

Align Technology, Inc.

Matching Manufacturing Capacity to Sales Demand

Sultan Almuji

Abdulrhman Alshahrani

Mada Alsalem

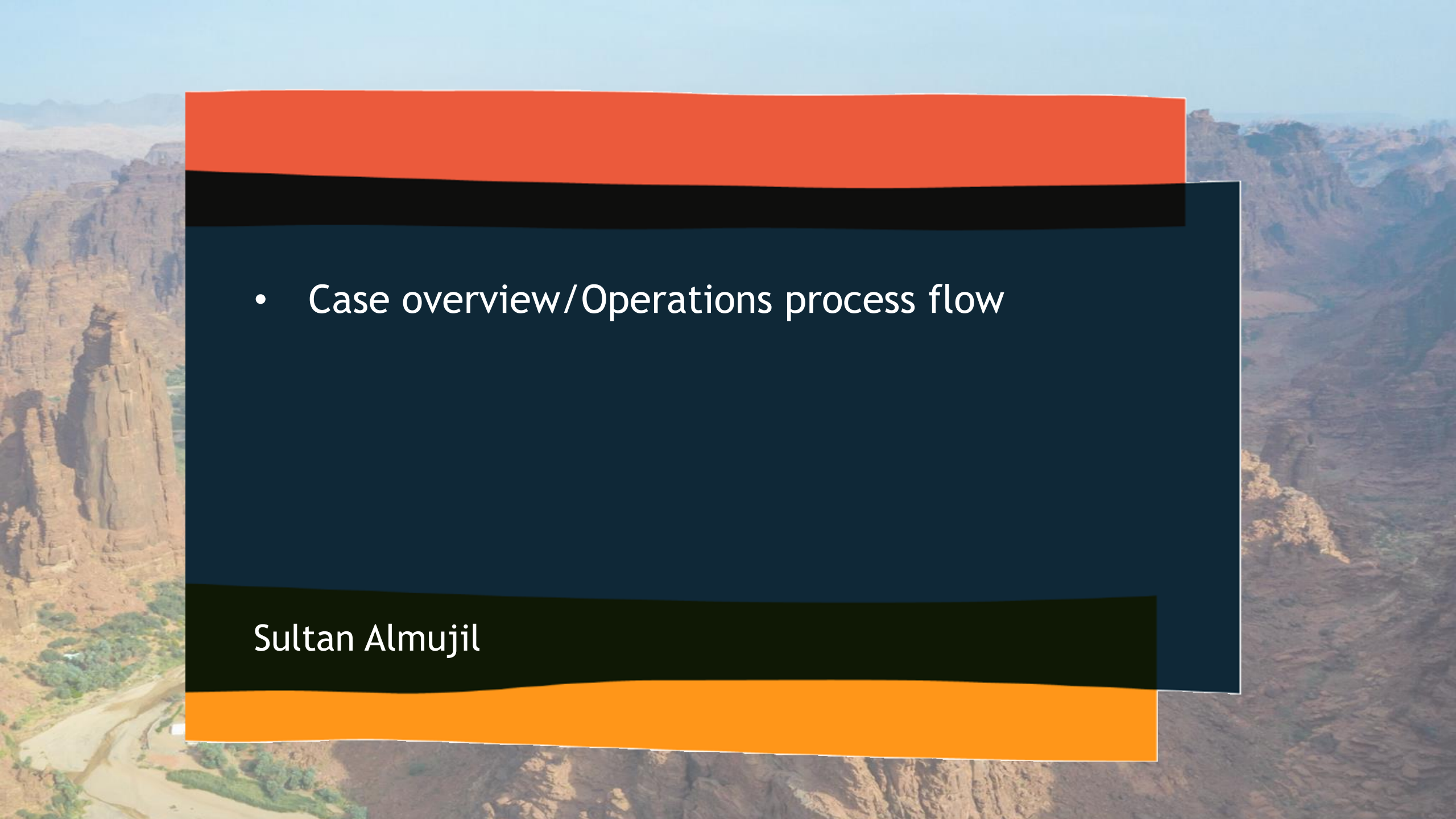
Walaa Bin Shuail

Nouf Aljassera



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- Case overview/Operations process flow

Sultan Almuji

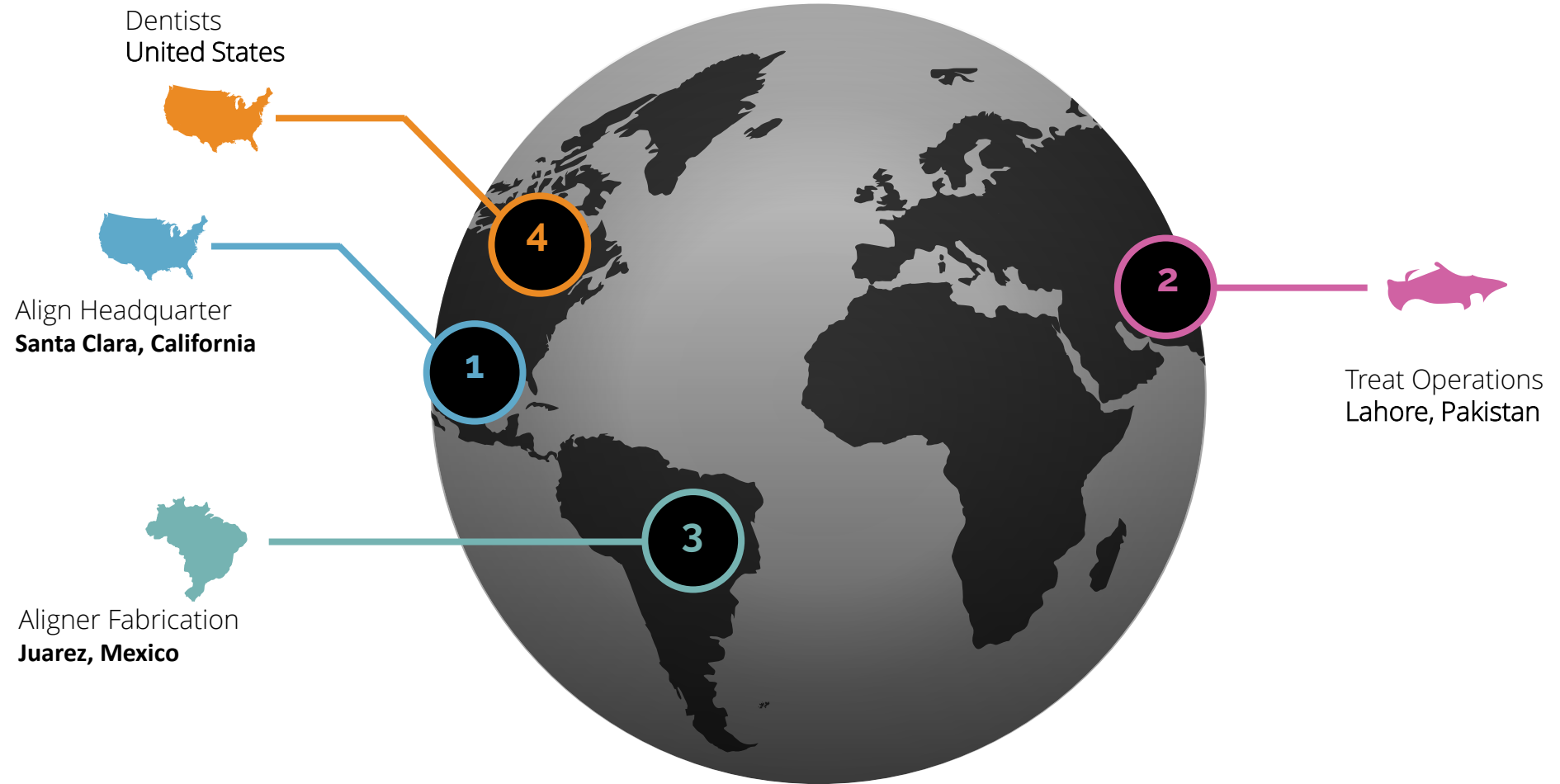
Case Summary

About the company

- The company established in the USA in April 1997
- They manufacture invisible braces called invisalign
- They operate in three different countries

The logo for 'align' features the word in a bold, lowercase, sans-serif font. A small blue dot is positioned above the letter 'i'.This block contains two logos. On the left is the 'invisalign' logo, which includes a stylized eight-pointed star icon followed by the word 'invisalign' in a lowercase sans-serif font, with a registered trademark symbol. To its right is a vertical line, followed by the 'iTero' logo, which consists of the word 'iTero' in a lowercase sans-serif font, also with a registered trademark symbol.

