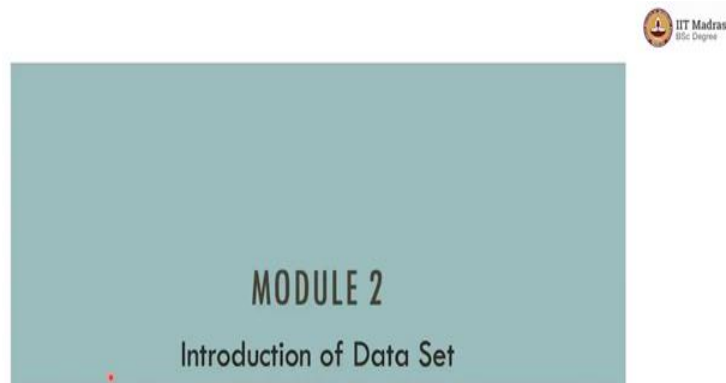


Business Data Management
Professor G. Venkatesh, Dr. Milind Gandhe, Mr. Siva Kumar Padmanabhan
Indian Institute of Technology, Madras
Introduction to the dataset - sales, production and inventory

(Refer Slide Time: 00:14)



Professor Milind Gandhe: So, maybe it is a good time now to start looking, Siva, now that you have given us this broad overview, maybe a good idea to start looking at a dataset.

Professor Siva Kumar Padmanabhan: Exactly, fantastic.

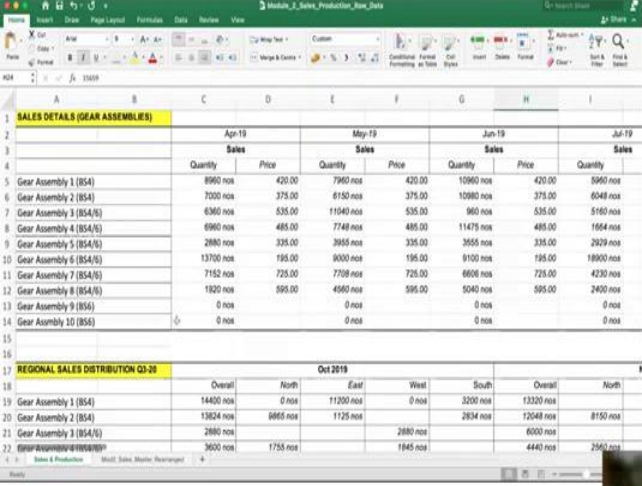
(Refer Slide Time: 00:33)



Professor Milind Gandhe: GV, we will have Siva walk us through the data?

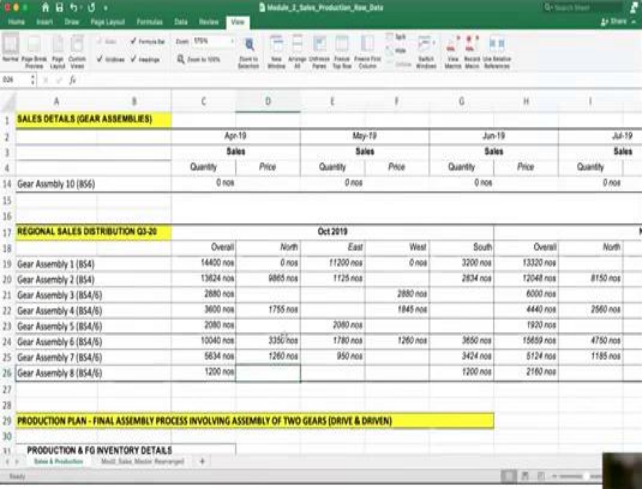
Professor Milind Gandhe: I will open the Excel.

(Refer Slide Time: 00:47)



SALES DETAILS (GEAR ASSEMBLIES)		Apr-19		May-19		Jun-19		Jul-19	
		Quantity	Price	Quantity	Price	Quantity	Price	Quantity	Price
1	Gear Assembly 1 (BS4)	8960 nos	420.00	7960 nos	420.00	10860 nos	420.00	5960 nos	
2	Gear Assembly 2 (BS4)	7000 nos	375.00	6150 nos	375.00	10860 nos	375.00	6048 nos	
3	Gear Assembly 3 (BS4/6)	6360 nos	535.00	11040 nos	535.00	960 nos	535.00	5160 nos	
4	Gear Assembly 4 (BS4/6)	6960 nos	485.00	7748 nos	485.00	11475 nos	485.00	1664 nos	
5	Gear Assembly 5 (BS4/6)	2880 nos	335.00	3955 nos	335.00	3555 nos	335.00	2929 nos	
6	Gear Assembly 6 (BS4/6)	13700 nos	195.00	9000 nos	195.00	9100 nos	195.00	16900 nos	
7	Gear Assembly 7 (BS4/6)	7152 nos	725.00	7708 nos	725.00	6606 nos	725.00	4230 nos	
8	Gear Assembly 8 (BS4/6)	1920 nos	595.00	4560 nos	595.00	5040 nos	595.00	2400 nos	
9	Gear Assembly 9 (BS6)	0 nos	0 nos	0 nos	0 nos	0 nos	0 nos	0 nos	
10	Gear Assembly 10 (BS6)	0 nos	0 nos	0 nos	0 nos	0 nos	0 nos	0 nos	

