

1.Executive Summary

This document provides a summary of potential security risks to Pampered Pets quality of products, supply chain and information system hosting and Disaster recover as the organisation is starting the digital process. This document shall provide further details and analysis of security risks that the organisation may encounter during the digital process and how to overcome the risks outlined.

The following recommendations that Pampered Pets should consider during their digitalisation process

- The supplier selection process and product quality are critical to the core business. To ensure product quality, an audit and process should be implemented throughout the product's life cycle. Section 2 covers the Security risks to quality of products
- Pet Pampers relies heavily on its supply chain to make sure its suppliers are doing things properly and are subject to regular audits. Additionally, the supplier's data handling needs to be closely monitored. In-depth discussion of dangers in the supply chain can be found in Section 3.
- Multi Criteria Decision Making (MCDM) is a quantitative method that assists in decision making using a specific criterion to fulfil the requirements of Pampered Pets supply chain. Section 4 has the details on calculation.
- E-commerce platforms are essential for online businesses, so we recommend public Cloud platforms with DR in different regions. Also, we have included the recommended platform for Pampered Pets DR solution on section 5
- Vendor lock-in is a common problem; Section 6 offers solutions to this threat

2.Security Risks to Quality of Products

It is essential to a company's success to have a solid understanding of both its customers and its supply chain. As a result, Pampers Pet needs to make certain that its supply chain capabilities support its capacity to respond to shifts in customer demand. The following risks that could occur along the supply chain could have an effect on the products' quality.

Table 1- Security Risks- Quality of Product

Risk ID	Risks	Justification	References
R001	Product defects due poor handling/storage	Supplier storage facility may have lack of power backups, ventilation	(Global Tranz, 2016)
R002	Quality control	International suppliers may produce ingredients in a non-secure environment, regular quality control is critical	
R003	Poor packaging	When a product gets damaged because of bad packaging, it hurts the brand's reputation, which affects online reviews of the product, which hurts sales.	(Peek, 2022)
R004	Contamination risks	During transportation from international suppliers there is of	

		products contamination specially in the food industry	
R005	Poor Inventory	Poor inventory may fail to address the supply demands	(Oluwaseyi et al., 2017)
R006	Lack of process and audit	Lack of process and audit may lead to poor quality	

