



**Update Inertia:**  
The psychology  
behind patching and  
updating software

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## Foreword

Many IT experts working in a small to mid-size business environment will be familiar with the conversation they have with their management team about maintaining security integrity of the IT systems. And they will probably also recognize the point where they find that management simply doesn't seem to hear them say how important it is or that it should take priority when a patch or update is needed.

Most people will share their experiences and frustration around keeping software updated – no matter that it is one of the best ways to increase security. People, regardless how well-informed or capable, don't always follow advice even when it's in their best interests. Not all small business owners or managers are IT experts either.

Patching and updating are critical for security. The Avast PC Trends Report 2019 highlights that the average PC is six years' old with 47% still running Windows 7 OS. Worryingly, 55% of software is out

of date, leaving these programs vulnerable to security flaws and incompatibilities.

Given this, from an intellectual standpoint, our updating behavior should be straightforward. Most IT experts would say it's an effective way to increase security and so updating IT is a logical action for a small business to take. However, from a psychological and user perspective, it's often seen as a time-consuming and/or high-cost activity with perceived low benefit. This therefore requires the in-house IT manager or team to be creative and persuasive when addressing the issue.

As an IT leader, helping you understand the psychology behind your management's view of update activation or their 'update inertia' could help you revisit your communication strategy around the job to do.

Avast teamed up with ORConsulting, a Psychology Practice for Business, to identify the barriers to updating IT and to find out if the science can help get technology messages heard, boost security, and improve the relations between IT and small business management. The following report provides guidance on how to reframe conversations about technology updates to make them more likely to be understood and acted upon.

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## Habituation

In 2014, a team of US researchers<sup>1</sup> wanted to find out what actually happens inside our brains when we look at screenshots of security warnings.

What they discovered starts to put some scientific rigor behind why people don't update their devices straight away or at all.

When people were shown realistic security warnings on a screen, regions of the brain associated with fear responses became more active. This seems like good news – that at least our brains perceive there is a threat out there. The bad news is that with repeated exposure to the message, our brains start to pay less and less attention to it.

Repeated exposure to a security warning – particularly if we've ignored one before and nothing bad happened – leads to habituation. Habituation is a natural (and, in most cases, helpful) response from the brain because tuning-out unnecessary stimuli frees up mental capacity to focus on the task in hand.

It is simply inefficient for the brain to focus on everything. Imagine how tired you'd be on your morning commute if you had to process all the sounds, sights, smells, and other sensations from the world around you.

### HOW TO TACKLE THIS?

Habituation doesn't just apply to security warnings but to any repeated message that your customers hear from you. Cutting through habituation requires creativity.

Airlines, for example, have recognized the problem with their own safety briefings. How many of us, once we've taken more than a few flights, actually watch the safety demonstration before a flight? The most effective airlines re-imagine their videos by introducing a degree of humor, different styles of music, and shifting the narrator unexpectedly – anything to get our brains to pay attention.

So, while it might be really tempting to dismiss inertia as laziness, it is much more complicated than that.

<sup>1</sup> Anderson, Kirwan, Vance, Eargle & Howard., "Users Aren't (Necessarily) Lazy: Using NeuroIS to Explain Habituation to Security Warnings." Thirty Fifth International Conference on Information Systems, Auckland 2014

## Past Experiences & Over-Generalization

A team of UK and US researchers<sup>2</sup> recently examined how people experience the process of updating software. They found six discrete stages:

- **Awareness:** of the need to do it
- **Deciding:** the crucial 'in the moment' calculation of costs vs benefits
- **Preparation:** stopping or changing what I'm doing in order to update
- **Installation:** the experience of watching / waiting while the software updates
- **Troubleshooting:** managing any requests for information or surprises that occur
- **Post state:** an evaluation of whether my upgrade effort was worthwhile

In this report, we're going to focus on the 'deciding' stage and, in particular, the finding that past experiences play a crucial role in making this, very often, split-second decision.

The research confirms that negative past experiences can result in upgrade inertia or avoidance, almost irrespective of how important the update may be for security reasons.

It's worth exploring this because it may mean that bad past experiences for your business' managers can override any logic that you might be providing.

