Teaching Case

The Southwest Airlines Winter Meltdown
Case studies on risk, technical debt, operations, passengers, regulators, revenue, and brand

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Abstract

The winter storm of late 2022 caused difficulties for many US-based airlines, but none more so than Southwest Airlines. Like other airlines, Southwest canceled flights in the early stages of the storm. Their attempted recoveries failed due to procedural and technology issues. The airline was unable to cope with the magnitude of canceled flights, aircraft and crews in the wrong places, disrupted passenger plans, and luggage separated from its owners. Over the next several days, Southwest canceled tens of thousands of flights, called in thousands of additional staff to support manual operations, and flew a reduced schedule for a time before returning to normal operations. The case provides numerous scenarios for you to analyze and research, to strengthen your understanding of the underlying concepts.

Keywords: Teaching Case, Supply Chain, Airline Industry, Risk Management, Scalability, Technical Debt.

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The Southwest Airlines Winter Meltdown. Case studies on risk, technical debt, operations, passengers, regulators, revenue, and brand

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1. OPENING STORY

You planned a holiday trip to visit your family months in advance. You arranged to take some additional days off from work. Earlier this morning, with trepidation, you dropped off Clyde at a local kennel. Just now, while standing in line waiting for TSA security screening, you learn that your flight has been canceled.

The bad news ripples through the long line of expectant flyers, who moaning and groaning, jump on their phones, looking for travel alternatives and calling relatives. You do the same. But you quickly realize that this flight cancellation is one of many, and your trip has probably ended before it ever started.

A brutal winter storm that swept across Central and Eastern U.S. in late December 2022 led to the cancellation of more than 12,000 domestic airline flights the week before Christmas (Josephs, 2023). No airline was spared − ice knows no brand allegiance. And while many carriers were able to quickly recover - United Airlines had to cancel approximately 36% of their flights, but they got 90% of their passengers to their destinations within four hours of schedule − the story at Southwest Airlines was far different (Miguens, 2023).

Days after major carriers were back to mostly business as usual, Southwest continued to cancel flights. From December 24th to the 31st, the major carriers canceled 19,421 flights; Southwest accounted for 72% of those cancellations - 14,042 (US Department of Transportation, 2023).

There were many impacts and, likewise, many causes:

- Close to 3 million holiday travelers had flight segments cancelled (Arnold, 2023). Their attempts to reschedule were hampered by overwhelmed phone systems and a reduction in customer service agents, as many stayed away from work to avoid irate passengers.
- With planes available, pilots and flight attendants sat idle due to multiple challenges with crew scheduling software.
- The financial toll on Southwest - more than $1.1 billion in lost revenue (Arnold & Skores, 2023).

We hope that this real-world case will help students understand and analyze situations from several fundamental perspectives. These include technical debt, scalability, risk management, and supply chain management. Note that all references to people by first name only are real people unless stated otherwise.

2. TECHNICAL BACKGROUND

There are a number of technical concepts that apply to various aspects of this case, and we identify and describe them briefly here.

Technical Debt

In technical circles, the phenomenon of deferred maintenance is called "technical debt." When citizens find that deep potholes in the road are destroying their cars, they realize that their tax dollars were not focused enough on road maintenance, and perhaps were spent on less-important things. Technical debt within computer systems, on the other hand, is not nearly so easy to discern. Quite often, unless a person is directly involved in the creation, care, and feeding of a computer-based service, it can be difficult or impossible to know the impact of technical debt.

Technical debt can result from various causes and appear in various forms (Besker et al., 2018; Kruchten et al., 2019):

- System Capacity limitations: Workloads can outgrow a system's design capacity.
- System Integration limitations: Very often, individual systems must cooperate to make an overall system function end to end - crews, planes, catering, de-icing, passengers, baggage - all must be coordinated.
- Security limitations: Frequently, investment is required to protect systems with no improvement in system function.
- Product Lifespan limitations: Computers don't last forever, but sometimes

companies keep using them well beyond their "end of formal support" date.
- Vendor Maintenance limitations: Support for third party computer hardware or software costs money and effort and may have diminishing value as systems age.
- Process mismatch: Changing business operations requires changes to systems, and sometimes businesses skimp on that - "there's nothing so permanent as a temporary solution" (a quote from one of this case study's authors, from industry observations in banking).
- Failing to integrate technology acquired through acquisition of other airlines.
- Business investment in customer-visible software features which promise new revenue versus investments in back-office core processing can lead to systems which lack capacity to meet customer demand.