Table 2- Risk Matrix of the security of the quality of the products

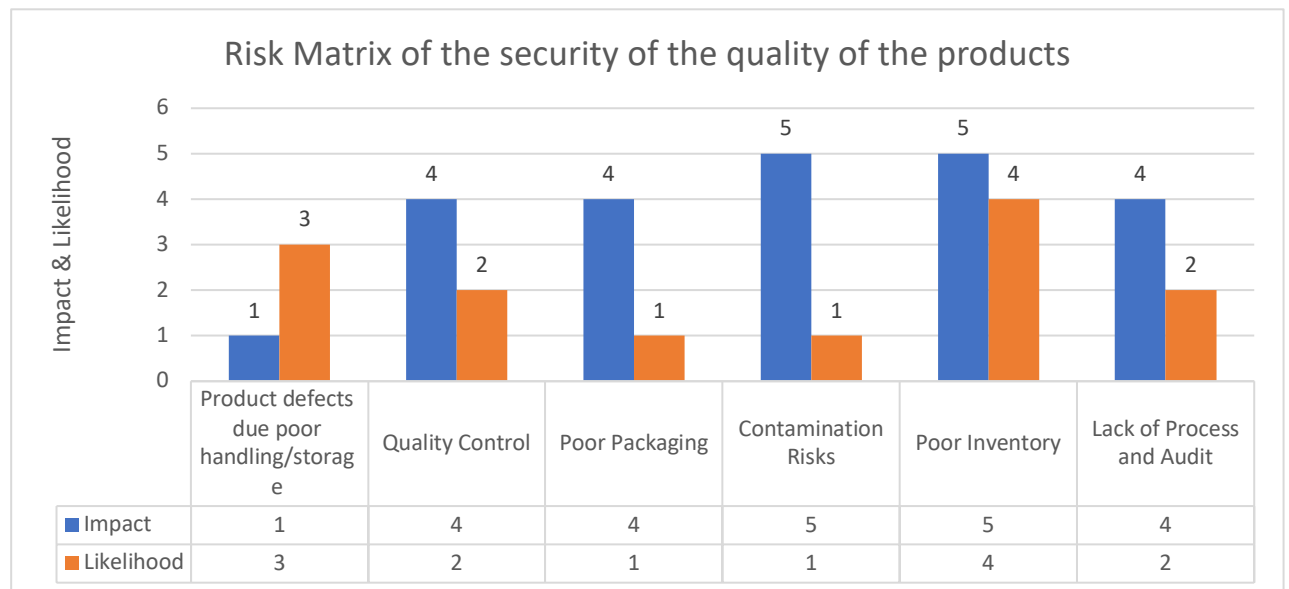


Table 2 identifies the risks to Pampered Pets quality of products based on the criteria identified in Appendix 03 and data in Appendix 04.

3.Security Risks to Supply Chain

In the digital world today, organisations such as Pampered Pets are vulnerable to security risks in their supply chain (Figure 1). The below table indicates the potential security risks that Pampered Pets may be vulnerable to as the organisation has begun the digitalisation process (Kost, 2022).

Table 3 identifies the potential risks to the supply chain for the Pampered Pets.

Table 3- Supply Chain Risks

Risk ID	Potential Risk	Justification	Reference
SC001	Data Protection	Pampered Pets data is potentially at risk without complying with the General Data Protection Regulations (GDPR) and Payment card industry (PCI) as it is currently difficult for the organisation to complete appropriate diligence into the suppliers and specific data security requirements to protect data at an early stage of the digitalisation process	(Walsh, 2019)
SC002	Third Party Vendors	Increases the risk of data security. The organisation is in the digitalisation process and the impact of having third party vendors is a potential financial loss. This is due to relying on external resources to perform specific services which Pampered Pets currently are unable to perform.	(Kost, 2022); (Security, 2020)
SC003	Supply Chain Fraud	Supply chain fraud is a major security threat for Pampered Pets because it involves a large network of suppliers, retailers, and logistic services. Pampered Pets must follow each third-party vendor's company policies. Financial fraud includes fraudulent transactions, inappropriate payments, and billing fraud, given the company's	(Wong et al., 2018)

		online presence. Third-party vendors sent Pampered Pets multiple or inflated invoices.	
SC004	Digital Risks	This is an unavoidable risk due to the digitalisation process Pampered Pets are in. As the organisation continues to add digital solutions to their system, the more potential network gateways and cyber-criminals have. Some of the digital risks include, ransomware attacks, malware attacks and security breaches	(Kost, 2022)