REGIONAL SALES DISTRIBUTION Q3-20		Oct 2019						
		Overall	North	East	West	South	Overall	North
1	Gear Assembly 1 (BS4)	14400 nos	0 nos	11200 nos	0 nos	3200 nos	13320 nos	
2	Gear Assembly 2 (BS4)	13624 nos	9865 nos	1125 nos	0 nos	2634 nos	12048 nos	8150 nos
3	Gear Assembly 3 (BS4/6)	2880 nos			2880 nos		6000 nos	
4	Gear Assembly 4 (BS4/6)	3600 nos	1755 nos		1845 nos		4440 nos	2560 nos
5	Gear Assembly 5 (BS4/6)	2080 nos		2080 nos			1920 nos	
6	Gear Assembly 6 (BS4/6)	10040 nos	3350 nos	1780 nos	1260 nos	3650 nos	15659 nos	4750 nos
7	Gear Assembly 7 (BS4/6)	5634 nos	1260 nos	950 nos		3424 nos	5124 nos	1185 nos
8	Gear Assembly 8 (BS4/6)	1200 nos				1200 nos	2160 nos	



SALES DETAILS (GEAR ASSEMBLIES)		Apr-19		May-19		Jun-19		Jul-19	
		Quantity	Price	Quantity	Price	Quantity	Price	Quantity	Price
14	Gear Assembly 10 (BS6)	0 nos	0 nos	0 nos	0 nos	0 nos	0 nos	0 nos	0 nos

REGIONAL SALES DISTRIBUTION Q3-20		Oct 2019						
		Overall	North	East	West	South	Overall	North
19	Gear Assembly 1 (BS4)	14400 nos	0 nos	11200 nos	0 nos	3200 nos	13320 nos	
20	Gear Assembly 2 (BS4)	13624 nos	9865 nos	1125 nos	0 nos	2634 nos	12048 nos	8150 nos
21	Gear Assembly 3 (BS4/6)	2880 nos			2880 nos		6000 nos	
22	Gear Assembly 4 (BS4/6)	3600 nos	1755 nos		1845 nos		4440 nos	2560 nos
23	Gear Assembly 5 (BS4/6)	2080 nos		2080 nos			1920 nos	
24	Gear Assembly 6 (BS4/6)	10040 nos	3350 nos	1780 nos	1260 nos	3650 nos	15659 nos	4750 nos
25	Gear Assembly 7 (BS4/6)	5634 nos	1260 nos	950 nos		3424 nos	5124 nos	1185 nos
26	Gear Assembly 8 (BS4/6)	1200 nos				1200 nos	2160 nos	

PRODUCTION PLAN - FINAL ASSEMBLY PROCESS INVOLVING ASSEMBLY OF TWO GEARS (DRIVE & DRIVEN)	
29	
30	

PRODUCTION & FG INVENTORY DETAILS	
31	



Professor Siva Kumar Padmanabhan: Perhaps we can start, as I said, we are going to go from the customer backwards, sales backwards in the value chain of the company. First thing we look at is the sales information. This is basically how much of the product was sold and at what price was it sold and, during each month. All this data, most of this data is available for the entire 24 months, so from April 2019 all the way to March 2021 to show all the different impacts that

happened the BS4 to BS6 transition, the impact of COVID, the recovery from COVID, and so on, so forth.

What you see in the sales data is, as I said, the 10-year assemblies, which are the finished products that ACE is selling. And for each of those year assemblies, you will see the sales for each month. For example, what you are seeing right now is the April 2019. It shows a total sale of that gear assembly, the numbers up to 8960 units of that finished product was sold, and the price at which it was sold 420 rupees that was the price that it was sold at and so on. You will see from May 2019, June 2019, quantity, and price for all the months, the 24 months. That is the first dataset that you will see.

And when you see this dataset, I think you will see the impacts that we talked about in the sales, you will see that the products number one to the BS4 parts, you will see that there the sales of those products. One of the things that I want you to analyze is what happens to the sales of those BS4 products as the transition to BS6 happens on April 1, 2020. That is the first question. And then you will see that the parts number 3 to 8 they are applicable for both BS4 and BS6, so that means that gear sales are not going to stop just because of BS4 or 6. But can you see some seasonal pattern in the year? That is my second question.

Seasonal pattern means at some point in the year the sales is high and then another point in the year was sales is low because we have 2 years. We can start to see potentially some seasonal patterns. My second question is, are there any seasonal patterns you see in the sales data? And then the last set of products is the BS6 products, which initially you will see 0, because BS6 is not kick in till the April 1st, 2020, and then you will start to see their sales. The question on that point is how, what is the pattern of sales of these BS6 products? Did they, when did they start selling and why did they start selling at that point, when you did see their sales start? That is the third question.

