# Appendix – A

**A Brief History of Persian Rugs:**

The art of carpet weaving in Iran can be traced back to over 2500 years. The earliest known carpet was not discovered in modern day Iran. Dating back to the Fifth Century B.C., the 'Pazyryk carpet' was discovered in the 1920s in Siberia amongst other treasures of a Scythian noble, perfectly preserved in ice. Persian carpets and rugs started off initially as 'articles of necessity', to cover the floor of wandering tribesman, mainly to give them protection from the cold and damp during the winter. The skills and the trade craft involved in making these intricate works of art have been traditionally passed on from one generation to another (irrespective of the times of peace, invasion, or war). Persian 'rugs' are not just considered 'rugs' but more like a work of art, with their rich colours and intricate designs, delicately hand woven. In-fact their perseverance to wear and tear is remarkable, considering a high-quality Persian rug can last anywhere from 20 to 200 years.

**The relevance of IT / e-commerce adoption to small business:**

Information Technology (collectively, referring to a combination of hardware and software, and addressed as 'IT' in the rest of this case study) provides a convenience for businesses (small and large alike) to improve their efficiency, business processes and overall effectiveness to serve their clientele. Even though small businesses are characterized by the challenges and constraints of finance, lack of an internal team, and a short range / fluid management perspective for decision making, considering the downward spiral in the cost of IT adoption over time[1], the benefits of adopting IT to serve the business needs is accessible even to the smallest of business ventures. In addition to adoption of IT, internet commerce (or e-commerce, that primarily involves buying and selling of goods and services over the internet), provide a significant advantage to small businesses (especially in the scenario's such as COVID-19), to take their offerings to people where they cannot be present physically (such as a brick-and-mortar store). By investing in a small IT infrastructure and having the presence of an online store (such as eBay or Amazon), small businesses can sell their products and services from a single location. As their business reach widens, the customer base will increase, having a direct impact on the sales revenue and profit margins. Finally, having an online store on e-commerce platforms such as eBay or Amazon means that small businesses do not have to have physical stores in all locations they wish to sell, resulting in cost savings on capital expenditure, as well as optimizing their operational expenses.

# Zahra's Carpet Paradise

29

30 Zahra's family has been in the business of selling Persian carpets. The business was established in 1935, in the
31 vibrant town of Healesville in Yarra Ranges, about an hour's drive from Melbourne. Zahra continues the family
32 business (currently in its fourth generation), by running 'Zahra's Carpet Paradise', a small business enterprise
33 selling fine Persian carpets on eBay and Amazon. To serve to a diverse clientele, Zahra sells Persian carpets across
34 different price points. As an example, the 'Nain', 'Isfahan' and 'Tabriz' city rugs[2] that Zahra sells, have a
35 reputation to be of the highest quality, and inspired from the tile works in mosques, palace gardens and floral
36 tessellations, with have a high knot count. They are the most expensive rugs she sells. In addition, she also sells
37 the less expensive variations such as the 'Qashqai' tribal rugs to serve a lot of her customers, who are price
38 conscious, but still would love to invest in good Persian rugs. Zahra sources her merchandise directly from
39 wholesalers and preferred suppliers based out of Turkey and the United Arab Emirates, who in turn get the
40 products directly from their trusted carpet and rug weavers in Iran. Since 2020, Zahra's carpet business started
41 expanding their footprint outside Australia, by serving clientele across multiple countries in Southeast Asia.
42 Today, Zahra's Carpet Paradise has a global footprint with their merchandise being sold in over thirty countries
43 across the world. Customer needs are addressed by the sales and customer service team of about 50 full time
44 staff members. The staff members work from the head office of Zahra's business that was recently relocated to
45 Melbourne, Australia from Healesville. Zahra's business has a centralized warehouse situated close to Melbourne
46 international airport. Zahra's business has an annual turnover of about AUD 10 million dollars as of January 2023.

