet Cutting spot check

Unassigned at this level (2)

Sharpen the shears Sweep the cutting floor

22 item(s) placed · 2 unassigned · 2 of 3 constraints were foreseen

Vertical Cohesion Applying Values, Ideals, Purposes and Beliefs

Coherence Grid — what-where's (S3 Purposes × S5 Ideals)

Recursion level: Willow & Weft Clothing Co.

Rows: Purposes (what we do) · Columns: Ideals (where we are going) · Cells: what-where Directive

Mission / Vision...

Values: Craft standing, Hours we ask of people, Promises kept

IDEALS (WHERE) →
PURPOSES (WHAT) ↓

Keep cutting waste under 5%

Deliver on our promises

Look after the people who make it

No autumn order slip

We hit the autumn d

Click an empty cell to author a what-where Directive; click a Directive to edit or link implem

Unassigned processes

S1/S2 work with no what-where justification

Autumn Shirt Run (Heading)

Bring forward cloth delivery (Task)

Cut the autumn pattern set (Task)

Draw on the cloth buffer (Task)

Draw on the cloth buffer — 2026-08-16 13:24

First production sample approved (Milestone)

Hold cutting waste near 4% (Objective)

Physical stock count (Task)

Reach 1,200 shirts despatched (Goal)

Rebuild Line B feed mechanism (Task)

Sew the autumn shirt bodies (Task)

Take in the cloth delivery (Task)

Weekly sewing machine service (Task)

Weekly sewing machine service — 2026-08-1

Resource and Knowledge Management with Integrated Markdown Editor and Obsidian Like Linking

Description — Suzuki Jimny SZ4

Overview of the 2013 Suzuki Jimny SZ4

The 2013 Suzuki Jimny SZ4 is a compact and rugged 4x4 SUV designed for off-road capabilities while maintaining a small footprint. It is known for its distinctive styling and practical features.



Key Specifications

Feature

Details

Engine

1.3-litre petrol

Power Output

83bhp

Torque

81Nm

Transmission Options

5-speed manual or 4-speed auto

Dimensions

Compact size for off-road use

Design and Features

M▲

8

Cancel

VSM Recursions & Activities

File

Run

Search

Records

Help

► Step

⌕ Reconcile

Project...

Recursion

Display Name

Order

~ Meta System

System 5

S5 Beliefs

1

System 4

S4 Anticipation

1

System 3

S3 Coherence

1

System 3*

S3* Audit

1

System 2

S2 Cohesion

1

System 1

S1 Home

1

System 1

S1 Garden

2

System 1

S1 Car

3

System

Environment

All Resources

All Capabilities

All Properties

Resources

Role Catalogue

Resources

Name	Type	Category	Capability
Suzuki Jimny SZ4	Equipment	Transport-Car	Full 24-7

Assigned Roles

Actual Properties

Assigned Work

Property	Category	Type	Value	Min / Max	OK	Action	Recorded
Car Tax (days remaining)	Transport-Car	numeric	349.37	1 /	✓	-1/day	2026-08-15 22:49
MOT (days remaining)	Transport-Car	numeric	209.03	1 /	✓	-1/day	2026-08-15 14:46