Operations' locations



Operation processes

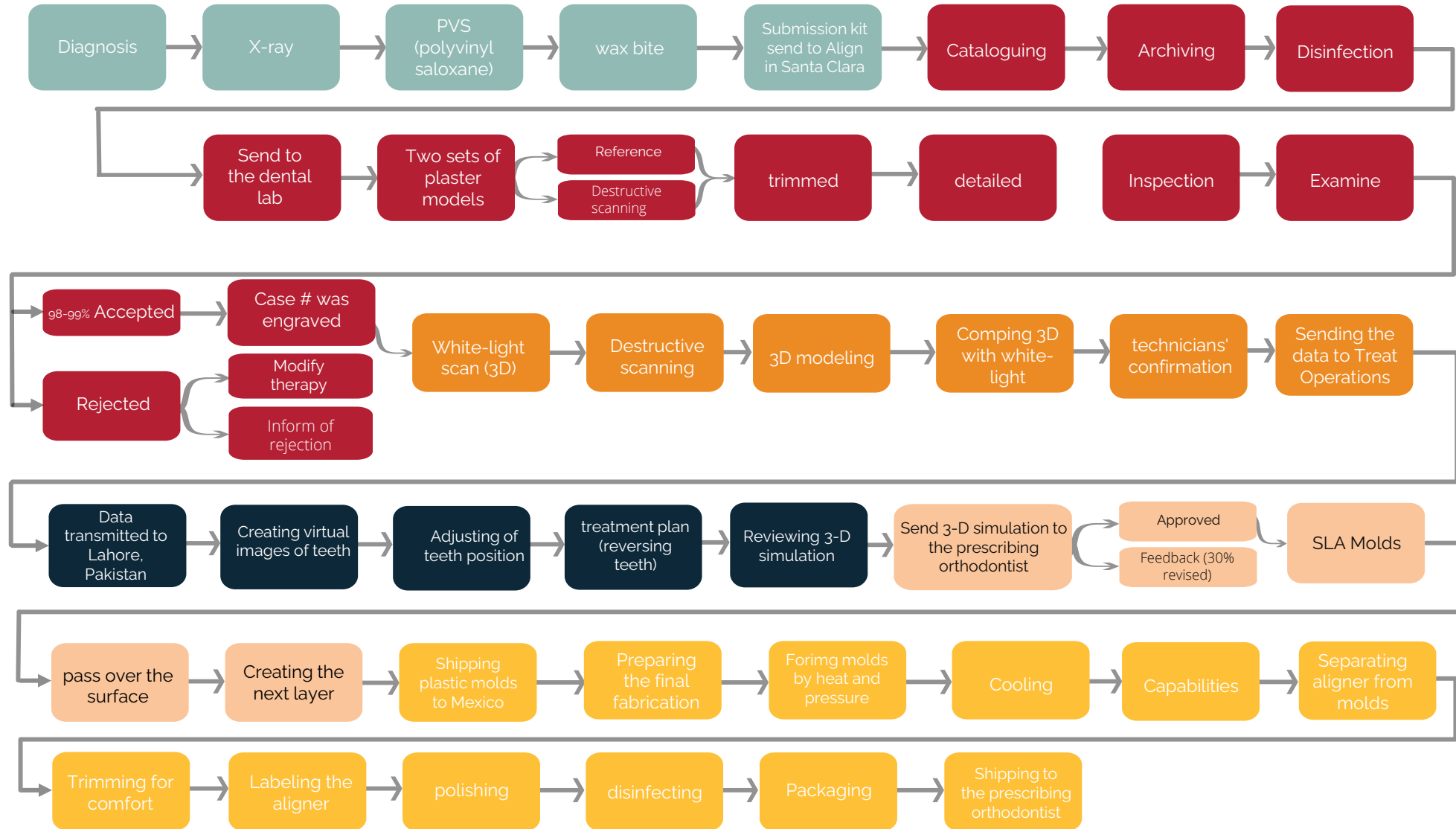


Six major operation processes which are:

- Treatment initiation.
- Receiving and preparation of the physical models
- Data acquisition
- Treat operations
- SLA mold fabrication
- Aligner fabrication



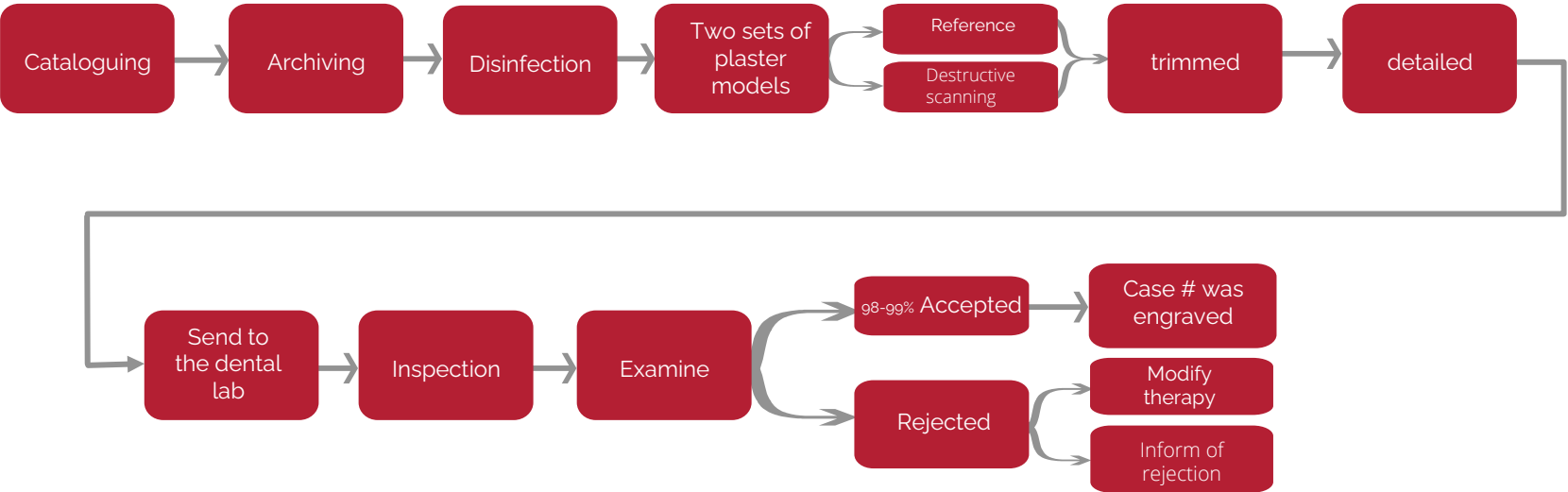
Holistic overview of the production process flow diagram