Southwest made a point of saying, in their action plan, that the airline would spend over $1B on "technology projects" in 2023 (Southwest Airlines, 2023). However, as in prior years, they don't specify whether or how much of those projects are customer-facing, versus how much is focused on improving the stability and performance of the "back end" operational systems required to get planes in the air and back to the ground safely.

Scalability

Scalability is a "desirable attribute of a network, system, or process …, to process growing volumes of work gracefully, and/or to be susceptible to enlargement" (Bondi, 2000). In the case of Southwest's systems, a central question of this case will be, were they scalable to handle the load of the large volumes of activity that ensued when flights were canceled? Southwest had issues with crew and flight scheduling systems (the systems that tracked crew location, rest status, and contractual obligations), as well as with crew reporting and authorization systems. Pilots and cabin crew members were required to dial a voice phone number to report their status and location. Due to staffing constraints, that number sometimes forced crew members to wait up to 9 hours before they could begin to get scheduled.

Similarly, passengers who tried to reschedule their flights had to wait on hold for hours as the Southwest customer service lines were jammed. Those wait times were due both to the shortage of trained customer service staff, as well as to the lack of reliable information about how to schedule those passengers on new flights. While customers did have the option of conducting those activities online (which the crew did not), most unhappy customers want to talk with a real person to ensure against further surprises.

Root Cause Analysis

Root cause analysis refers to the process of attempting to discern the most fundamental, or root, cause of a problem or situation. It is often conducted, conceptually, by repeatedly asking "why" after identifying a partial cause for a problem. The goal of root cause analysis is to focus on solving the fundamental cause, and to avoid solving what amounts to a symptom, rather than solving the underlying cause (Rooney & Heuvel, 2004).

As an example of this process, for this situation:

Question: Why did Southwest Airlines have a cascade of failures which led to a loss of service which lasted for days and cost the company between $725 and 825 million?

Answer: Because unusually severe weather caused travel disruptions that overwhelmed the scheduling system's ability to manage all of the airline's scheduling and logistics needs.

Question: Why?

Answer: Because the system was not designed nor provisioned to deal with such a high level of disruption and the subsequent logistical complexity.

Question: Why?

…

This line of questioning has taken us nearer to the real cause of the outage: A lack of investment in mission critical IT resources which left the company with dangerously high technical debt. Now that the causal analysis has drilled down to a more relevant 'why' question, useful explanations for the failure can be proffered.

Risk Management

Risk is a concept that is not unique to business or technology - it is fundamental to many aspects of everyday life. Risk refers to the probability that a certain type of event will occur. Impact, in contrast, is the magnitude of damage that might result should the event occur. Risks are usually perceived as having negative outcomes (injuries, damage, cost, and the like), though sometimes

they are positive (we most commonly focus on risk as being related to negative outcomes).

There are several fundamental approaches to managing risk (Ahmed, 2017). One can avoid the risk, transfer it to someone else, reduce it to acceptable levels or simply accept it.

- Avoidance: If a risk is determined to be too high, then you avoid the activity that creates the risk.
- Transfer: In many cases, the risk can be transferred to another party.
- Reduction: Risk reduction is a common step for processes or activities that cannot be avoided, and where the risk cannot be transferred to another party.
- Acceptance: In some cases, the best option is to accept a risk. If steps have been taken (as in the above strategies) to reduce or mitigate the risk, the remaining level of accepted risk is known as "residual risk."