Recursion

VSM System

Details

Notes

Homeostats

States

Recursion

VSM System

Display Name

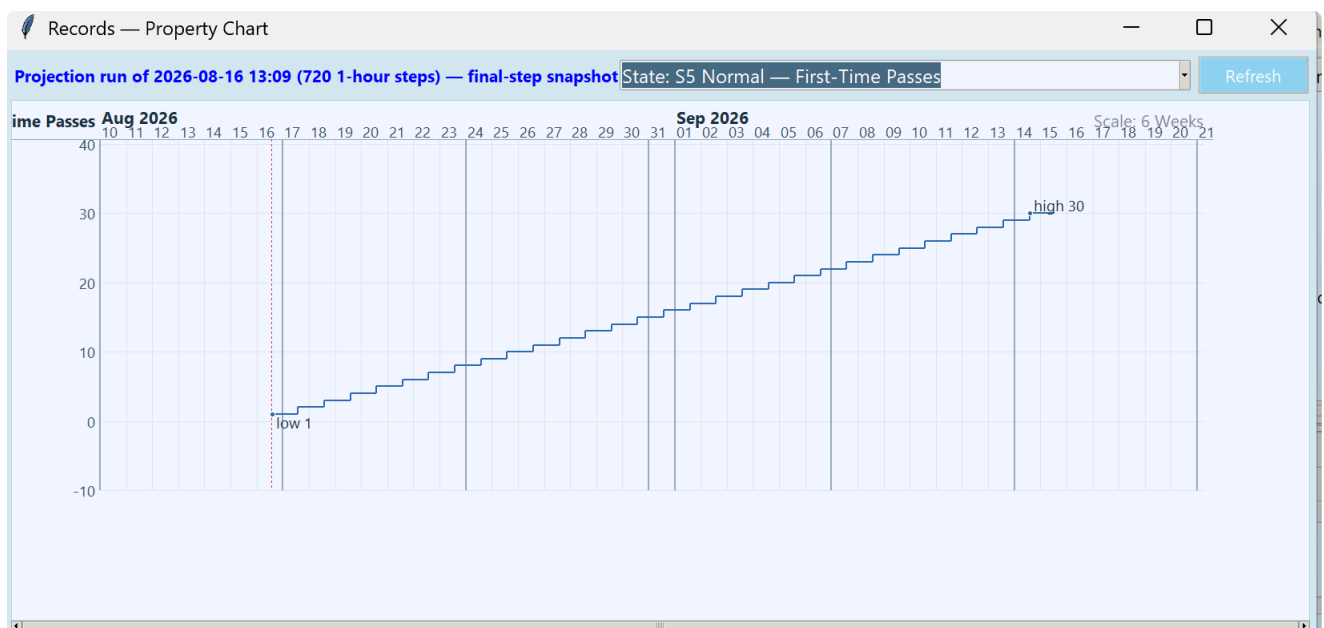
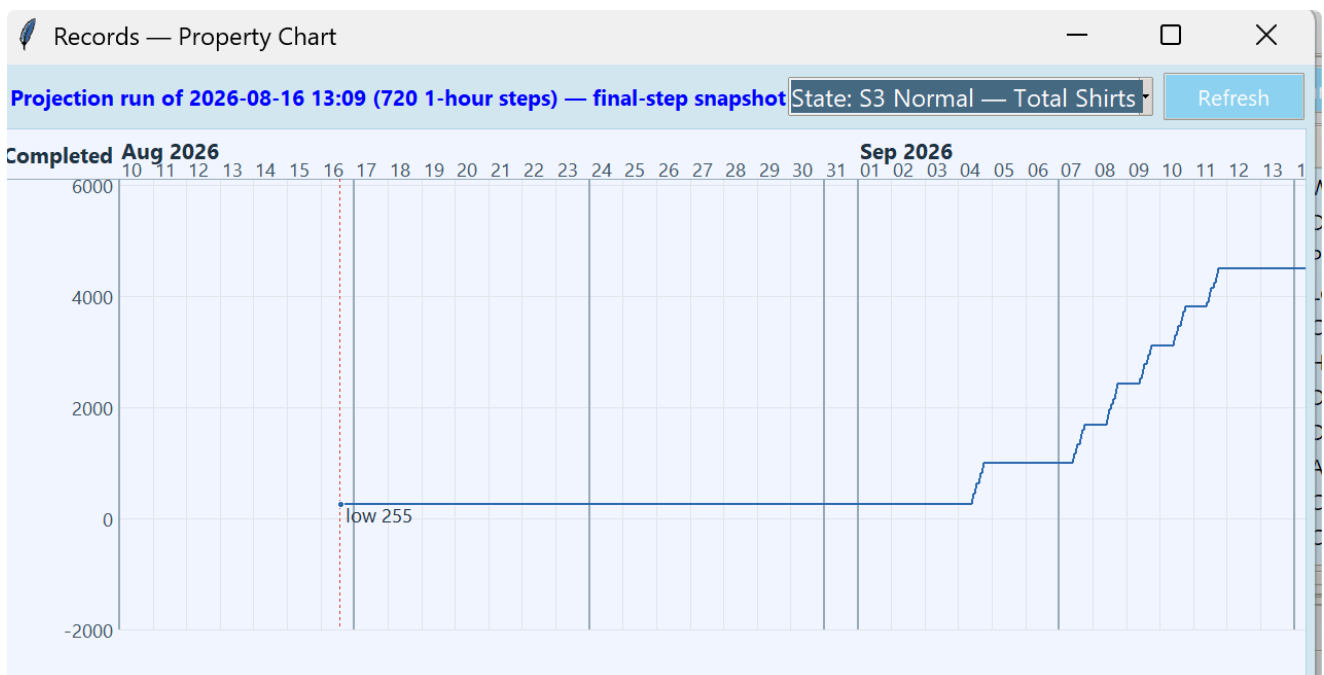
Meta System