Table 4- Risk Matrix of the security risks of the supply chain

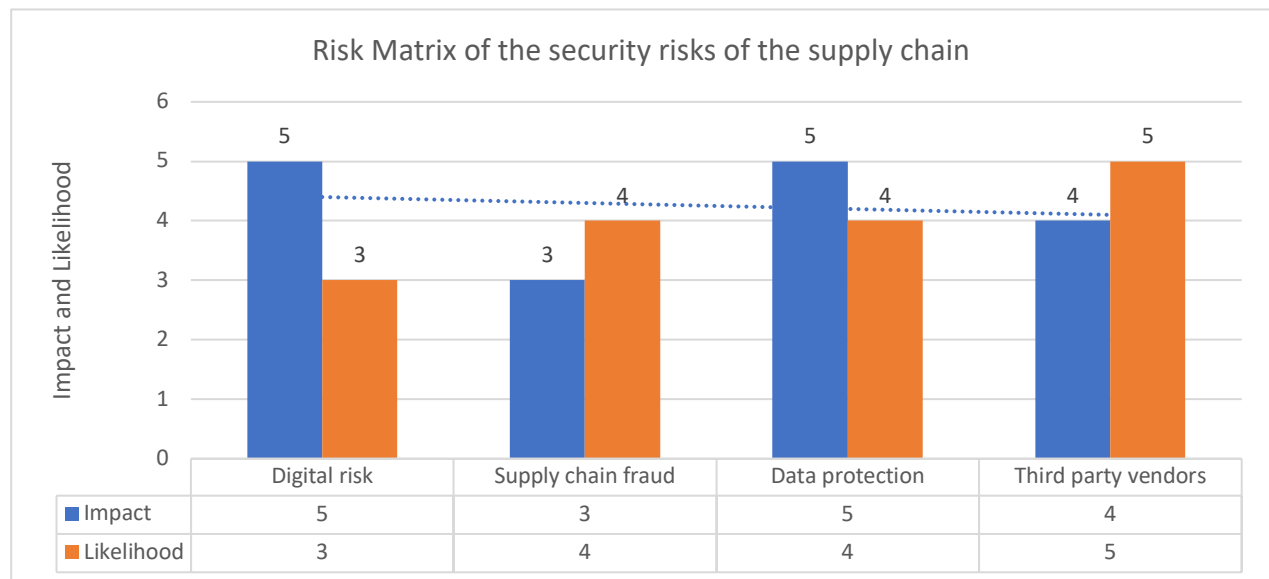


Table 4 identifies the security risks to Pampered Pets supply chain based on the criteria identified in Appendix 03 and data in Appendix 05.

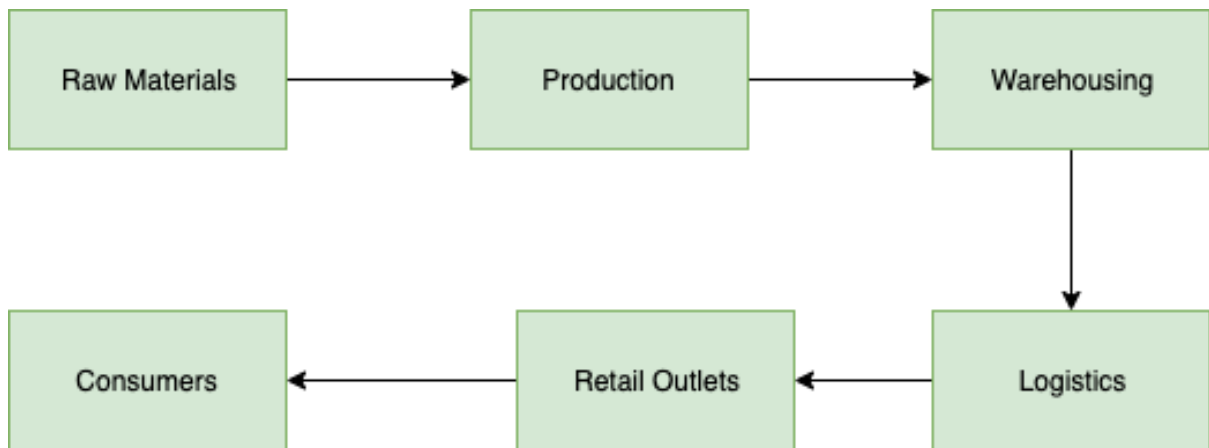


Figure 1-Pampered Pets Supply Chain

4. Quantitative Risk Method

Decision making in a supply chain is an important role that ensures the operations in the supply chain at Pampered Pets is as efficient as possible. This would allow the organisation to achieve its highest level of customer satisfaction at an optimum cost. The decision-making process consists of 3 levels which include (Khan, Chaabane and Dweiri, 2018).

- Strategic
- Tactical
- Operational

Multi Criteria Decision Making (MCDM) is a quantitative method that assists in decision making using a specific criterion to fulfil the requirements of Pampered Pets supply chain (Figure 1).

MCDM would be the right choice of quantitative risk method as this method is best suited for repetitive tasks that are in a supply chain. According to (Tramarico, Mizuno, Salomon and Marins, 2015), AHP is the most common MCDM method used in a

supply chain, therefore, it would be an appropriate quantitative risk method Pampered Pets to consider. In addition, AHP shall assist the organisation in organising and analysing complex decisions through each stage of the supply chain process (What is the Analytic Hierarchy Process (AHP)? | Passage Technology, 2022).

Table 5 indicates the scale used during the AHP referred to as the Saaty table (Saaty, 1987).