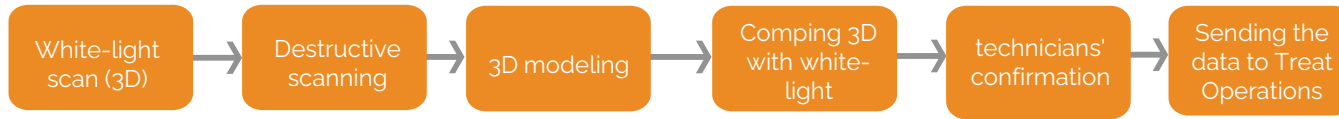
Treatment Initiation



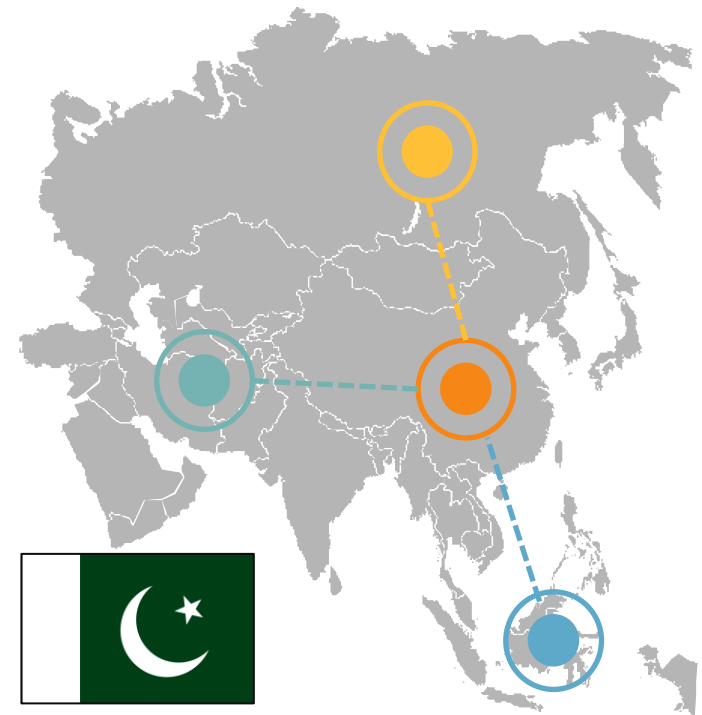
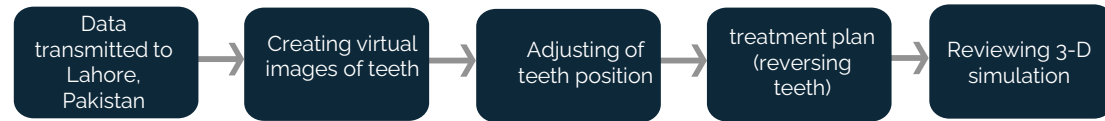
Receiving and Preparation of the Physical Models