Sometimes, organizations take an approach that *externalizes* some part of their risk. This means that they (deliberately or inadvertently) *transfer* some of their risk to external parties - customers, vendors, employees, etc. In Southwest's case, some have argued that Southwest's choices for technology investment effectively transfer some of the impact of these risks to various other parties. Pilots and cabin crews are left away from home and without work; customers are left stranded somewhere during their travels, sometimes without their luggage. Some of these external parties may be compensated, but often they perceive that compensation to be inadequate. The details of that transfer of risk and impact are not calculated here, but it is clear that some parties believe they did not agree to take on that risk, and were not compensated appropriately (e.g., Arnold & Walters, 2023).

Airline Industry Issues

Managing an airline industry requires dealing with several specific challenges due to the nature of its operations and competitive environment. Supply chain challenges are common to all industries; airlines in particular have very large and expensive equipment (planes) that are hard to move and are highly regulated, making the airline industry somewhat uniquely challenging. Similarly, airlines sell a product (seats) that are highly time-sensitive – when the aircraft door closes, the value of an empty seat immediately goes to zero, since no revenue can be generated without a passenger in that seat (Wang et al., 2021).

Challenges include:

- Crew rest requirements - flight and cabin crew members are limited in how many hours they can work in a row, and how much rest/sleep time is required before they can fly again.
- Pilots can "declare" a fatigue issue, even if they've just finished a rest period.
- Getting all the pieces in the right place at the right time is critical (Belhadi et al., 2021; Vieira & Loures, 2016):
  - ✓ Aircraft, crew, landing rights, gate space, fuel, catering supplies, and ground crews all must be ready in time to get the plane in the air and to land and unload it at the other end.
  - ✓ Passengers must know the plane is going to fly and be ready to board. Unlike retail, where an unsold object can be sold the next day, an unsold/unoccupied seat on a plane generates no revenue.
  - ✓ The plane must be flight-ready, which means it must have been inspected and maintained by ground crews and flight crews before the flight. Some of this is expected to be handled on a daily basis, when the plane is parked overnight in its expected location.
  - ✓ Planes are not generally expected to sit idle for more than a day or two, and an idle period triggers a need to do additional maintenance and testing. In this case, some of that had to be done away from the usual locations, requiring that maintenance workers be moved to those airports (Sider, 2022b).

Southwest operates an unusual routing system, relative to its major US airline competition. Most airlines operate with a small number of hub airports, and most flights begin or end in one of the hubs – a hub and spoke approach. Southwest, in contrast, uses a point-to-point model. In this model, flights tend to go direct from one destination to another and back again, but do not routinely transit through a central hub airport. As such, getting aircraft back to a starting point for a new day of flying is much harder to do with most flights starting from smaller and less "busy" airports (Sider, 2022a).

Potential Impact of Social Media on Communication and Amplification

Communication occurs quickly and in real-time in social media. The potential amplification/reach of media in general and social media

communications specifically, including posts, shares, comments, and "likes/dislikes" can be significant, multiply very quickly, and amplify things intentionally – or unintentionally. This is particularly important during a crisis and presents a modern-day challenge for firm leadership and the marketing and PR teams, as social media empowers the users and requires that firm's focus on effectively influencing perceptions, behaviors, and knowledge. If the strategy is not well thought out and executed, it can have a significant impact on the brand – especially if the communication is not seen as authentic. Also, in the absence of information, people often make things up to fill the void, and those things tend toward the negative (Zide et al., 2014).

Impression management theory (Goffman, 2002) establishes the correlation between branding and managing others' impressions, while signaling theory (Spence, 1973) addresses how this plays out in social media impacting employees, customers, the media, and other stakeholders. Impression management requires controlling and managing others' impressions through the information presented. In social media, the firm is working to control its brand and social media influencers are simultaneously working to maintain and control their own brands, consequently weighing in on posts and providing their perspectives that influence perceptions (Kietzmann et al., 2011). Social media also provides the customers/passengers the ability to partake real-time in the conversations and influence the dialogue, often done in their personal social media accounts and delivered as part of the passengers' personal brands (Van Zoonen, 2009).