47 Considering that the primary focus of Zahra's business has been to serve customers, the I.T. infrastructure needs
48 of her business have been simplistic. In other words, Zahra has been able to manage her I.T. needs and her day-
49 to-day operations using Microsoft Office suite of applications (such as Word and Excel applications) to exchange
50 information from the online marketplace, as well as generate business reports. Zahra's carpet paradise has
51 partnered with established online retailers such as Amazon and eBay to host her online marketplace. Currently,
52 Zahra's team downloads the orders from eBay and Amazon, imports information into the business tracking
53 spreadsheets, prints the order details and other documentation required for shipping, and coordinates with
54 shipping partners for collection of shipments. Members from the sales team travel to Melbourne Port three times
55 a week, where they work with customs officials to clear and release (from customs) the new stock of shipped
56 Persian Rugs that has been sent from their suppliers in Turkey and UAE.

57 The current process of managing Zahra's business, sales orders, suppliers, and shipping partners management
58 using spreadsheets is cumbersome. Today, there is no way to automatically ascertain the real time inventory
59 levels for carpets from different suppliers in the centralized warehouse. Zahra's team spends considerable time
60 and effort (about 4 days a month for 3 employees) to take stock of inventory and perform inventory counting.
61 This task is also important to prevent pilferage of the expensive merchandise during the handling process. In
62 addition, considering the foundational nature of the I.T. infrastructure, currently there is no automated process to
63 reconcile stock, customer purchases and supplier reorder processes. The manual reconciliation of data is currently
64 managed by a resolute team of 5 employees in the organization. Also, during high volume sales during the holiday
65 season, consolidating customer orders, collaborating with suppliers to ensure optimal stock for fulfillment, and
66 working with delivery partners to ensure customers receive their shipments on time are some of the areas that
67 are getting difficult to manage using the current applications.

68

69 Even though Zahra's business has an annual turnover of about AUD 20 million dollars, she realizes that a
70 considerable share of her profits is being paid in fees and charges for services offered by her e-commerce
71 platform providers (eBay and Amazon)[3,4]. The current limitations of the I.T. infrastructure with the added
72 reliance on third party service providers is resulting in an overhead of about 40% from the profit margins of the
73 business, just for stock management and fulfillment. In other words, about 40% of the profits are being
74 unnecessarily spent on tasks such as stock management and fulfillment (that can easily be automated), as well as
75 third party fees. Zahra feels that this overhead can be minimized to under 10% by investing in a new e-commerce
76 web application portal. The overhead savings can be better utilized to expand Zahra's business to other countries
77 that are not currently served, as well as serve her customers better by offering more competitive prices on the
78 merchandise.

79 These business challenges have motivated Zahra to terminate her relationship with eBay and Amazon. She wishes
80 to go independent. To achieve this goal, Zahra wishes to invest in developing a custom e-commerce web portal
81 called *Project CarpetIT*. In this way, Zahra believes she can grow her customer base whilst cutting costs (from
82 party seller fees and commissions) and streamlining her business. Through *Project CarpetIT*, Zahra has an
83 ambitious outlook to scale up the rugs business to about AUD 20 million dollars over the next ten years.

84 Zahra's Carpet Paradise has recently obtained a conditional business loan of AUD 200,000 from a top financial
85 service provider in Victoria, Australia to undertake *Project CarpetIT*. The approval of this loan is contingent to
86 Zahra, executing a '**Pilot Phase**' of *Project CarpetIT*, with a small subset of key features / functional areas and
87 demonstrating the usefulness of the pilot e-commerce web site to the financial provider. On the successful rollout
88 of this pilot phase, the financial provider has agreed to release the loan amount of AUD 200,000 for a complete
89 implementation of the e-commerce portal other desired features (such as supplier management and stock
90 reconciliation) as explained previously.

91 Considering Zahra does not have any budget to execute the '**Pilot Phase**' of *Project CarpetIT*, Zahra wishes to get
92 this pilot system to be built by a 4-to-6-member student team at the University of Melbourne taking up
93 SWEN90016 in about 6 weeks, starting Sep 2023 with $0 budget. For the '**Pilot Phase**' of *Project CarpetIT,* Zahra
94 has identified the following use cases as being critical. The use cases are grouped into different functional areas.

### Functional Area 1: Data Capture

**Use Case 1 – Customer Information**
A user interface that captures the details of customers before making an online order. These details include name of the customer, age, e-mail, shipping address, billing address, primary contact number, secondary contact number, and 1 identifying document (such as a national identity card) for the customer. The identifying document is to maintain the integrity and genuineness of the customer. Also, customer preferences for newsletter (daily, weekly, monthly, sale events or no subscription as a drop-down list) needs to be captured.