Data Acquisition



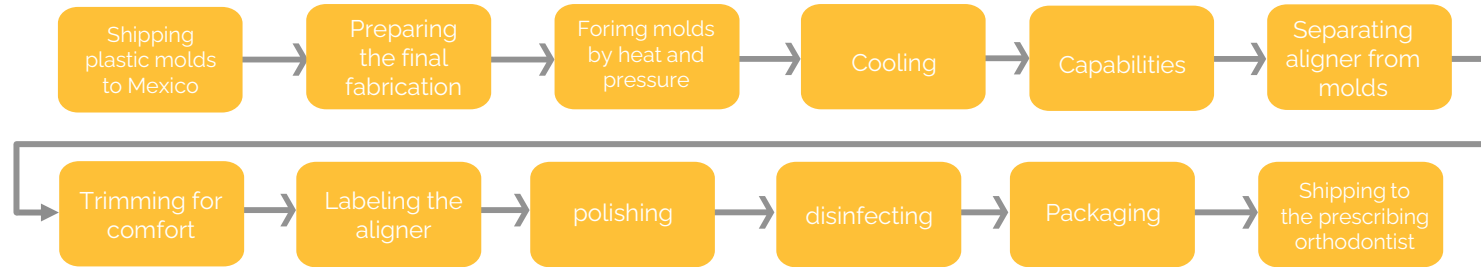
Treat Operations

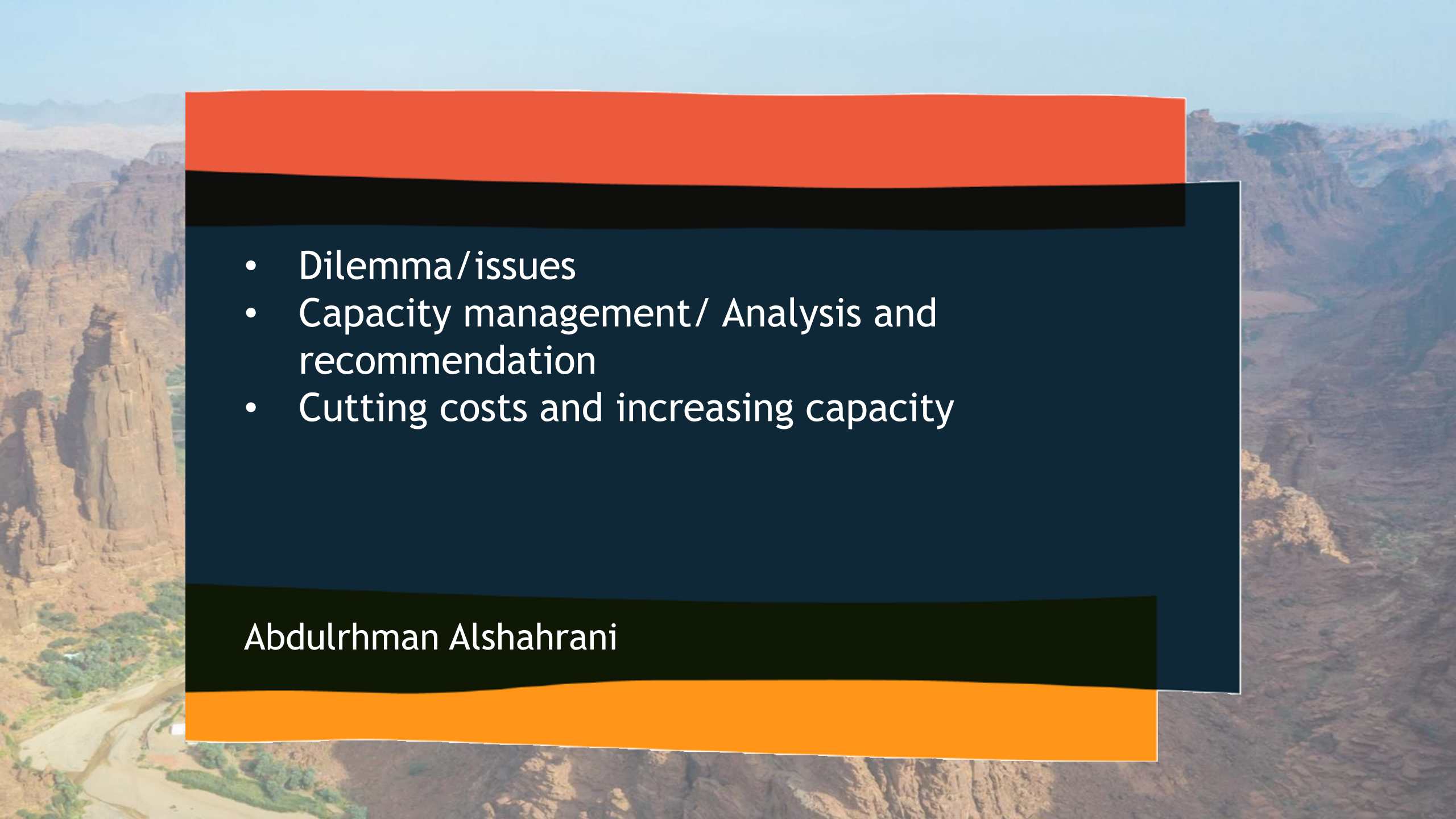


SLA Mold Fabrication



Aligner Fabrication

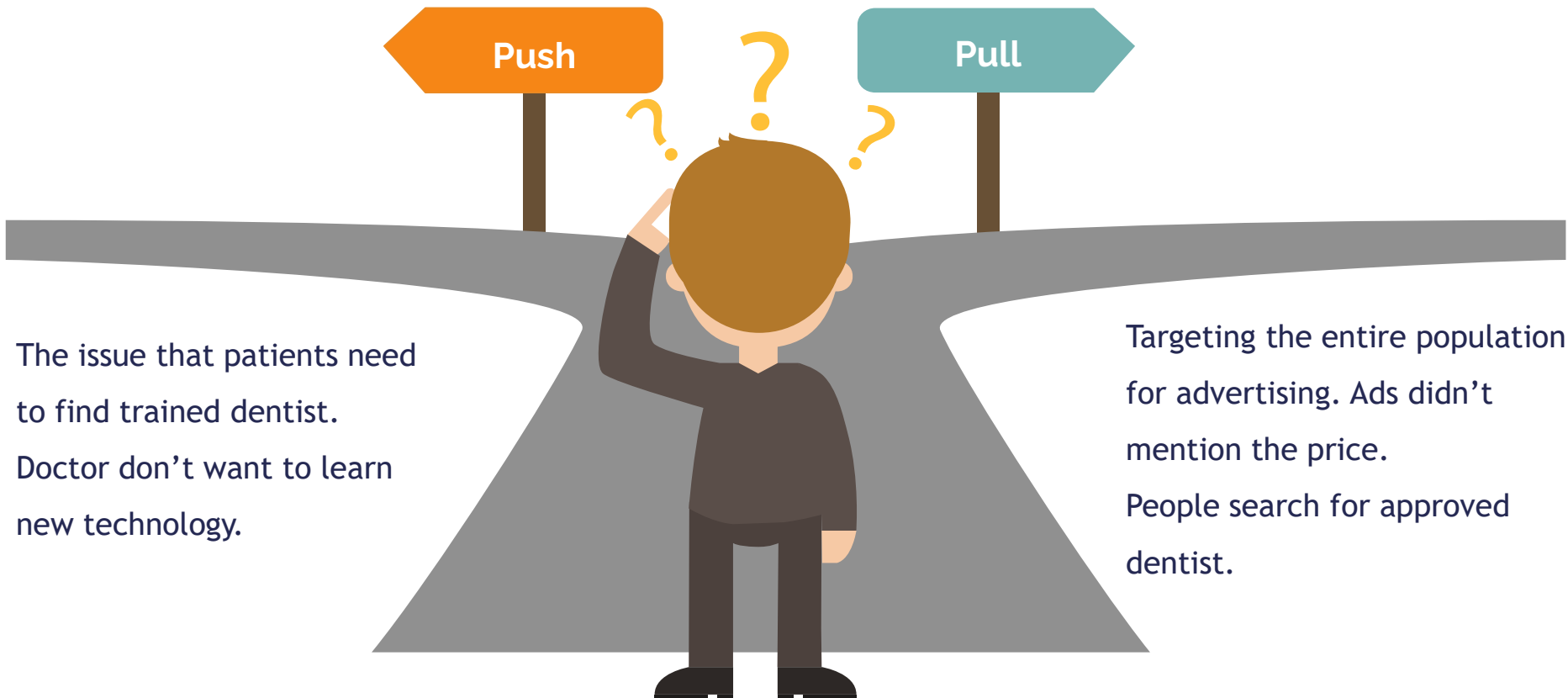


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- The background of the slide is a high-angle photograph of a vast, rugged canyon. A river flows through the bottom of the canyon, surrounded by green vegetation. The canyon walls are steep and rocky, with various geological formations. The sky is clear and blue. The slide itself is a dark blue rectangle with a white border, positioned in the center of the image. It has a red header bar at the top and an orange footer bar at the bottom. The text is white and lists three bullet points.
- Dilemma/issues
 - Capacity management/ Analysis and recommendation
 - Cutting costs and increasing capacity

Abdulrhman Alshahrani

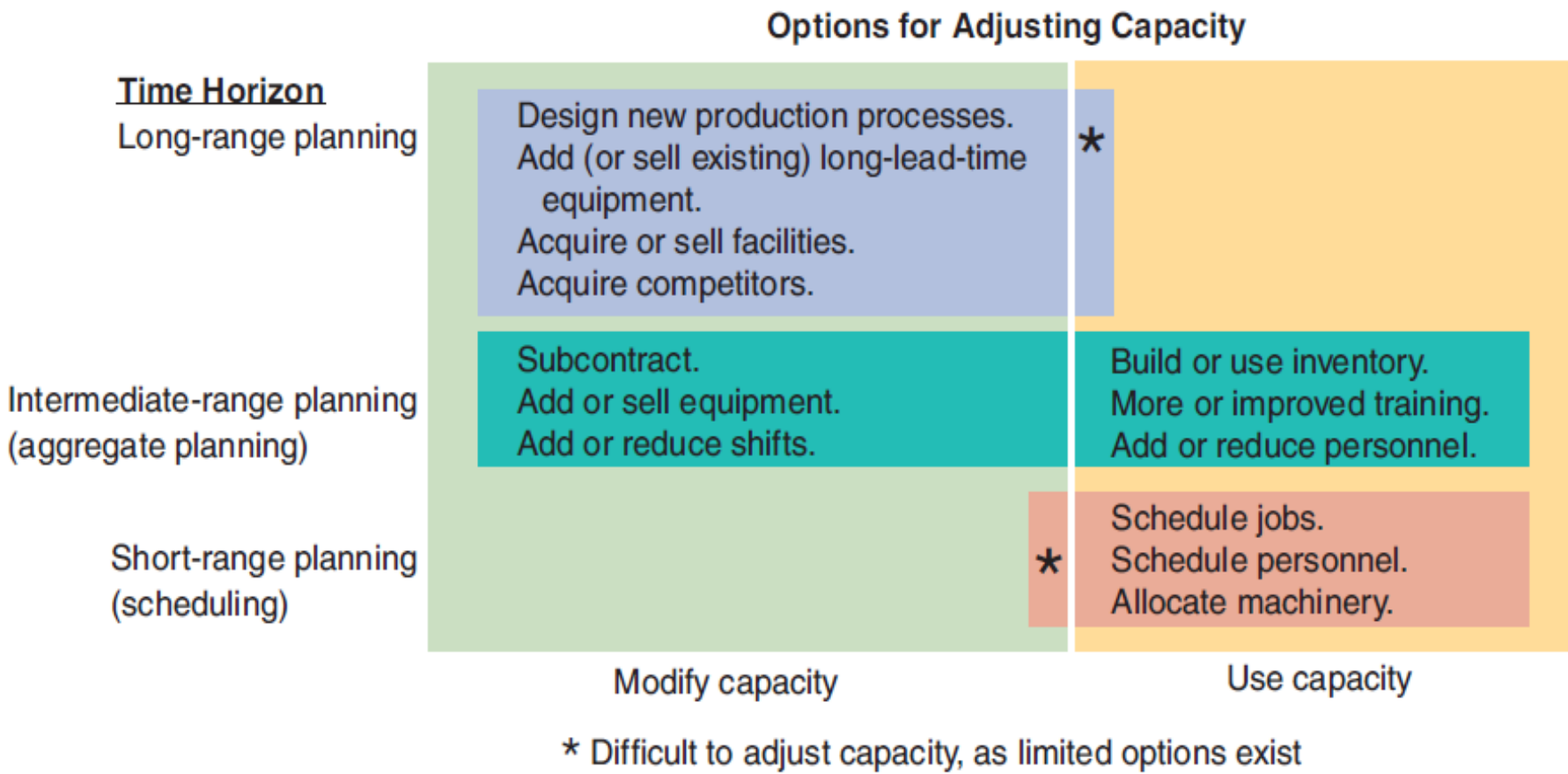
Dilemma/issues

- Inventory in this case is not possible as each product is tailor made and customized to the prospective client
- One of the earliest issues that Align faced was its marketing strategy