The wide variety of stakeholders with potentially competing priorities creates a complicated landscape to navigate for the firm and often requires a sophisticated multi-pronged approach. The signaling theory in social media occurs when signals are sent in social media to influence the receiver's perceptions, behaviors, and knowledge. The receiver then determines if the signal is authentic and impactful enough to influence/change their perceptions. The multi-stakeholder participation in the conversation occurs in personal and corporate (both internal and external) networks and platforms making it difficult to influence – especially if there are not clearly defined strategies, policies, procedures, and trained effective staffing.

Crisis Communication Considerations and Tools

Bukar et al (2020) conducted a systematic literature review and found that the three most popular response strategies to a crisis are: rebuilding/apology followed by denial/scapegoating and then, diminish/excuse . Southwest's response strategy for the recent crises is primarily based on apology with some information strategy that will be further discussed in Scenario 6 below.

Social Media-based Crisis Communication Models

At a strategic level, it helps to consider three models - Integrated Crisis Management (ICM), Situational Crisis Communication Theory (SCCT), and Social-Mediated Crisis Communication (SMCC) - that link stakeholder emotions and the response strategy as outlined in Figure 1.

Figure 1 – Integrated Crisis Management Strategy (Vignal Lambret & Barki, 2018) – *used with permission*

Jin & Liu's (2010) SMCC model and framework can then be applied tactically to help further assess potential gaps, issues, and opportunities in Southwest's crisis communication strategy. See Figure 2 for an overview of that approach.

3. DISCUSSION SCENARIOS

The following scenarios may be assigned by your instructor as individual or group exercises. Each is designed to be self-contained, so you could analyze any one scenario on its own, and from either a technical level or an organizational level. All individuals named in the scenarios are fictional composites, unless otherwise stated.

Scenario 1 - **Where's my luggage?**

Along with the numerous pains associated with

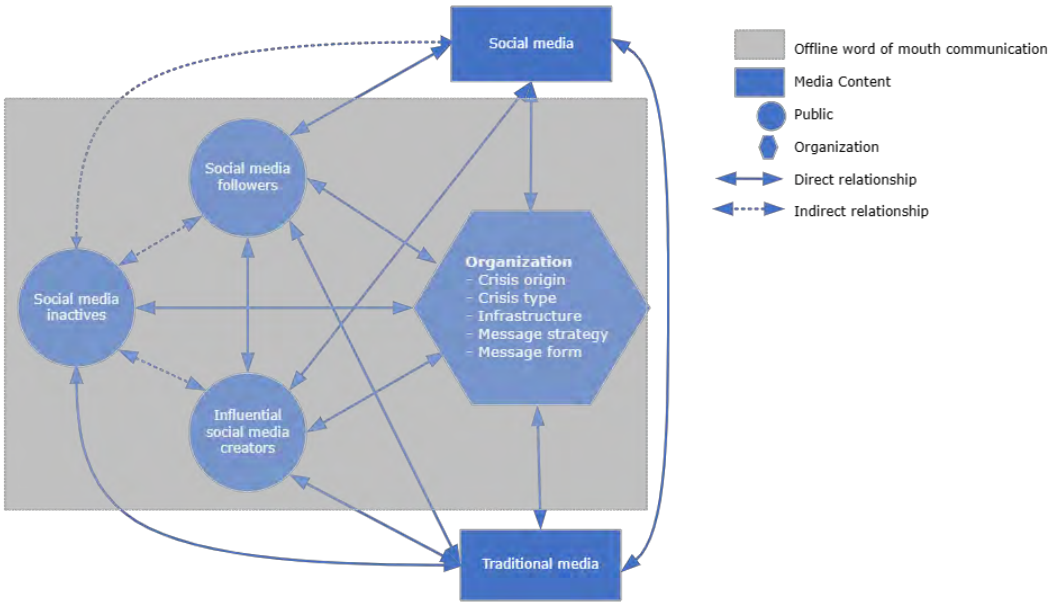

Figure 2 – Social-Mediated Crisis Communication Strategy (Jin & Liu, 2010)- *used with permission*

canceled and rescheduled flights, many Southwest Airlines customers suffered an additional headache - lost luggage. They'd check their bags, wade through security, discover that their flight had been canceled; and, at some point, ask themselves… Where's my luggage?