N/A

N/A

Description Preview

No description provided.



Algedonic Signals

Records — Algedonic Log

Algedonic signal log (most recent 500) Clear Log... Refresh

Raised ▼	Type	Severity	Process	Violation	Message
2026-08-16 12:09	THRESHOLD	WARNIN	Sewing machine 3	PROPERTY_THRESHOLD	'Stitch Tension' on resource 'Sewing machine 3' has gone past its ma
2026-08-16 12:09	THRESHOLD	WARNIN	Sewing machine 2	PROPERTY_THRESHOLD	'Hours Since Service' on resource 'Sewing machine 2' has gone past i
2026-08-16 12:09	RITUAL	INFO	Monday line huddle	RITUAL_FIRED	Ritual 'Monday line huddle' set S5 property to 1.0.
2026-08-16 12:09	CHECK	WARNIN	Stock count reconciliat	CHECK_DISCREPANCY	Manual reading for 'Cloth Stock (m)' (205) disagrees with the model's
2026-08-16 12:09	VIABILITY	WARNIN	Cut the autumn pattern	VIABILITY_CRITICAL	'Cut the autumn pattern set' (priority ≥ 7) depends on 'Priya Nandaku
2026-08-16 12:09	EMERGENCI	INFO	Autumn run emergenc	NEGATIVE_EMERGENC	Emergence factor 0.902 below threshold 0.95: the combined 'Shirts C
2026-08-16 12:09	COHERENCI	INFO	Weekly sewing machin	COHERENCE_GAP	'Weekly sewing machine service — 2026-08-10 08:00' shows none of
2026-08-16 12:09	COHERENCI	INFO	Weekly sewing machin	COHERENCE_GAP	'Weekly sewing machine service' shows none of the expected words i
2026-08-16 12:09	COHERENCI	INFO	Rebuild Line B feed me	COHERENCE_GAP	'Rebuild Line B feed mechanism' shows none of the expected words i
2026-08-16 12:09	COHERENCI	INFO	Take in the cloth delive	COHERENCE_GAP	'Take in the cloth delivery' shows none of the expected words (Coher
2026-08-16 12:09	COHERENCI	INFO	Physical stock count	COHERENCE_GAP	'Physical stock count' shows none of the expected words (Coherence
2026-08-16 12:09	COHERENCI	INFO	Draw on the cloth buff	COHERENCE_GAP	'Draw on the cloth buffer — 2026-08-16 13:24' shows none of the exp

Report Writing

Report preview

What matters most

Top 5 priorities

#	Process	Quadrant	Priority	Urgency %	Assigned %	Done %
1	Draw on the cloth buffer – 2026-08-16 13:24	Do first	7	100	100	0
2	Cut the autumn pattern set	Do first	8	92	100	0
3	Cut the autumn shirt panels	Do first	8	69	100	0
4	Rebuild Line B feed mechanism	Do first	7	68	100	0
5	Sew the autumn shirt bodies	Schedule	7	37	100	0