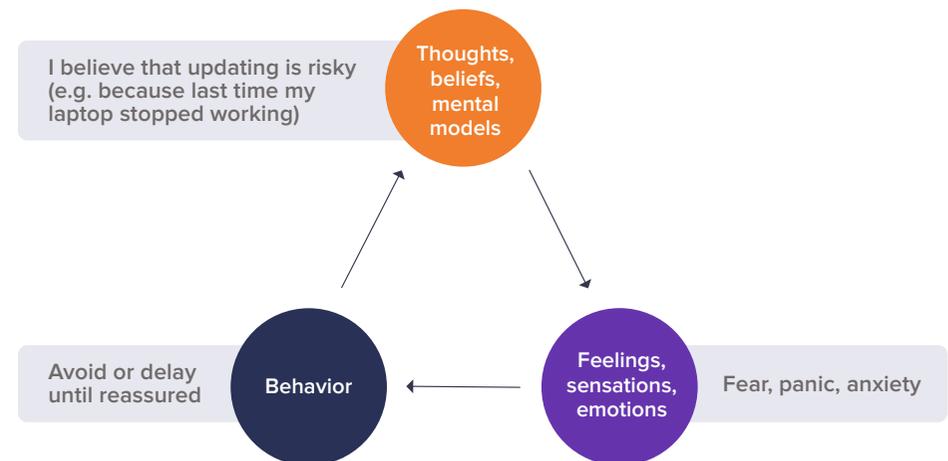
When we look at what is happening here, we start with the human brain which can be viewed as a 'get out of the way quick machine'. While it's capable of doing very logical things, it also has to make sure we are safe physically and psychologically – so it's extremely well practiced at seeking rewards and minimizing threats. If you've ever burned your finger by touching a flame, it would be sensible for your brain to save this association because of its potential usefulness in the future.

We're talking here about the brain's limbic system. The limbic system is in a pretty constant tussle with the frontal lobes of the brain which are associated with logical reasoning. Was that person really pleased to see you? Did that handshake feel OK? Does your boss really just want a 'quick chat'? Can I be bothered to go to the gym?

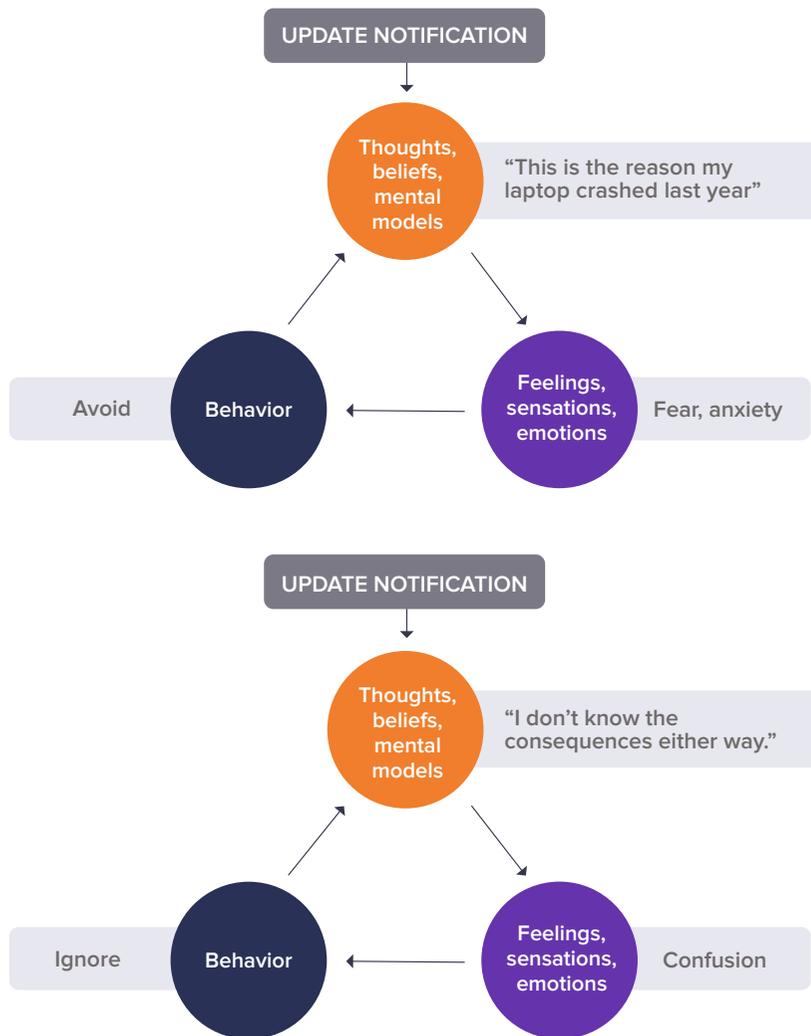
**In a fight between logic and emotion, it's very often the limbic system that wins.**

What also emerges from the research around software updates is that people's mental models are pretty fuzzy when it comes to understanding security threats and what patches and updates actually do.