For many passengers who were fortunate enough to book new flights and reach their intended destination, they'd arrive to discover that their luggage wasn't there. Unable to get concrete information from baggage agents, who genuinely didn't know where their bags were, many travelers would return to the airport multiple times to check for their luggage while having to purchase replacement clothing and belongings. The reversed result was all too common as well. Travelers unable to get to their destination canceled their travel plans - only to discover (via the airline, or via Apple AirTags or other trackers) that their luggage went without them to their destination, leading to additional time and cost spent retrieving their bags. These separations were frustrating and problematic, as some checked luggage included pets, car keys, Christmas presents, and critical medications (Sider, 2022b).

Across the country there was chaos in Southwest baggage claim areas as passengers searched for their luggage. Among them were a few good Samaritans, who while searching for their own luggage, took time out to text random phone numbers that they saw on luggage tags, letting their owners know where their bags were.

Southwest Airlines has for years carried the most luggage of any U.S. carrier, in part because they allow every passenger up to two bags for free. They have a good record evidenced by a low frequency of mishandled bags, lower than competitors in general. However, Southwest does not offer baggage tracking capabilities that are common to many other airlines (Sider, 2022b).

Ultimately, many thousands of Southwest Airlines customers went almost two weeks before they got their luggage back (Gimbel, 2023; Sider, 2022b).

Questions

- As an airline customer, how might you protect yourself from such an outcome?
- What information system solutions could Southwest Airlines have had in place to minimize this disruption?
- What other questions or observations can you make about this scenario as it relates to risk management, technical debt, information, and information systems?

Scenario 2 - **Where'd my flight crew go?**

The brutal winter storm triggered a cascading set of challenges. Thousands of Southwest Airlines customers were affected, as were flight crews, increasing the overall impact and delaying recovery of normal operations.

As the storm continued, ground crews were required to work overtime - in frigid conditions.

Some of them developed frostbite and many of them called in sick. As ground operations slowed, more flights were canceled. Cancellations in Denver, for instance, led to cancellations in Dallas, Chicago, etc. as planes and/or their crews wouldn't arrive from Denver (Leff, 2022). Steve (a real passenger and friend of one of the authors) was passing through Denver on another airline that day, and reported seeing 2-3 thousand people in line at Southwest counters.

In normal conditions, as part of their point-to-point model, it is very common for Southwest flight crews to start their day in one city and finish their day in another city after numerous flights. With this once-in-a-lifetime storm, the many cancellations caused planes, pilots, and flight attendants to not be where they needed to be, adding to challenges for the next day's flights.

Once many Southwest pilots and flight attendants were out of position, Southwest's outdated crew scheduling system failed to keep up with the work of rescheduling, notifying, and relocating them. In a message to the company, Southwest Chief Operating Officer Andrew Watterson said, "we had aircraft that were available, but the process of matching up those crew members with the aircraft could not be handled by our technology." He added that the process had to be handled manually, which was "extraordinarily difficult" (Sangal et al., 2022).

One possible contributor to these failures might be found in Southwest's investment strategy. Recent capital expenditures, which includes technology projects, have been $1 billion in 2019, $515 million in 2020 and $505 million in 2021. Similarly, the number of employees in their business group which includes technology workers dropped 27% from 2018 to 2021, while overall full-time employee count dropped just 6% over the same time period (Arnold & Walters, 2023).

Questions

- How could Southwest Airlines communication systems be improved to more easily allow flight crew personnel to update their location and availability when phone systems are overwhelmed?
- Compare and contrast Southwest Airlines' "point-to-point" scheduling methodology to their competitors' "hub and spoke" approach, including pros and cons of each.
- What other questions or observations can you make about this scenario as it relates to risk management, technical debt, information, and information systems?