Capacity management/ Analysis and recommendation

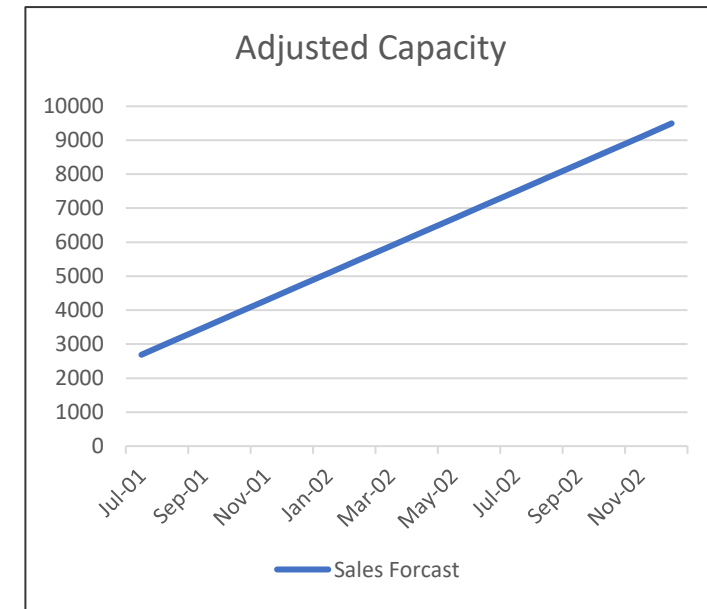
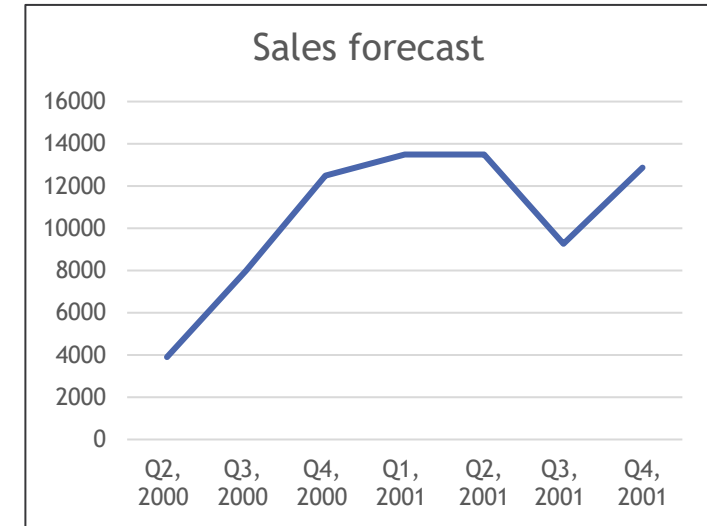
We are adjusting the capacity given that our time horizon is 18 months



Capacity management/ Analysis and recommendation

Referring to that we are proposing the below options (tactics) to adjust the capacity to match the demand:

1. **Making staffing changes** (reassign the shifts considering the time-zones differences)
2. **Adjusting equipment** (Adding extra equipment at the bottleneck processes)
Enhance the bottleneck time at reverse tooth movement process by adding/relocating extra resources to the bottleneck.
3. **Improving processes to increase throughput**



Capacity management/ Analysis and recommendation

Things to consider:

Dec 2001, is Ramdan in Islamic Calendar

Implications:

- Extensive demands on leaves for Ramdan, Eid and Chrisms
- Ramdan shift maybe different in Pakistan



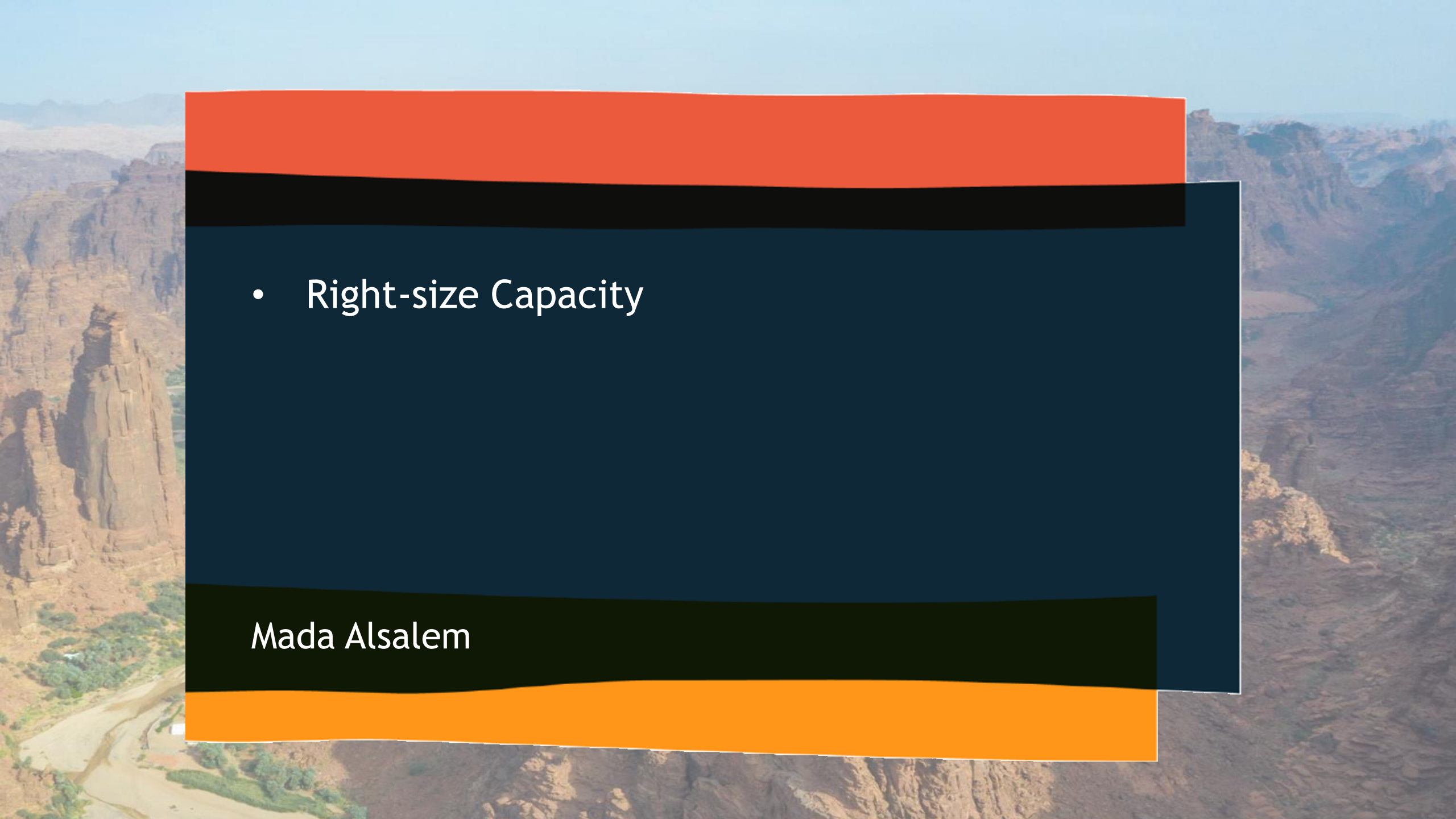
Month	Month
Jan 2001	Shawwal, 1421
Feb 2001	Dhu al-Qidah, 1421
Mar 2001	Dhu al-Hijjah, 1421
Apr 2001	Muharram, 1422
May 2001	Safar, 1422
Jun 2001	Rabi al-awwal, 1422
Jul 2001	Rabi al-thani, 1422
Aug 2001	Jumada al-awwal, 1422
Sep 2001	Jumada al-thani, 1422
Oct 2001	Rajab, 1422
Nov 2001	Shaban, 1422
Dec 2001	Ramadan, 1422