So, if you combine these two things together, lots of people will overgeneralize so that all updates are associated with a bad past experience. It's a self-fulfilling prophecy that ends up like this:



<sup>2</sup> Kami Vaniea & Yasmeen Rashidi, "Tales of Software Updates: the process of updating software." Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems.



When technical experts try to influence people, they often rely on logic – assuming that facts and evidence will speak for themselves. Updating behavior is much more complex and messy than that. Encouraging people to talk about their past experiences could really help them become less fuzzy and start to challenge the core beliefs they have. Many people won't recognize they have these core beliefs until they start talking.

### HOW TO TACKLE THIS?

Being able to talk honestly about their concerns gives you the ability to demonstrate you understand them – and that is one of the keys to being a trusted advisor.

The key to unlocking the self-fulfilling prophecy is not to be too obvious – people resist change when they sense someone is trying to change their mind for them.

Start first with seeking to understand. You don't have to agree, provide sympathy, or explanations at this point – simply aim to understand what their experiences have been.

As security experts, we can be more helpful, advisory, and influential when we've demonstrated our understanding – then we can start to ask them questions that might help them see that their core beliefs are based on specific incidents, rather than warranting an over-generalized one.

The point is that we will be exponentially more influential if our own views and opinions are offered *after* we've demonstrated some non-judgmental listening.

## Framing – What's The Bird Seed?

Imagine you're in a room with a chicken. Your task is to get the chicken into the corner. You've got some tools to help: a megaphone, some strong tape, a stick, and a packet of bird seed.

It hopefully wouldn't take you long to work out that the bird seed is the most efficient method. Shouting at the bird using the megaphone is understandable but not very productive; hitting it with a stick is cruel and it will run away; and wrapping its wings with tape and putting it in the corner is also cruel and you'd have to catch it first. So, in the end you work out that the bird is attracted to the seed.

The human brain is obviously more complex than the chicken's but they both share a fundamental operating principle: minimize threat = maximize reward.

So if you try to get people to do things by using various forms of (red) tape, loud messages and threats, or hope that people will do things simply because they've been told to, the chances are you won't succeed.

### People do what they are attracted to.

Think about a recent sales negotiation in which you were involved. In every successful sale, there was something in the way the offer was framed that was attractive to you, the customer, either because it reduced a threat or promised a reward (or both). This is framing.

### Framing is a skill to be nurtured.

Think about the director of your company for a moment. When you talk with them about security updates, what do they actually hear? Or if you are the director of your business, what is your response when you are faced with security updates to be made to your business IT? Do they/you hear it as a necessary (albeit important) chore? Or do they or you hear it as a way in which they or you can keep the business more up to date, stronger and more resilient than the competitors?

### The latter 'framing' feels a lot more attractive.

The effects of framing help us to understand why people are more likely to buy food which is labelled as being 90% fat-free rather than being 10% fat. Why people buy more kale and broccoli when it's labelled as a superfood rather than as just 'green vegetables'. When we look positively at what a Paralympian can achieve rather than feeling sorry for a disabled athlete.

### Framing is not trivial at all. People win elections as result of it.

The principle is about finding a frame that resonates – that rewards on some deeper level – that is the bird seed for that person or group.

There is a tendency for example, for IT developers to frame updates around security, whereas non-expert consumers find usability a more attractive frame<sup>3</sup>.

Mathur<sup>4</sup> found that Android users were more or less likely to use auto-updating on mobile applications based on a couple of deeper level factors. People who were more risk averse in terms of ethical dilemmas and/or financial investments were more likely to avoid auto-updates. Some of your customers will fit this profile. For them, a more attractive frame could be to spell out the risks:

"Not switching auto-updates on for security updates increases the chances of someone gaining access to your bank account or stealing your credit card information."

3, 4 Mathur & Chetty, "Impact of User Characteristics on Attitudes Towards Automatic Mobile Application Updates." Proceedings of the Thirteenth Symposium on Usable Privacy and Security, July 12–14, 2017, Santa Clara, CA, USA

## HOW TO TACKLE THIS?

People obviously don't have a sign on their foreheads telling us what matters to them, so finding the right frame can be a matter of trial and error, but it's certainly much easier if you've spent time listening to them. If you want some general pointers, however, David Rock<sup>5</sup> developed **SCARF** as a useful acronym for thinking about rewards and threats and how we can frame to trigger them.