Scenario 3 - Rebecca gets delayed by a firewall, and (sort of) changes planes

On March 30, 2023, Southwest released its "action plan" (Southwest Airlines, 2023) to address the issues that arose in December 2022, hoping to put its operational challenges behind it. But just a few weeks later, on Tuesday, April 18, a firewall failed in a Southwest data center, which grounded all Southwest flights. On that same Tuesday, Rebecca (a real person and friend of one of the authors) was on her way from New Orleans to Dallas, and on to California for a brief visit with old friends. Her flight, and hundreds of others, were delayed for an hour due to the failure of "a vendor-supplied" component. The component failure blocked access to "operational data," preventing flights from boarding or departing. The winter breakdown, along with the April 18 failure, has been blamed by many on "technical debt." In the April 18 case, Southwest's published analysis reported the problem was a single third-party component, specifically, a firewall (Lampert & Singh, 2023).

In Rebecca's case, even though her takeoff from New Orleans was delayed by an hour, and her layover in Dallas was reduced from two hours to 40 minutes, it turned out that the re-scheduling system worked in her favor. She wound up right back on the same plane for the trip to California, and that leg of the journey landed on time. However, while on the ground in Dallas, she had to get off the plane and then get right back on that same plane, using her second boarding pass.

Questions

- Given Southwest's published analysis of the April 18 issue, what is the alleged cause of the delay?
- Is the alleged cause, from the prior question, really the root cause? If not, what more fundamental causes can you identify?
- Do any elements of this explanation seem potentially misleading or unsupported?
- What other questions or observations can you make about this scenario as it relates to risk management, technical debt, information, and information systems?

Scenario 4 - Flight and cabin crews ask, **"**Why do I have to call to reschedule? **I can't just click a button?"**

Mary and Sam, Southwest flight attendants, had landed in Burbank and ended their workday as the winter storm started to have its effects. Sam realized he was not likely to be assigned a flight any time soon, so he rented a car and drove three

hours to visit friends near Los Angeles. Mary stayed at a hotel near the airport. Both would need to let Southwest know where they were at the start of their next duty period. Janice (also a fictional composite), the pilot on that Burbank flight, still had several hours left in her duty period, and stayed at the airport.

Southwest requires crew members to use a voice telephone system to deliver the data required to allow its crew scheduling team and their software, called SkySolver, to make informed scheduling decisions. SkySolver's job (working with other systems) is to get the crews, planes, and passengers aligned, assigned, and positioned for their next flight, and to let crew members know where they have been assigned (Sider, 2022a). When large numbers of crew members were reassigned, due in this case to canceled flights, the task of collecting crew data and delivering assignments was messy and ultimately not scalable without adding large numbers of additional staff in the crew scheduling call center.

There are several constraints around how Southwest, and all airlines, can schedule crews. For pilots, so-called "Part 117" rules control how much rest a crew member needs to have between assigned duty periods (which often include several flights) and between flights. Both flight attendants' and pilots' assignments are governed in part by union rules. Some of those rules may have been involved in forcing the voice-based dialog on crew scheduling (Snyder, 2023).

About those three Burbank crew members: Janice had been scheduled to fly out of Burbank, but her destination airport was closed. She tried to reach someone at Southwest to arrange to make another flight, but to no avail - she was on hold for several hours, and then her duty period expired. Sam was trying, at his friend's home, to get scheduled for the next day, but no luck. Mary returned to the airport the next day and was able to reach Southwest's crew assignment team by phone early in the day and get scheduled for a flight out of Burbank. But even that was difficult, as it took significant time to find all of the crew members and get them to Burbank, ready to fly.

Questions:

- In looking at this series of events, what seems to be the bottleneck in the system as described from the crew members' viewpoint?
- What alternative methods of data collection might be used instead?
- If you were consulting for Southwest, what fundamental changes would you recommend they make to their crew availability and scheduling system?
- What other questions or observations can you make about this scenario as it relates to risk management, technical debt, information, and information systems?

Scenario 5 - A Myriad of Problems

Readying an airplane for flight requires many steps by many teams. Schedulers assign a plane and flight crew. Reservation systems compile a list of expected passengers. When the designated plane lands, ground crew members guide the pilot to the terminal gate and connect the passageway to the plane. As passengers disembark, baggage handlers move luggage off the plane, while other teams clean the cabin and bring in food. And, all the while, gate agents are readying passengers for boarding.