Capacity management/ Analysis and recommendation

Cutting costs and increasing capacity

Reducing the costs by cutting from the non bottleneck resources as follows the operation of receive/order entry

Operation	Receive/ Order Entry	Dental Lab	Data Acquisition ^b	Treat Operations	SLA Mold Fabrication	Aligner Mold Fabrication and Ship ^c
Capacity						
Cases/8-hour shift ^d	200	160	87.5	340	110	160
Current number shifts	1	1	2	1	2	1
Cases/person/shift	25	6.67	17.5	0.75	6.47	0.67
Cases/machine/shift	N/A ^e	6.67	17.5	0.75	7.33	0.13
Number of operators	8	24	10	450 ^f	34	240
Lead Time for Adding Capacity						
Lead time to hire (weeks)	2	4	2	1	2	1
Time to train (weeks)	1	4	2	12	2	4
Lead time to purchase/install machines (weeks)	2	3	9	4	18	4
Costs						
Employee wages/HR	\$12.50	\$14.50	\$18.50	\$2.65	\$14.75	\$5.50
Hiring and training cost/person	\$2,000	\$6,000	\$4,000	\$1,800	\$4,000	\$2,000
Equipment and installation	N/A ^e	\$2,000/operator	\$180,000/unit	\$5,000/station	\$800,000/unit	\$3,000/unit

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- Right-size Capacity

Mada Alsalem

Right-size Capacity

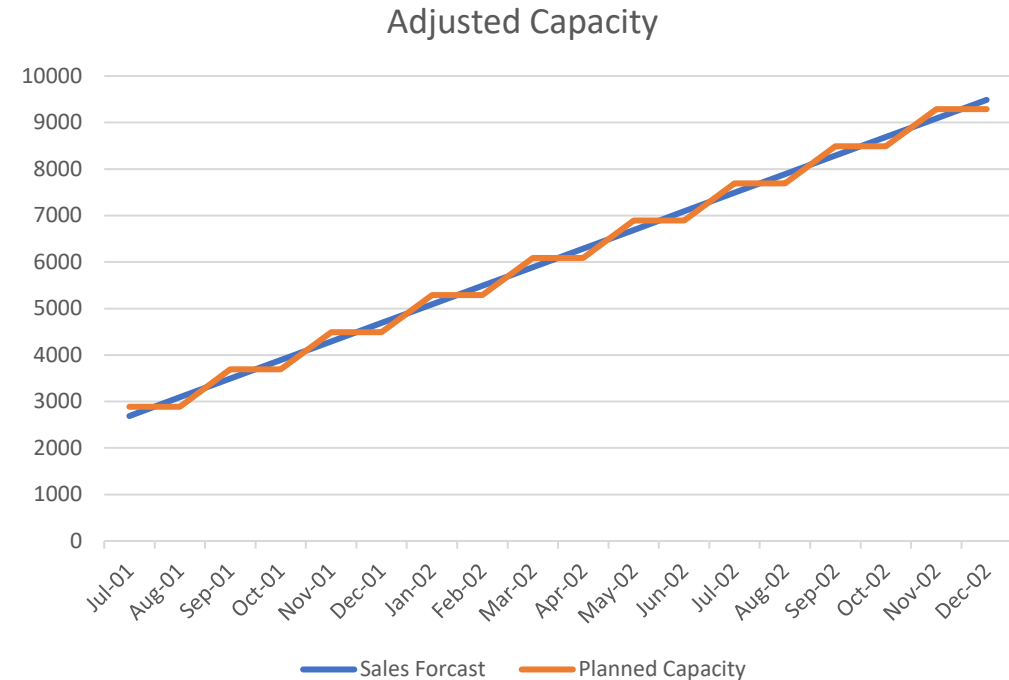
What is the “right-size” for the capacity?

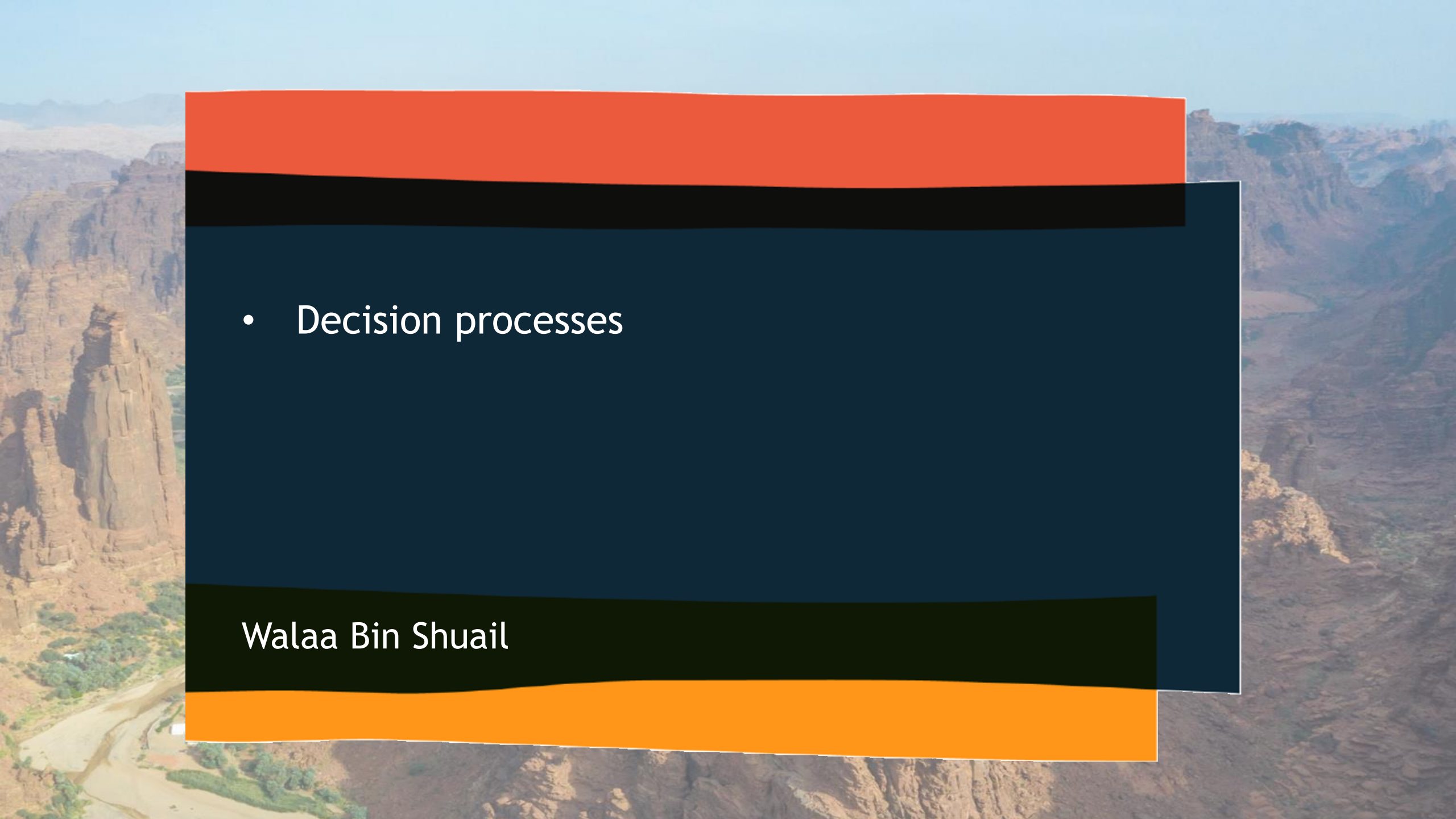
- Right-sizing the manufacturing capacity involves adjusting the size of capacity to a more effective size.
- It is aimed at bringing an organization to the right size for achieving its objectives at the lowest total cost.
- Align has **high fixed costs** due to the scaled up capacity (20 % excess capacity rule) above normal demand.
- Assuming new forecasts are reliable estimates of future case sales, we suggest the following strategy.