Table 5- Scoring AHP Scale

Score	Importance Degree
1	Equal Importance
3	Moderate Importance
5	Strong Importance
7	Very Strong Importance
9	Extreme Importance
2,4,6,8	Intermediate Values

Table 6-Critical Success Factors (CSF) considered

Critical Success Factors	Justification	Reference
Local Raw materials sourcing (LS)	Local sourcing benefits the humanisation of pet products and increased consumer sustainability demands.	(Thelen, 2021)
Global Distribution (GD)	Pampered Pets will benefit from the opportunity of global distributions as this would provide them the revenue growth and reduce its costs	(Chopra & Meindl, 2012)
Information Technology	Embracing technology change can be challenging for the employees as they are	(Palmer, 2021)

Digitalization and modernisation (ITD)	customed to perform tasks in a specific manner. It is therefore vital to train the employees during the ITD process.	
Quality (Q)	The quality of the products is vital for the improvement of the pet food quality. This ensures that Pampered Pets is responsible for the quality produced with the assistance of quality control checks.	(Utami & Harahap, 2019)
Government compliance (GC)	It is important for Pampered Pets to consider the government rules and regulations for importing and exporting pet food to its potential retail outlets ensuring they are compliant with the UK government.	(UK, 2021)
Shortage of Skills (SS)	Lack of skilled workers in a specific field to assist Pampered Pets in the digitalisation process	(Future, 2021)
Political uncertainty (PU)	Pampered Pets would be required to consider the political factors that would affect the organisations economy and therefore requires to be kept up to date on regular basis.	(Romei & Strauss, 2022)

Risk Drivers

Table 7- CSF Risks Identified

Critical Success Factors	Risks
LS	<ul style="list-style-type: none">• Quality• Demand• Operational
GD	<ul style="list-style-type: none">• Financial• Management Safety/Security• Shipping• Tampering
ITD	<ul style="list-style-type: none">• Cyber Security• PCI / PII data leak• Availability
Q	<ul style="list-style-type: none">• Counter fit• Regulation• Climate change
GC	<ul style="list-style-type: none">• GDRP Compliance• PCI compliance
SS	<ul style="list-style-type: none">• Technical skill shortage
PU	<ul style="list-style-type: none">• Political• Financial• Distribution & Sales

Table 8 provides the initial pairwise comparison using the Satty table (Table 3) that the local weight calculated in table 7 by normalising the matrix.

Table 8 - AHP Pairwise Comparison

Criteria	LS	GD	ITD	Q	GC	SS	PU
LS	1	5	3	2	2	2	2
GD	0.2	1	7	4	2	2	2
ITD	0.33	0.14	1	3	4	3	3
Q	0.5	0.25	0.33	1	5	4	2
GC	0.5	0.5	0.25	0.2	1	3	3
SS	0.5	0.5	0.33	0.25	0.33	1	2
PU	0.5	0.5	0.33	0.5	0.33	0.5	1
Total	3.53	7.89	12.25	10.95	14.67	15.5	15

Table 9- Normalised pairwise matrix

Criteria	LS	GD	ITD	Q	GC	SS	PU	Weight sum value	Criteria weight	Ratio
LS	0.25	1.08	0.49	0.29	0.2	0.14	0.11	2.56	0.25	10.3
GD	0.05	0.22	1.13	0.59	0.2	0.14	0.11	2.44	0.22	11.24
ITD	0.08	0.03	0.16	0.44	0.4	0.2	0.17	1.49	0.16	9.21
Q	0.12	0.05	0.05	0.15	0.5	0.27	0.11	1.27	0.15	8.67
GC	0.12	0.11	0.04	0.03	0.1	0.2	0.17	0.78	0.1	7.73
SS	0.12	0.11	0.05	0.04	0.03	0.07	0.11	0.54	0.07	7.94
PU	0.12	0.11	0.05	0.07	0.03	0.03	0.06	0.48	0.06	8.5

Table 10-Consistency Index and Consistency Ratio

Criteria	LS	GD	ITD	Q	GC	SS	PU	Criteria Weight (AVG Value)
LS	0.28	0.63	0.24	0.18	0.14	0.13	0.13	0.25
GD	0.06	0.13	0.57	0.37	0.14	0.13	0.13	0.22
ITD	0.09	0.02	0.08	0.27	0.27	0.19	0.2	0.16
Q	0.14	0.03	0.03	0.09	0.34	0.26	0.13	0.15
GC	0.14	0.06	0.02	0.02	0.07	0.19	0.2	0.1
SS	0.14	0.06	0.03	0.02	0.02	0.06	0.13	0.07
PU	0.14	0.06	0.03	0.05	0.02	0.03	0.07	0.06

Consistency Ratio:

$$\lambda_{\max} = 9.08$$

$$CI = (\lambda_{\max} - n) / (n - 1), (\lambda_{\max} \text{ is the max. average value})$$

$$CI = (9.08 - 7) / (7 - 1)$$

$$CI = 2.08 / 6$$

$$CI = 0.35$$

$$CR = CI / RI \text{ (refer to appendix 02 for random index value)}$$

$$CR = 0.35 / 1.32$$

$$CR = 0.26$$

List of assumptions

The following assumptions are considered while outlining the potential security risks to the quality of the products and supply chain.