Winter weather - particularly devastating with Winter Storm Elliott - often adds additional steps to the preparation process. Frost, snow and/or ice on any of the critical surfaces of an airplane can affect takeoff performance. Under these conditions, maintenance workers and the ground crew follow deicing/anti-icing procedures.

Then, throw into the mix Southwest's self-inflicted challenges - crew scheduling software unable to scale as needed, phone systems swamped due to insufficient staffing levels - and you get a myriad of problems:

- Southwest gate agents struggled to provide flight crews with passenger manifests, leading to delays as crew members walked through cabins checking off passengers against a paper print out.
- Although terminals were filled with passengers stuck due to delayed and canceled flights, gate agents often couldn't create tickets for them, leading to flight delays and open seats once flights finally took off.
- Seth, a Southwest pilot, landed at Orange County airport in California, an hour behind schedule. On the tarmac, he discovered that there were no open gates due to already gated flights suffering their own delays. This led to further delays.
- Veronica, another Southwest pilot, was asked to "deadhead" as a passenger to Albuquerque (so she could pilot a flight starting there), but then her flight leaving from Albuquerque was canceled. There were countless instances of flight crews deadheading, sometimes multiple times, trying to set them up for assignments

that never materialized.

Trying to recover, Southwest reduced the number of planned flights, giving them time to get flight crews and planes into proper position to return to normal operations. Even this approach led to challenges. Planes can't remain parked for long, so they were put into both short- and long- term storage, which required that they rotate through their entire fleet to keep their planes from sitting idle too long. Workers had to travel in order to maintain those planes (Sider, 2022c).

Questions

- What changes to Southwest's systems might have made it easier to find a full flight crew in a situation like this?
- What further problems result from these challenges?
- What other questions or observations can you make about this scenario as it relates to risk management, technical debt, information, and information systems?

Scenario 6 - People are saying what? Is an apology enough?

On December 29, 2022, as reported in multiple media outlets (Muntean & Wallace, 2023), the Secretary of Transportation, Pete Buttigieg, whose office received thousands of complaints, sent a letter to Robert Jordan, the Southwest CEO and posted it on the Department of Transportation's (DOT) website (Buttigieg, 2022). The letter confirmed their phone conversation and stated four key priorities: getting passengers to their destinations, providing services for disrupted passengers, providing appropriate refunds, and reuniting passengers with their luggage.

On December 30, Robert Jordan stated, "This has been an incredible disruption, and we can't have this again" (Sider, 2022c). Southwest has repeatedly apologized in the media. On March 30, 2023, Southwest posted their "Final Summary and Action Plan" on their website outlining three key root causes: "Winter Operations" - a lack of winter infrastructure, equipment, and staffing, which impacted flight crews; "cancellation waves" that overloaded the system and forced a reversion to manual processes; and "cross-team collaboration" - communication process gaps created bottlenecks and issues. The report adds an information response strategy component and indicates significant progress has been made but it does not address the technology issues to any substantive level.

Unfortunately, Southwest has continued to have technology issues and based on social media they are continuing with the "apology response strategy" and appear to still be lacking cross-team collaboration regarding messaging, as key components of their marketing communication and PR strategy are at odds, as outlined below.

On Tuesday morning, April 18th, José was flying from Miami to Dallas when his plane was grounded on the tarmac. The longer they sat, the more concerned he became. José pulled out his cell phone and searched Facebook to see if anything had been posted - he quickly found many posts all stating things like: "Heads Up - Southwest asked the FAA to pause all nationwide departures due to technology issues … this is crazy as it has been less than six months since Southwest had to cancel 15,000 flights".

José found a lot of other posts with similar information. He began skimming them when a new post popped up with the following embedded in the post: "This from Southwest: As a result of the intermittent technology issues that we experienced, we should hopefully be resuming our operation as soon as possible. We apologize for any inconvenience this may cause, but we're hoping to get everyone going ASAP. STAND BY" (Nick Beres NC5, 2023). José began to read the 352 comments (many from very unhappy stranded flyers) and decided to share the post as 425 others did, to try to help any of his friends and family who might also be traveling.