**Use Case 2 – Supplier Information**
A user interface that captures the details of suppliers that supply the inventory for Zahra's business. This includes information such as Supplier Name, Supplier Address, Contact Name (person responsible for handling supplier-related matters), Contact Email (email address of the supplier's contact person), Contact Phone Number (phone number to reach the supplier or their representative), Supplier Tax ID (tax identification number of the supplier, such as a VAT number or Employer Identification Number (EIN)), Payment Terms (agreed-upon terms for payment, such as NET 30 days, NET 60 days, or due upon receipt), Preferred Payment Method (such as check, bank transfer, or electronic funds transfer (EFT)), Supplier Website (URL of the supplier,

if available), Business Registration Number (official registration number of the supplier's business), Insurance Details (Information about the supplier's insurance coverage, if applicable), Bank Details (bank account information required for electronic payments, including account number, bank name, and branch), Contract Expiration Date (date when the supplier's contract or agreement is set to expire), and Notes (Any additional notes related to the supplier, such as specific terms, agreements, or other relevant information as needed).

**Use Case 3 – Logistics Partner Information**
A user interface that captures the details of shipping partners that transport the inventory for Zahra's business. This includes information such as Shipping Partner Name, Shipping Partner Address (physical address of the shipping partner, including street, city, state, and ZIP code), Contact Name (name of the person responsible for handling shipping-related matters at the partner company), Contact Email (email address of the shipping partner's contact person), Contact Phone Number (phone number to reach the shipping partner or their representative), Types of Shipping Offered (different types of shipping services provided by the partner, such as ground shipping, air freight, ocean freight, or express delivery), Service Areas (regions or countries where the shipping partner operates or provides services), Shipping Rates (pricing structure or rates offered by the shipping partner for various shipping services), Tracking Options (available tracking methods or systems offered by the shipping partner to monitor shipments), Delivery Timeframes (estimated timeframes or delivery windows provided by the shipping partner for different shipping services), Packaging Requirements (any specific packaging guidelines or requirements set by the shipping partner, such as weight limits, dimension restrictions, or hazardous materials regulations), Insurance Coverage (information about the shipping partner's insurance coverage or options for protecting shipments in case of loss or damage), Returns and Claims Process (details about the process and policies for returns, claims, and resolving shipping-related issues), Notes (any additional notes or comments related to the shipping partner, such as contractual terms, special agreements, or other relevant information as needed).

**Use Case 4 – Shipping Partner Reviews**
A user interface that captures the customer feedback for shipping partner after items are delivered. This includes customer name, customer email (from Use Case 1), Order details for which feedback is being given (Customer Orders displayed as List of Values from Use Case 8), Service Rating (List of Values from 1 Star to 5 Star), and a text area to capture customer feedback. A registered customer should be logged in to leave a shipping partner review.

**Functional Area 2: Information Setup for Carpets**

**Use Case 5 – Creation of Carpet Categories**
A simple user interface to create various carpet categories. Some of the popular carpet categories that are currently being sold are Tabriz Carpet, Isfahan carpet, Kashan carpet, Heriz carpet, Qom / Qum / Ghom carpet, Nain carpet, Kilim carpet, Sultanabad / Arak carp, Kerman Carpet and Serapi Carpet. A special category 'Kit' is also defined to accommodate Carpet Kit Items (Use Case 7). Each of these carpet categories should be linked to one or more suppliers that supply these carpet categories.

**Use Case 6 – Creation of Carpet Items**
A simple user interface to track various carpets that are currently sold. Each carpet item should be assigned to a carpet category from a drop-down list (Use Case 5). In addition, carpet length, carpet breadth, carpet weight, dimensions, carpet colour, carpet pattern, dominant colour 1 (in the pattern), and dominant colour 2 should be captured for all carpets. The carpet size should support both numeric and alphabetic values (such as XL, XXL). In addition, at-least 3 high resolution images of the carpet should be uploaded when creating the carpet item.

s8 | S W E N 9 0 0 1 6                Faculty of Engineering & Information Technology
School of Computing and Information Systems
Semester 2, 2023 – Dr. Andrew Valentine

Finally, item quantity, and country of origin (list of values) should be captured. Each of the carpets should be linked to one or more suppliers that supply these carpet items.