### Status

We know the brain activates (positively and negatively) when we perceive a boost or a set-back to our sense of status.

So how does updating software boost your business' status in some way? One of the problems may be that being up to date is invisible – there's a reason why airlines have 'gold cards' for their frequent fliers, why TripAdvisor gives you credit for the number of contributions you make – these are visible status boosts that prompt and encourage engagement. Can you make the status benefits of what you're offering more visible to those who need to weigh in on the decision? Is it clear that updating and applying patches makes the business more competitive than others, more progressive? Does it make them more up to date than other people?

### Certainty

We can all cope with a degree of uncertainty but too much of it releases stress hormones. Conversely the brain releases little hits of dopamine when a familiar, expected, predictable result occurs.

People often avoid updates because they are uncertain of the benefits. Specifically, there is doubt around: the cost of updating (e.g. time taken, downtime/loss of productivity, disk space) the necessity of the update (is it clear why I need to do this?) and the risks of updating (data loss/backup, will it be malicious? will it be superseded? will it have bugs?)

Anything you can say or do to boost certainty will help.

### Autonomy

People don't like being told what to do. We don't mind a bit of direction but we prefer options and choice.

If we tell people they have to update, however sensible the advice, we run the risk of triggering the same type of brain response as when an animal is backed into a corner. Obviously, we can't just let people choose their own paths, but it is certainly worth giving options whenever possible.

### Relatedness

The brain very quickly categorizes the people we meet into friend or foe. Can I relate to this person – find some form of human connection? If we can, great. If we can't, then our brains use very different pathways to interpret what they're saying to us and our capacity for empathy is reduced.

The same is true for brands. Our update behavior can be heavily influenced by how much we relate to, connect with, and trust the source of the message or provider of the software. Equally, in small companies particularly, people may get a relatedness boost if they know that by updating when requested, they are doing what most other people in their company do – in other words, that they are part of the crowd. People are social animals after all.

### Fairness

If you have siblings then you already know that it matters how the cake gets sliced. The brain produces threat responses when things aren't fair and rewards when they are.

Updating can be framed positively as being fair if everyone does it within the requested time frame – and unfair for the majority if people don't. From a security standpoint, fairness is a relatively easy frame – that it's not fair if a third party has access to your data but has not plugged their software holes.

<sup>5</sup> David Rock, "SCARF: a brain-based model for collaborating with and influencing others." NeuroLeadership Journal. Issue 1. 2008.

## Behavioral Economics

People don't always do what they say they're going to do and certainly don't always do as they're told. It is for this reason that anyone who needs to influence people to upgrade software has to be creative about it. Fortunately, over the last few decades there's been a real growth in a highly applied field originating from the fusion of psychology with economics.

Behavioral economics highlights a huge number of unconscious biases, quirks and influences on the way humans make decisions (and not just financial ones). If we accept that people don't always do what they're told (even when it's in their best interest), knowledge of these biases can help us be creative in the way that we nudge people in the right direction.

In this section, we'll take a look at a selection of these biases and encourage you to think about how they apply to your business and ways to influence them.

Our article comes with a health warning. There are very few 'plug and play' solutions here – it really is a case of experimenting, collecting data, and seeing what works.

### Fundamental Attribution Bias

(aka – Don't underestimate the context!)

When we're trying to figure out other people's behavior, we are heavily biased towards thinking there's an internal reason for it. However, when we explain our own behavior, we tend to point to the external situation.

Think about the last time someone pulled out in front of you in a car, or drove too close behind you – you probably thought they were an 'idiot' or whatever insult came to hand. Either way, you assumed it was something about them as a person that made them do it. But whenever you've done the same, you no doubt had a very reasonable **external** reason for your behavior (it was an unfamiliar road, a new car, you had to get to an important meeting).

#### HOW TO TACKLE THIS?

When you're next frustrated that people aren't updating their software, make a mental note of your reaction and think about how you can influence the context rather than the person.

We've all been to meetings in which the context wasn't set up for people to feel engaged. We've all seen people present information when the audience was distracted or hungry – and still the presenter continues. We underestimate the context so, look at what else is going on when you're trying to convince people. How would they explain their behavior? Is anything in their explanation open to change?

## Diffusion of Responsibility

(aka – I'm just one of many!)

One of the very first experiments in Psychology involved measuring the effort people exerted during a tug of war. They found that the more people were added on to a team – the more tempting it was for people to exert less individual effort.