- Ingredient is sources from the local suppliers and suppliers follow the government regulatory.
- Suppliers undergo a security background check.

- The new proposed digitalization e-commerce is hosted in public cloud
- Staffs are trained in the new Information model

5. Disaster Recovery

As Pampered Pets business is in the current process of being digitalised, it is therefore vital for the business to have a business continuity and disaster recovery strategy in place. Figure 2 illustrates the disaster recovery plan in which the organisation should implement for continue business operation.

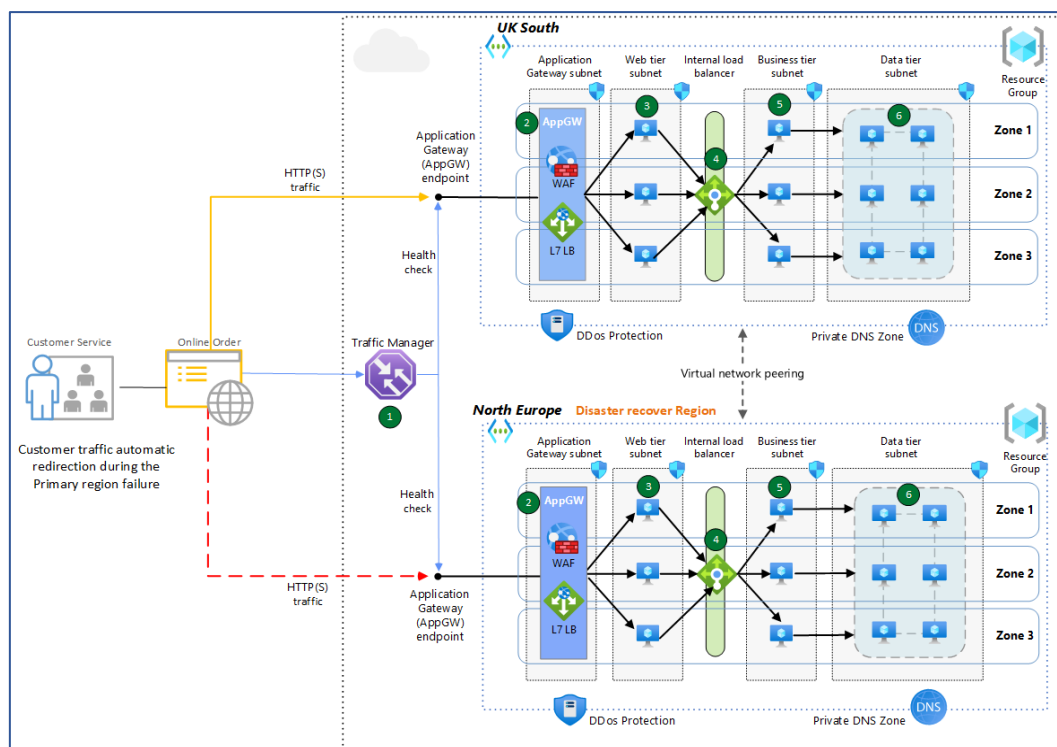


Figure 2-Disaster Recovery Cloud Solution (MSFT et al., 2022)

Figure 2 additionally depicts the Azure Validated Design (AVD). The recommended design depicts the online business in the event of a disaster affecting the physical location. High availability and a disaster recovery plan are required. Pampered Pets should consider selecting two geographic regions.

The Recovery Time Objective (RTO) and the Recovery Point Objective (RPO) are important parts of any plan for dealing with a disaster. RPO and RTO are two important metrics that companies use when making a disaster recovery plan that will keep their business running even if something goes wrong.

To achieve RPO, application and database need a synchronised system that allows a switch over in the shortest time with immediate data backup to retrieve the recovery point in less than a minute. Running both systems in parallel to enable a seamless switch over may be expensive for Pampered Pets. This allows Pampered Pets to switch over immediately with minimal disruptions. (Milward,2022).