**Use Case 7 – Creation of Carpet Kit Items**
A simple user interface to track various carpet kit items that are currently sold. A kit is a pre-defined combination and quantity of specific items. For example, a Comprehensive kit could have a carpet, three rug pads (providing cushioning, prevents slipping and extends life of rug) and 1 Carpet Cleaning Solution, 1 Soft Brush and 1 Care Instruction booklet. Similarly, a Decorative Carpet Kit could have 2 carpet items of the same category and 4 decorative pillows. The carpet kit item should default to carpet category 'Kit' from a drop-down list and is not editable (from Use Case 5). In addition, carpet length, carpet breadth, carpet kit weight, and kit dimensions should be captured for all carpets. The carpet kit size should support both numeric and alphabetic values (such as XL, XXL). In addition, at-least 3 high resolution images of the carpet kit should be uploaded when creating the carpet kit item. Finally, item quantity and country of packaging of the kit item (from list of values) should be captured.

## Functional Area 3: Customer Order Interface

**Use Case 8 – Requisition of Carpets or Kits**
A "Checkout" user interface that captures the specific order details for one or more carpet items or kits in the shopping cart. The "Checkout" User Interface includes – Carpet Item(s) / Kit Item(s), Quantity. The following fields in the Checkout Interface are defaulted from the customer profile (from Use Case 1) who has logged into the system and placed items in the cart - [Customer name, email address, phone number. Shipping Address, Billing Address - (read only)], Preferred Payment Method (Editable), Delivery Instructions (Editable), Additional fields to be displayed - Purchase Order Date (Non editable and defaults to system date), Order Number (Non editable), Order Total (Non Editable), Discounts or Promotions (if applicable, any discounts or promotional codes used by the customer for the purchase order), Order Total (total cost of the purchase order, including the price per carpet, quantity, any applicable taxes or fees, and shipping charges), Sales Representative (name or ID of the sales representative responsible for assisting the customer with the purchase order), Order Status (a field to track the status of the purchase order, such as "pending," "confirmed," "shipped," or "delivered"), and Customer Notes (Any additional notes or comments provided by the customer related to the purchase order or specific requests) . A registered customer should be logged in to create a requisition.

Note – Creating a Requisition record in the database as mentioned above is sufficient. You are **not** expected to implement payment gateway integration to take online payments for Order fulfillment.

## Functional Area 4: Optical Character Recognition Support

**Use Case 9 – Optical Character Recognition and Conversion**
Support for an Optical Character Recognition API[5, 6] that can automatically extract text, handwriting and data from scanned documents. Here the user interface should have a feature to input the scanned image / notes sent by a customer requesting for specific carpet item / kit item. Individual data elements from the customer notes should be extracted and presented for display / review on the UI. You are **not** expected to convert the extracted text into a Purchase Requisition Record as done in Use Case 8.

s9 | S W E N 9 0 0 1 6     Faculty of Engineering & Information Technology
School of Computing and Information Systems
Semester 2, 2023 – Dr. Andrew Valentine

**Functional Area 5: Text to Speech Integration**

**Use Case 10 – Alternate Mode for Requisition of Aid Items**

Customers shall be able to request a carpet item / kit item using speech. To start with, implement a "Speech to Text" functionality to transcribe customer speech requesting carpet items into text. Store this text in a database with Transcription Details (such as Transcription Record ID, plus the text transcription of the entire message) as one record. You are **not** expected to convert the text transcription message into a Purchase Requisition Record as done in Use Case 8.

99

**Functional Area 6: Administrator User and Dashboards**

**Use Case 11 – Administrator User**

The system shall have a pre-defined "admin" user created. Only the admin user should be able to view the dashboards (Use Case 12 and Use Case 13). The "admin" user shall be able to view the dashboard (Sales and Analytics), plus view the list of all orders in the system.

**Use Case 12 – Sales Dashboard**

A simple dashboard that is also the default User Interface to be displayed when the admin user logins into the system. The dashboard displays 4 graphs in a 2 X 2 layout (2 rows with 2 graphs displayed in each row). The first graph displays the Top 5 carpets items that have sold in the last 90 days (excluding kits). The second graph displays the Top 5 Carpet Item categories that have been sold in the last 90 days. The third graph displays the Top 5 carpet items that have a low inventory (and needs to be requested from the suppliers). The fourth graph displays the Top 5 carpet items that have high inventory (to decide promotional sales for stock clearance). The user should have an option to display the choice of the graph type (bar charts or pie chart) for each graph. The dashboard should only be displayed if the user is logged into the system as an "admin" user (Use Case 11).

