

Briefing Note: The Swiss Cheese Model

The Model

The Swiss cheese model explains how organisational systems fail despite having several layers of protection in place. It was developed by the psychologist James Reason from his research into human error and organisational accidents (Reason, 1990; 2000).

The model pictures each of an organisation's defences as a slice of Swiss cheese. Defences include technology, procedures, training, supervision and management oversight. No defence is perfect, so each slice has holes. Most of the time, a hole in one slice is covered by another slice. An incident occurs when the holes in several slices line up, allowing a hazard to pass through every layer.

The model has been used widely in healthcare, aviation and other safety-critical industries, and the same thinking underlies the principle of "defence in depth" in cyber security.

Key concepts

Concept	Meaning
Layers of defence	The barriers an organisation relies on to prevent harm, such as systems, rules, checks and oversight
Active failures	Unsafe acts by people at the front line, such as a mistake or a missed step. Their effects are usually immediate and short-lived
Latent conditions	Weaknesses built into the system by decisions made higher up, such as under-staffing, poor design or deferred investment. They can lie dormant for years before combining with an active failure
Holes that move	Holes open, close and shift over time, so the alignment that allows an incident is often temporary and hard to predict

Reason (2000) contrasts two ways of responding to failure. The **person approach** blames the individuals at the front line. The **system approach** asks why the defences failed and how the conditions that produced the error can be changed. The Swiss cheese model is a system approach: it directs attention away from individual blame and towards organisational decisions.

Applying the model: the Corran case

In the PHP2Shell exercise, Corran's Brazilian subsidiary, ViajaBem, was exposed while the main platform was not. The Swiss cheese model shows why: several layers of defence had holes at the same time.

Layer of defence	The hole at ViajaBem	Type
Software	Ran PHP 7.4, which no longer receives official security fixes	Latent condition
Monitoring	Not covered by the group's security team	Latent condition
Supplier management	Run by a local IT supplier with no group oversight	Latent condition

Layer of defence	The hole at ViajaBem	Type
Strategic decisions	Integration deferred to 2027 to save costs	Latent condition
Governance	The CISO reported to the CIO, so cyber risk did not reach the board directly	Latent condition

Every hole in the table is a latent condition created by management decisions, not a mistake by an individual. Blaming the local IT supplier would be the person approach; the model directs attention instead to the decisions made in London.

The same reasoning applies beyond cyber security. Business failures such as product recalls, supply chain disruption or compliance breaches can often be traced to latent conditions created by earlier strategic choices.

Criticisms of the model

The model is widely used, but it has attracted sustained criticism.

- **It is linear and static.** It presents failure as a sequence of holes lining up. Systems thinkers such as Leveson (2011) argue that many failures arise instead from complex interactions between parts of a system, which a row of slices cannot capture.
- **It is a metaphor rather than a testable theory.** Perneger (2005) found that healthcare professionals interpreted the model's elements inconsistently, which limits its precision as an analytical tool.
- **It favours hindsight.** After an incident, the holes are easy to identify. Before it, they are much harder to see, and the model offers little guidance on finding them in advance.

Larouzee and Le Coze (2020) review these criticisms and argue that the model remains valuable, provided its limits are understood. Reason himself acknowledged that it simplifies how organisations fail.

Using the model in your own work

At Level 7, you are expected to evaluate the models you use, not only apply them. When you use the Swiss cheese model:

1. identify the layers of defence that were relevant to the case, and the holes in each;
2. distinguish active failures from latent conditions, and trace the latent conditions back to the decisions that created them;
3. evaluate what the model does not explain, such as interactions between parts of the system or why the holes were not seen beforehand;
4. support your evaluation with the critical literature, not only with Reason's original work.

Reason (1990; 2000) are seminal sources and may be cited alongside more recent work such as Larouzee and Le Coze (2020).

References

Larouzee, J. and Le Coze, J.C. (2020) 'Good and bad reasons: the Swiss cheese model and its critics', *Safety Science*, 126, 104660.

Leveson, N.G. (2011) *Engineering a safer world: systems thinking applied to safety*. Cambridge, MA: MIT Press.

Perneger, T.V. (2005) 'The Swiss cheese model of safety incidents: are there holes in the metaphor?', *BMC Health Services Research*, 5, 71.

Reason, J. (1990) *Human error*. Cambridge: Cambridge University Press.

Reason, J. (2000) 'Human error: models and management', *BMJ*, 320(7237), pp. 768-770.