Right-size Capacity

Leading demand with incremental expansion:

- Straddling demand by building capacity that is average (± 200 input/month) is found to be cost-effective and allows for delayed capital expenditure.
- Although the lag strategy is much more conservative with costs, the match strategy is the most effective strategy that ensures the availability of sufficient capacity to meet the needs of the company's customers at the lowest cost.



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- Decision processes

Walaa Bin Shuail

Decision processes

Where the labor challenges occurs?

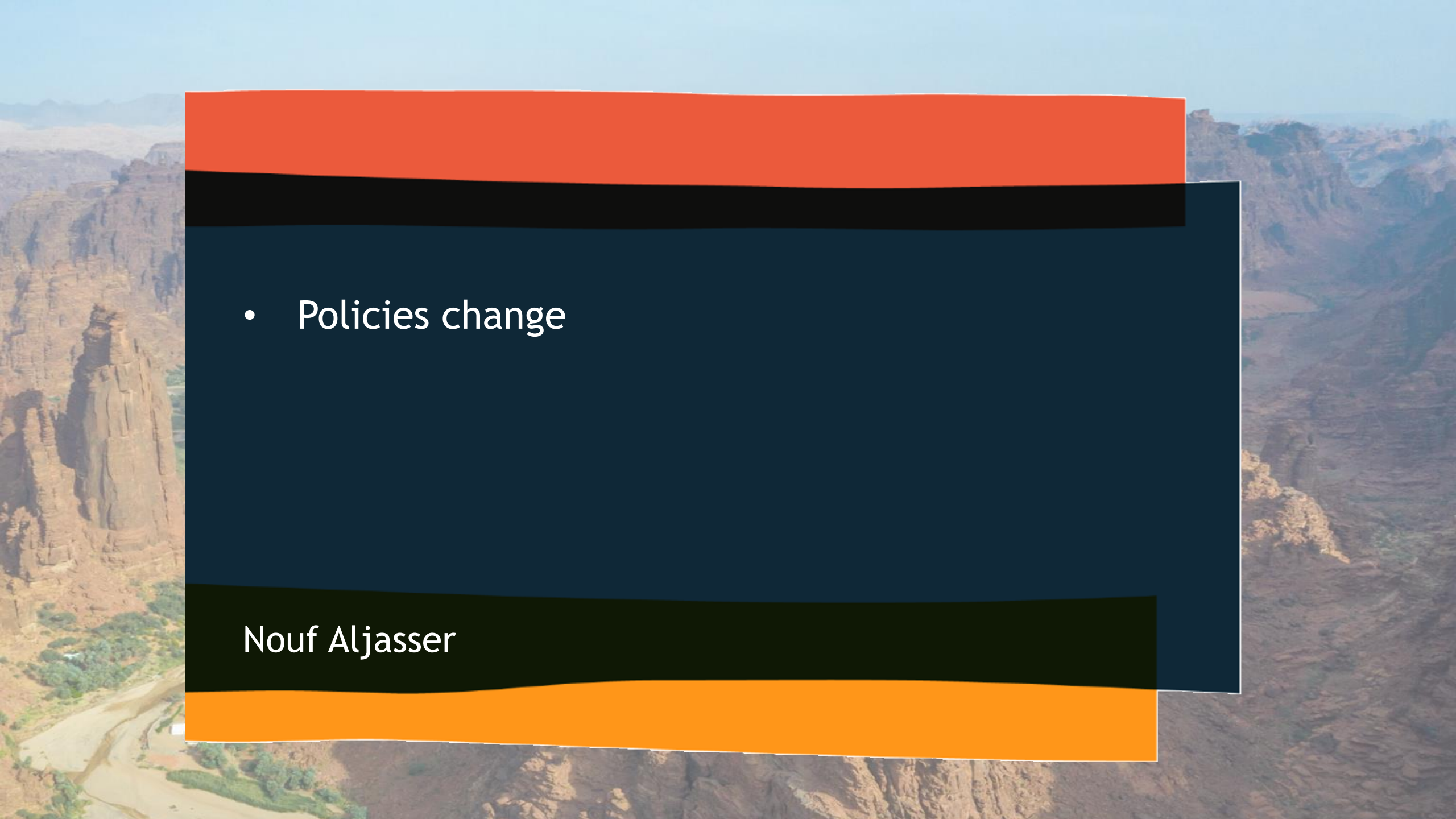
- Aggressive forecasting, with the mind that the customers will keep on coming as the days would pass. This led to higher capacity and hence higher fixed costs.
- Orthodontists were not adopted to the technology
- Since the manpower are mainly considered underutilized we are using an Average capacity with incremental expansion to manage the labor capacity with providing overtime as demand grow and reassess the need of hiring/training gradually.

Decision processes

Decision processes recommended to increase the labor capacity

- For resizing/ downsizing the labor force, again two things will be keep in consideration and they are:
 1. Indifference Time: Indifference time is the time in which we are indifferent about letting go of the labor or holding it.
 2. Hiring and Training Time: The time and cost that is required to hire and train the labor personal.

The calculations shows that number of persons to be laid off depends on the training and hiring time and acquisition cost. And we got results that Align Tech should lay off around 174 labor personals, where 9 personals can be laid off from the Fabrication department

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- Policies change

Nouf Aljasser

Policies change

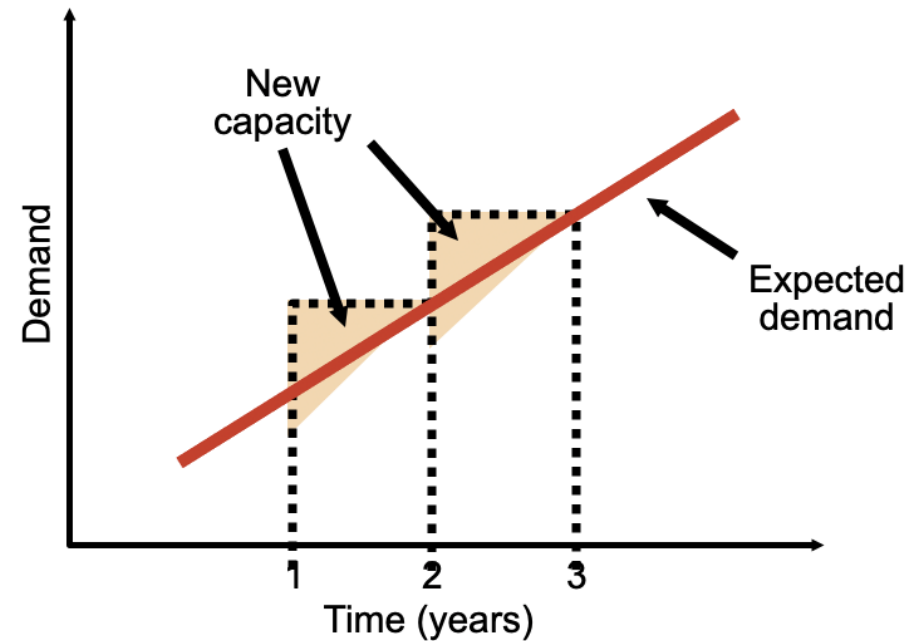
Will your policies change when additional machines are required to **expand capacity**?