**Use Case 13 – Analytics Dashboard**

A simple dashboard that integrates web analytics service provided by Google. For the pilot phase, the following analytics information is to be displayed in the dashboard. Analytics Summary (User and Page Views for current day, last week, 30 days, 90 days and 1 year), Session Report (number of interactions from users for your web site that happens within a given timeframe, Page Report (Average number of pages visited in the pilot e-commerce portal per user session), Bounce Rate (Number of people leaving the e-commerce portal after just visiting 1 page on the web site), Top Countries(Display what part of the world your visitors are coming from), and Search Engines Summary(Display what browsers your users are visiting the e-commerce portal from). The dashboard should only be displayed if the user is logged into the system as an "admin" user (Use Case 11).

100

**Functional Area 7: Social Media Integration**

**Use Case 14 – About Us Page**

A static page that shows briefly mentions the history and achievements of Zahra's Carpet Paradise. The UI should support different content types such as text, images, audio and video files.

**Use Case 15 – Link to Social Media Profile**

The User Interface for "About Us" requirement documented in Use Case 14 shall have two "Follow Us" buttons. The first button will transfer the logic to the Facebook Profile Page of Zahra's Carpet Paradise. The second button will do a similar activity for the Instagram Profile page of the business.

s10 | S W E N 9 0 0 1 6                    Faculty of Engineering & Information Technology
School of Computing and Information Systems
Semester 2, 2023 – Dr. Andrew Valentine

101

| **Functional Area 8: Security Considerations** |
| --- |
| **Use Case 16 – Secure Hosting**<br>The new I.T. System shall be securely hosted to prevent hacking from unscrupulous actors (HTTPS pages)<br><br>**Use Case 17 – Restricting the number of login attempts**<br>To prevent hacking and malicious users from accessing the web site, the number of wrong logins attempts to the web site shall be restricted. After a pre-defined number of attempts, the user shall not be able to access the web site for a pre-defined time. The pre-defined attempts and the lock out time shall be configurable by the end user of the system.<br><br>**Use Case 18 – Two Factor Authentication**<br>Provide a user interface to enable customers registered in the e-commerce portal to enable and disable 2 Factor Authentication (2FA). You can offer multiple verification methods for 2FA, such as SMS, email, or authenticator apps. Customers should be able to choose their preferred method and configure it within their account settings. For this Use Case, you can choose to default the 2FA support to only one 2FA verification method as applicable (either one of SMS, email, or using an authenticator app). |

102

| **Functional Area 9: Print and e-mail Support** |
| --- |
| **Use Case 19 – Print Functionality**<br>The new I.T. system shall provide a functionality for customers to print the "About Us" page in a PDF format.<br><br>**Use Case 20 – email Functionality**<br>The system shall send an email under the following circumstances.<br>    1. Use Case 1 – When a new customer registers in the e-commerce portal or when any existing customer details are updated in the system.<br>    2. Use Case 8 – Whenever a new requisition is created for a carpet or kit item by an existing customer. |

103

104 **Common Expectations for all the Use Cases**

105 The user interface element validations for all the use cases should be as per standard practice, to minimize data
106 entry errors. The new pilot system will be accessed by the "admin" employees of Zahra's Carpet Paradise, and
107 registered customers only.

108 **Case Study References:**

109 [1] A never ending decrease of technology cost – IEEE Future Directions
110 [2] Types of Persian Rugs Encyclopedia | Lilla Rugs | Persian Rugs London
111 [3] Selling Fees | Seller Centre (ebay.com.au)
112 [4] How Much Does It Cost to Sell on Amazon? | Pricing Calculator
113 [5] Amazon Textract | AWS Machine Learning Blog
114 [6] Computer Vision | Microsoft Azure

s11 | S W E N 9 0 0 1 6      Faculty of Engineering & Information Technology
School of Computing and Information Systems
Semester 2, 2023 – Dr. Andrew Valentine