In smaller organizations, the effect is reduced: 'I know I need to pull my weight when it comes to IT policies because if we're non-compliant then it's pretty obvious it's me that let the team down'. In larger teams and companies, the effect is magnified. It's just easier to assume that as long as most other people are behaving properly then we'll be OK. What difference does my behavior make?

So how do we increase ownership and personal responsibility? Naming and shaming could be one solution, though this comes with the risk of a backlash. Random checks are another approach that in some places has encouraged greater responsibility.

### HOW TO TACKLE THIS?

When the UK health service wanted people to donate more blood, they found that a simple change in their advertising led to a 10% increase in donations. The change was simply to name a specific town or region. 'Blood stocks are low in (your town), please help' was more effective than saying 'Blood stocks are low across the UK, please help'.

This positively framed message was able to cut down the diffusion of responsibility and create the sense that one person's behavior can make a difference.

Using ideas like this requires creativity and experimentation but at least they are informed by evidence about how humans actually make decisions.

## Social Norms

(aka – We're social animals!)

As much as we like to think that we're unique individuals, it's also true that we fear being rejected by our social groups (whether that is our friends, work, community, etc). Consequently, there are countless behaviors that we adopt because of the social norms they represent. Just try taking a ride on the London Underground or a San Francisco tram and smile at people as they get on. Or skipping instead of walking.

### HOW TO TACKLE THIS?

With this in mind, how can you use this powerful, naturally occurring peer pressure to influence people to do things?

A clothing retailer told us that if they want to sell a line of jackets, for example, they will tidy the store in the morning but deliberately leave the jackets messy, as if people had been looking through them already. They find that the first shoppers through the door are naturally attracted to the jackets because at a subliminal level there's a sense that other people have done the same.

Anti-smoking campaigns for younger people have started to emphasize how few teenagers smoke these days, focusing on the social message rather than health. Most teenagers think that the percentage of their peers who smoke is higher than it is, so providing this data shifts the social norm in the other direction i.e. you won't stand out if you don't smoke.

Some charity websites provide information about how much money other people have donated. If we think that most other people are giving \$30 instead of \$10, there's some pressure to follow suit.

## Confirmation Bias

(aka – We ignore things that don't fit with our preconceived ideas)

Most people assume that they are observant, taking in their surroundings and making decisions accordingly. This is true some of the time; it's also not true quite a lot of the time! If you were really paying attention to everything, living each moment as if it were completely fresh, then life would be exhausting. To save valuable energy, our brains rely on past experiences and mental models of how the world works. To a large extent, we see what we expect to see. This is why we were fooled by the **gorilla** in the basketball game and why magicians can still make audiences gasp in awe.

Airline pilots are trained to avoid confirmation bias when faced with unexpected situations in flight. In the past, some airline accidents happened because the pilot assumed the problem was X and only paid attention to the evidence that supported the assumption, overlooking evidence that clearly said it was Y.

Confirmation bias helps to explain why opinions can be hard to shift. If someone has a strong belief that updating is a waste of time, they'll tend to focus on all the examples and situations that prove their point. If someone else believes that updating is always important, they'll tend to notice all the examples of things that have gone wrong because of out-of-date software.

### HOW TO TACKLE THIS?

Educating people can help. Understanding their beliefs can also help but, as we all know, you can lead a horse to water... An alternative strategy is not to focus on those with strong beliefs (they'll tend to be the vocal ones) and put your energy instead into influencing the quieter ones who don't have strong views either way.

This group is often in the majority and if you can nudge them into updating more often, it might be possible to make updating the 'social norm'. Over time, peer pressure will exert

itself so that the strongly opinionated start to stand out as being different. They may never change their own behavior but at least newcomers to the organization don't think that their behavior is the way everyone does things.

You may also want to recognize this phenomenon in yourself. Chances are, particularly if you have strong beliefs about why people don't update, that you will discount evidence that runs counter to your own theories.

## The Availability Heuristic

(aka – If I can remember it, it must be important)

Heuristic is another name for a mental model or rule of thumb – one of the brain's short cuts that influences how we make decisions without really being aware of it. In this case it's the tendency to give more weight to examples and information that come readily to mind – often because we heard them recently. When we're evaluating options or making decisions, we don't always stop to gather all the evidence and so examples that are readily available have a disproportionate influence.