6. Vendor Lock-in

As part of cloud computing, the term vendor lock-in is referred to as organisations such as Pampered Pets limited to only a particular Cloud Service Provider (CSP) and is unable to switch to another CSP.

Table 11 identifies the issues that Pampered Pets may have during the digital process considering vendor lock-in and possible methods to mitigate the vendor lock-in (Khera, 2021).

Table 11-Vendor lock-in issues

Vendor Lock-In Issues		Mitigation
1	Compatibility issues	<ul style="list-style-type: none"> • Perform proof of concepts with multi-cloud • Choose current technologies and applications
2	Vendor Agreements	<ul style="list-style-type: none"> • Validate SLA for capacity, availability, and exit • Negotiate the agreements/contracts which favours to company
3	Multi-Cloud approach	<ul style="list-style-type: none"> • Choose multi-cloud to avoid vendor goes out of business, hardware ceased for government, failures/outages • Keep backups and encryption keys outside the cloud

With these factors and possible mitigations, Pampered Pets should not consider a vendor lock-in as it would ensure the organisation maintains the flexibility to change CSPs according to its business or keep some of the less critical security risks within the organisation (Opara-Martins et al., 2016).

DR Platform Recommendation

We recommend to host Ecommerce PaaS solution on Azure Cloud, this solution enables to allow to handle any volume of customers by vertically scaling.

This AVD architecture walks you through an implementation of an e-commerce front end using Azure platform as a service (PaaS) tool (Mason, 2022).

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Appendix

Appendix 01- List of Abbreviations

Abbreviation	Definition
BC	Business Continuity
DR	Disaster Recovery
FW	Firewall
LB	Load Balancer
WAF	Web Application Firewall

Appendix 02- Random Index Table

Random	1	2	3	4	5	6	7
Index	0	0	0.58	0.9	1.12	1.24	1.32

Appendix 03- Risk Matrix Criteria

Risk Value	Criteria
1	Very Low
2	Low
3	Medium
4	High
5	Critical

Appendix 04- Quality of Products Risk Matrix Analysis

Risk ID	Title	Impact	Likelihood
R001	Product defects due poor handling/storage	1	3
R002	Quality Control	4	2
R003	Poor Packaging	4	1
R004	Contamination Risks	5	1
R005	Poor Inventory	5	4
R006	Lack of Process and Audit	4	2

Appendix 05- Supply Chain Risk Matrix Analysis

Risk ID	Title	Impact	Likelihood
SC001	Data Protection	5	4
SC002	Third Party Vendors	4	5
SC003	Supply Chian Fraud	3	4
SC004	Digital Risk	5	3

Appendix 06- Cloud Architecture and DR platform (Bill of Materials)

Platform	Purpose	Qty
Azure Load Balancer	A zone-redundant Load Balancer will still distribute traffic with a zone failure.	2
Traffic Manager	DNS-based traffic load balancer that distributes traffic to services across global	1

	Azure regions while providing high availability and responsiveness	
Azure Virtual Machines	VMs are on-demand, scalable computing resources that give you the flexibility of virtualization but eliminate the maintenance demands of physical hardware. The operating system choices include Windows and Linux.	12
Application Gateway	A layer-7 load balancer. The v2 SKU of Application Gateway supports cross-zone redundancy. A single Application Gateway deployment can run multiple instances of the gateway.	2
Azure Load Balancer	Layer-4 load balancer. A zone-redundant Load Balancer will still distribute traffic with a zone failure.	2
Azure DNS	Hosting service for DNS domains. It provides name resolution using Microsoft Azure infrastructure. By hosting your domains in Azure, you can manage your DNS records using the same credentials, APIs, tools, and billing as your other Azure services.	2

Private DNS zones	Azure DNS Private Zones provide name resolution within a virtual network, and between virtual networks. The records contained in a private DNS zone aren't resolvable from the Internet. DNS resolution against a private DNS zone works only from virtual networks linked to it.	2
Azure Virtual Network	A secure private network in the cloud. It connects VMs to one another, to the internet, and to on-premises networks.	2
SQL Server on VMs	SQL Server in the cloud without having to manage any on-premises hardware.	12
Azure DDoS Protection	Enhanced features to protect against distributed denial of service (DDoS) attacks.	2

Appendix 07 - Platform Recommendation

Implementation of an e-commerce front end using Azure platform as a service (PaaS) tool (Mason, 2022).

Architecture