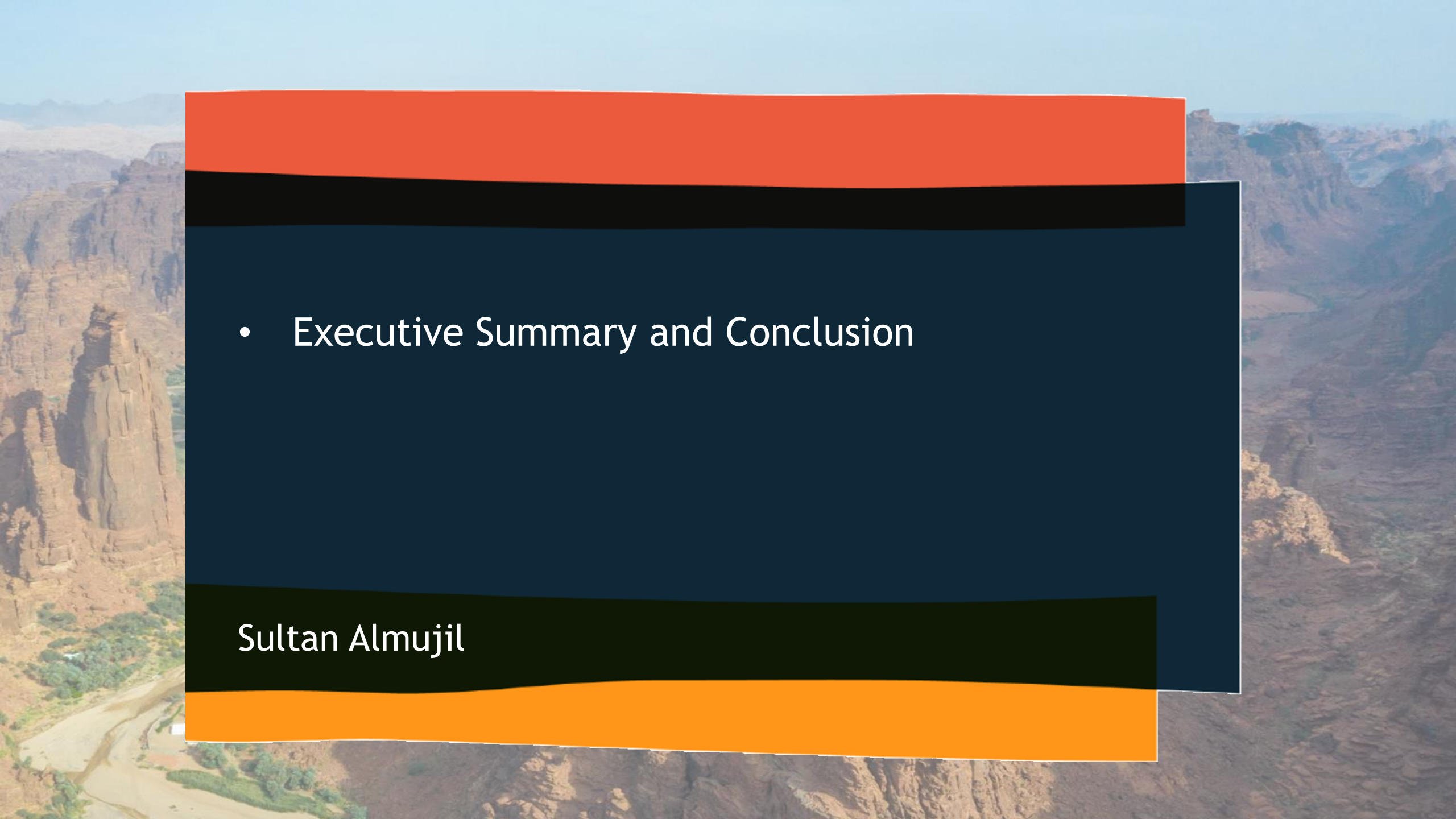
- We should take into consideration that the demand increases in small units while capacity additions are likely to be in large units and this indicates **capacity decision risks**.
- When additional machines are required, this indicates an increase in demand so undoubtedly our policy will change to expand the capacity.
- Through the policy of **Leading demand with incremental expansion**, we can adjust the capacity to the demand.
- The parity between the capacity of the company and the demands of its customers leads to efficiency in utilized resources and satisfied customers.

Policies change

Leading demand with incremental expansion:

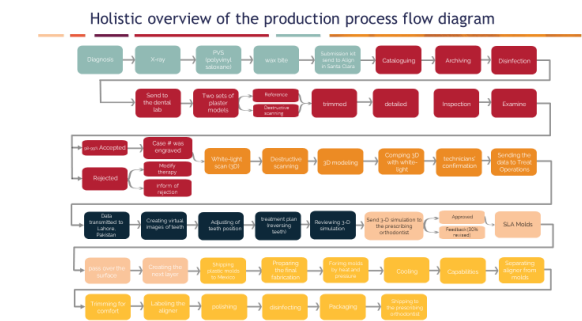
- Maintaining sufficient capacity.
- Gain market share by satisfying the demand.
- Fulfilment of customer needs.
- Expansion may result in Economic of scale.



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- An aerial photograph of a vast desert canyon, likely the Grand Canyon, showing rugged rock formations and a winding river. Overlaid on the image is a presentation template consisting of a dark blue central rectangle, a black horizontal bar below it, and orange horizontal bars at the top and bottom. The text is white and positioned within these colored areas.
- Executive Summary and Conclusion

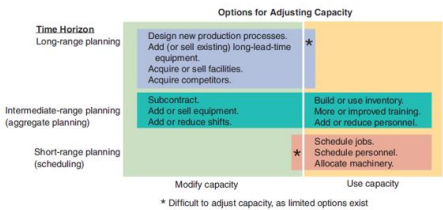
Sultan Almuji

Executive Summary



Capacity management/ Analysis and recommendation

We are adjusting the capacity given that our time horizon is 18 months



Right-size Capacity

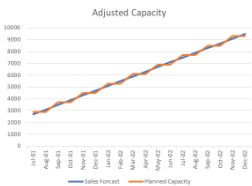
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Policies change

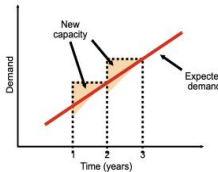
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Policies change

Leading demand with incremental expansion:

- Maintaining sufficient capacity.
- Gain market share by satisfying the demand.
- Fulfilment of customer needs.
- Expansion may result in Economic of scale.



A scenic view of a canyon with a river at the bottom, overlaid with a dark blue rectangle containing the text "Thank you". The canyon features steep, layered rock walls and a winding river in the distance. The sky is clear and blue.

Thank you