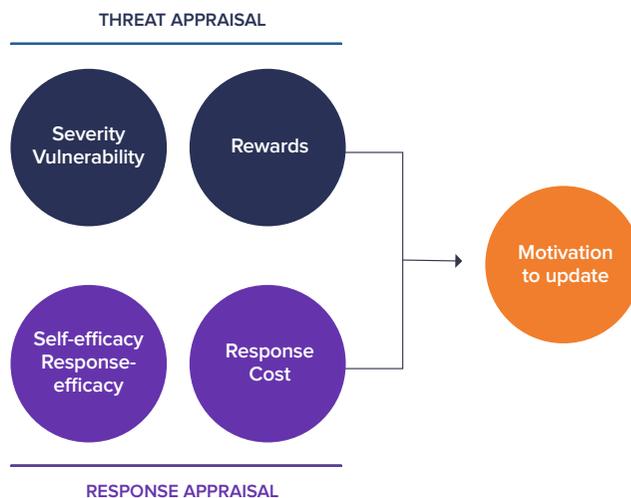
Perhaps this morning you read something online about a burglary and then this afternoon a colleague tells you that they were robbed on the weekend "Oh yes," you reply, "The crime rate does seem to be going up".

### HOW TO TACKLE THIS?

Knowing about these biases of course, means that we can use them to our advantage. Asking people to share stories about their laptop crashing, or of ID theft or lost documents (as long as it's not traumatic) will, in the short-term, help to make examples of IT security more available. When they're next faced with an update decision, these available examples may just nudge them in the right direction.

## Protection Motivation Theory

In the medical profession, there is a definite frustration that people don't do what's good for them despite being shown the evidence. As a result, academics interested in update requirements inertia have looked at health research to see what can be learned. One approach that helps explain update inertia is called Protection Motivation Theory.



In this theory, when people are deciding whether to update or not, the decision is the result of weighing up both the threat and the response. In turn, the threat appraisal and the response appraisal are subdivided into a richer cost-benefit picture.

There are an increasing number of studies using this model (particularly around security updates) and it's proving helpful because it opens up how we might tailor our messages to address the different parts of the equation.

### HOW TO TACKLE THIS?

The important thing to remember is that this is a matter of perception. Whenever you tell, coach or encourage people to update their software, they will be making an assessment based on:

- **Severity.** How severe do I perceive any threat to be? (is the information available? is the message believable?)
- **Vulnerability.** How vulnerable do I think I am (have I been the victim of malware before? Do I know of anyone who has been hacked?)
- **Rewards.** What are the rewards for me by continuing with the existing software (I know it works. I can live with its imperfections).
- **Self-efficacy.** Do I feel confident that I can do what I'm being asked to do (do I know how to update? Do I understand the jargon and process?)
- **Response-efficacy.** Do I believe that by updating my software, the threat will be dealt with (do these things really work?)
- **Response Cost.** What are the costs of me responding to the request (will I lose my work, have to wait ages, be able to control what happens, run the risk of other software being added or being set as a default?)

Each of the elements above has been found to significantly influence users' behavior. In time, more research may reveal which elements are more important than others.

Until that picture becomes clearer it seems sensible to think about the messaging you use with people and evaluate which parts of the decision-making process you're actually reaching.

## Conclusion

Next time you receive a security update, check your immediate response and see if you can identify what it is and what might be behind it. If you are inclined to snooze the notification and do it another time, question your assumptions.

Is avoiding doing the update immediately because your device needs to be connected to power or Wi-Fi? Or are you putting it off for another reason, such as a perception or an experience that new updates have bugs and to wait for the new release? Can you weigh up the risks of immediately doing the update versus waiting?

Life may intervene but it's always important to keep connected devices and apps regularly up to date and patched in this age of both known and unknown security threats.

Next time you receive notification of a security update to your company devices, consider your approach. Will you go ahead and run the update straight away? If not, what are the blockers? Is it complicated to update because of system integration? Maybe it's downtime and the loss of productivity.

If it is about having the conversation with management about how to approach an important update or patch cycle, what might be their bias and how can you overcome that by framing the need? Maybe your management team doesn't see it as a priority? Reframing the conversation is a useful strategy to keep management engaged and seeing patching as strategic rather than operational and advise on the implications of not patching.

### ABOUT AVAST BUSINESS

Avast Business provides advanced, integrated endpoint and network security solutions for businesses and IT service providers.

Backed by the largest, most globally dispersed threat detection network in the world, the Avast Business security portfolio makes it easy and affordable to secure, manage, and monitor changing business networks. The result is superior protection that businesses can count on.

For more information about our managed services and cybersecurity solutions, visit [www.avast.com/business](https://www.avast.com/business)