José scrolled back to the top of his feed, and when it refreshed, he noticed a new post from another passenger - PAUSE CANCELED - GET READY TO SIT AND WAIT……THERE WILL BE DELAYS! - this post already had 3,000 likes and 1,000 shares. An hour later the flight attendant announced, "The issue has been resolved, and we are getting in line to take off. Please take your seats."

José got to Dallas 3 hours late and met his son at baggage claim. As they waited for his bags, José's son showed him a post from "The Points Guy," an influencer that he follows. The post said: "UPDATE: Southwest Airlines flights resume after IT issues cause systemwide ground stop. Southwest Airlines grounded its entire operation on Tuesday morning, citing unspecified IT issues. The airline did not give a time for the fix. Here's the latest. (536 comments and 321 shares)".

On April 21, 2023,the Department of Justice's (DOJ) legal arm joined the investigation (Skores, 2023). "The investigation is focused on whether Southwest engaged in unrealistic flight scheduling which is illegal under federal law and whether Southwest provided timely refunds and

reimbursements to affected passengers as required," the spokesperson said.

Questions

- Given the responses of the public and stakeholders (media, passengers, influencers - "The Points Guy," DOT, DOJ, and others), how successful has Southwest been in managing perceptions about the technology and technical debt issues?
- What would you advise Southwest to consider doing immediately/in the short term based on recent activities and results?
- What advice would you give to the Southwest leadership about their brand?
- What other questions or observations can you make about this scenario as it relates to risk management, technical debt, information, and information systems?

4. ADDITIONAL RESEARCH QUESTIONS

Please feel free to use these prompts as you and your instructor see fit, to conduct additional research and analysis of this painfully spectacular failure.

Social Media Engagement and Artificial Intelligence: Social media obviously provide a mechanism for significant numbers of people to publicly impact a company's brand. Responding in a timely manner to individual comments is impossible using human-powered responses. However, recent developments in generative artificial intelligence may change that dynamic. Consider the risks and tradeoffs associated with using so-called generative AI to respond to customer social media postings and share your insights.

Action Plan Review: Southwest Airlines has published their action plan (Southwest Airlines, 2023) about three months after the winter disruption settled down. Read the document (see reference list) and provide feedback per your instructor's guidance about some chosen aspect(s) of the plan. This could be an assessment of the plan's candor, an analysis of the timeline called out by the plan, comments on the relative investments in infrastructure and inward-facing technology vs. external or customer-facing technology, or others.

Outsourcing, Customizing Software, and Technical Debt: Outsourcing is the process of moving a logically consistent unit of work to another company, paying that company to do the work for your company. Southwest used outsourcing to get access to the flight- and crew-scheduling software called SkySolver. They are reported to have acquired this technology from GE's Aviation Services unit and have heavily modified it to suit their specific needs. What are the tradeoffs and risks of buying or licensing software from someone else and then customizing it? What are the advantages and disadvantages? Why not just build one's own technology for operations like this, since that gives you much more control of how the system works?

5. CONCLUSIONS

Airlines are not easy businesses to run. They are capital *and* labor intensive, they are subject to impacts from weather, politics, public health, and other unexpected issues. And they are competitive, seeking not only to provide good price and performance for customers but also an appropriate yield for every seat on the plane, and to keep planes in the air and generating revenue (Wang et al., 2021).

The Southwest Airlines 2022 Winter cancellation storm provides an opportunity to dig deeply into the need for scalability, the challenges of risk management and technical debt, and the wide variety of challenges of managing airline supply chains. In addition, it brought up the challenges of brand management amidst a crisis. We hope that this provides you with a useful and accessible tool to apply these fundamental business and technology concepts to real-world events with very real-world impacts.

As a conclusion to the case for the regulatory aspects, nearly a full year later Southwest agreed to pay a total of $140 million, including a $35 million fine to the US Department of Transportation. The other $100+ million will come in the form of reimbursements to travelers delayed on Southwest in coming years (Shepardson, 2023).

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