The main cut in detail

Cut the autumn shirt panels

Type	Condition	Priority	Urgency %	Assigned %	Done %	Start	End	Duration (d)	Effort
Task	Active	8 (Essential)	69	100	0	2026-08-23 08:00	2026-09-05 17:00	14.0	11.5

Description

Lay up and cut 1,200 shirt bodies, fronts, collars and cuffs.

Booked across a fortnight against the promised despatch dates. Overtime is permitted on this one — it is the job we would protect at the cost of a late evening, and it is the reason the deadline is typed in rather than left to the system.

Cutting quality decides the finish downstream: a panel cut a millimetre out is a collar that never sits right, and no amount of care on the line recovers it.

Directives

- Keep cutting waste under 5% × Look after the people who make it: We hit the autumn dates without asking anyone for more than the hours we said we would.

Homeostats and Transducers

S1 Homeostat In

+Env

-Env

+Prop

-Prop

Persistence:

Feed: Weather

Input: [Sub] S3 Homeostat Out

Date: 2024-01-11 12:00

Stormy Dull Fine Swelter

P(E|P) Results: 0.464 0.382 0.108 0.047

Feed Property	Property Value	Prob/Wt P(P)	Lik'hd P(P E)
[Feed: Weather] Temper.	4.800	0.02	0.00
[Feed: Weather] Rain	8.500	0.49	0.50
[Feed: Weather] Wind Sp.	32.500	0.37	0.23
[Feed: Weather] Pressure	992.000	0.12	0.00

Normalize & Calculate

Save

Learning Mode

S1 Homeostat Out

+Env

-Env

+State

-State

Persistence:

Stormy Dull Fine Swelter

P(Env) Input: 0.464 0.382 0.108 0.047

System State	Prob/Wt P(E)	Lik'hd P(S E)
Too Wet	0.502	0.97
OK Weather	0.405	0.03
Too Hot	0.093	0.00

Normalize & Calculate

Save

Learning Mode

VSM Recursions & Activities

FileRunSearchRecordsHelp

StepReconcileProject...

Recursion	Display Name	Order
Meta System		
System 5	S5 Beliefs	1
System 4	S4 Anticipation	1
System 3	S3 Coherence	1
System 3*	S3* Audit	1
System 2	S2 Cohesion	1
System 1	S1 Home	1
System 1	S1 Garden	2
System 1	S1 Car	3

SystemEnvironmentAll ResourcesAll CapabilitiesAll Properties

Feeds for Recursion: Meta System

Meta System	VSM System	Feed Name
Meta System	S1 Car	New Environment Feed

RecursionVSM SystemFeed

DetailsNotes

Recursion: Meta SystemSystem: S1 Car

Feed Name: New Environment FeedCSV Path: C:/Users/jonat/Work/Python_Projects/Thinker/CS

Description:Weather Feed
This feed provides weather paramaters of Temperature, Rainfall, Wind speed, Presure

Data Prev:

datetime	Temperature	Rain	Wind Speed	Pressure
2026-08-05 08:00	11.0	0.5	8.0	1012.5
2026-08-06 08:00	9.5	1.5	12.0	1008.0
2026-08-07 08:00	4.2	8.0	22.0	990.0
2026-08-08 08:00	4.8	8.5	32.5	992.0
2026-08-09 08:00	5.5	7.0	22.0	1000.5
2026-08-10 08:00	6.3	7.5	9.0	1005.0
2026-08-11 08:00	7.1	1.0	8.5	1010.5
2026-08-12 08:00	10.0	0.0	0.0	1015.0
2026-08-13 08:00	15.2	0.0	0.5	1015.0
2026-08-14 08:00	14.3	0.5	0.0	1014.5

Cancel