The fourth question is what is the impact of COVID on the sales of these products? As production actually and sales slowed down after the pandemic struck in March 2020, what kind of impact are we seeing from the pandemic through the next several months as a first wave hit and then we see that what kind of impact do you see in the sales of these products? That is another question I have. And I also want to find out some things like what are the products that are giving me the highest sales quantity and what are the products that are giving me the highest

sales value. Value means revenue, which means not only that if you multiply the quantity and the price and that is when you get the sales value.

Which products gave me the best sales value that I should pay more attention to, because I obviously want to pay a lot of attention to products that giving me a lot of revenue. I want to make sure that there is no shortage of those products and so on. Those are other questions I have on that first table. What is the product that is giving me the maximum revenue, what are the products that are giving me the minimum revenue, which means I might rethink whether it is worth selling those products in the next coming years? Those are some questions I have on that first table you see.

Professor Milind Gandhe: Next table seems to be more from a regional perspective, I see. Maybe you can help us understand this table.

Professor Siva Kumar Padmanabhan: Yes, absolutely. What we then say is because ACE gears sells in all four regions of the country, and automobile clusters are there as you know in multiple parts, so around the best like the Mumbai, Pune, especially, you have a cluster of manufacturers and in the south, of course, Chennai is the Detroit of India. There is a lot of manufacturing activity, also east and north where significant activity happens for companies such as Tata Motors and Mahindra and so on.

The regional sales distribution is given for just three months and is given only for the 8 products in this case, this because, of course, the products 9 and 10 were not selling in that particular three months we looked at October 2019, November 2019, and December 2019. This is called the Q3 of the financial year '20.

For each of the three months, you will see for the eight products that were selling at that time. You will see the overall sales, but you also see in which region how many units of that product sold. You will see north, east, west, and south. If you take gear assembly 1, for example, in October 2019, it sold 14,400 units. And most of the sales came from east and south, so 11,200 units in the east, and 3200 from south. There were no sales north and west for that unit. That could be because that assembly is used by a particular manufacturer who only has factories in east and south that could be the reason for that.

And similarly, you will see for all the eight gears what is the regional sales for each of the 4 regions. That is what is there in this table. And in terms of questions around this table, I want to understand which regions are most important to me, where is that I am getting the maximum sales quantity, but also the maximum sales revenue. Now, you must look at both tables to figure out the revenue side of it. That is one part I want to find out.

And then I also want to find out, is there, I could, for example, I could give specific focus to some regions by appointing a regional sales agent. What these regional sales agents do, is they are stationed or located in that region in one of the cities and they are make sure that, they will make sure that the customers in that region get regular with it, their feedback is incorporated, the schedules are clarified and so on, then the agents can help improve customer relationship and also improve the sales.

If I want to appoint a few agents, then which region should I appoint these agents in and then how many agents should I appoint in each region? If I want to appoint an agent in such a way that it is somewhat related to the amount of revenue I am making from that region. Every region in which I am making more than certain number of products are sold or revenues gathered, I want to appoint those agents and I have a fixed budget for how many agents I can appoint, then how should I appoint those agents? Which region should I appoint more, and which region should I appoint less? That is another question that I would like to have.

And then I would also like to see are there some products that are clustered in some region, some products are only in certain region, some products are only in certain other region, is there a pattern like that? Those are some of the questions that I have from a regional perspective.

(Refer Slide Time: 9:18)

Microsoft Excel - Workbook1_2_Sales_Production_New_Data

Home Insert Draw Page Layout Formulas Data Review View

File Home Insert Draw Page Layout Formulas Data Review View

28 PRODUCTION PLAN - FINAL ASSEMBLY PROCESS INVOLVING ASSEMBLY OF TWO GEARS (DRIVE & DRIVEN)

29

30 PRODUCTION & FG INVENTORY DETAILS

31

32 Apr-19 Apr-19 May-19 Jun-19 Jul-19

33 Production Production Production Production Production

34 Beg. Inv. Prod. Qty. End Inv. Quantity End Inv. Quantity End Inv. Quantity End Inv. Quantity

35 Gear Assembly 1 3210 nos 7020 nos 1250 nos 9000 nos 2250 nos 9000 nos 330 nos 9000 nos

36 Gear Assembly 2 2320 nos 6000 nos 1320 nos 6000 nos 1170 nos 10000 nos 190 nos 7500 nos

37 Gear Assembly 3 1560 nos 8000 nos 3200 nos 8000 nos 160 nos 2000 nos 1200 nos 5000 nos

38 Gear Assembly 4 3410 nos 6000 nos 2400 nos 8000 nos 2702 nos 10000 nos 1227 nos 2000 nos

39 Gear Assembly 5 970 nos 3000 nos 1090 nos 4000 nos 1135 nos 4000 nos 1580 nos 3000 nos

40 Gear Assembly 6 5600 nos 12000 nos 3900 nos 12000 nos 6900 nos 12000 nos 9800 nos 12000 nos

41 Gear Assembly 7 2480 nos 7000 nos 2308 nos 7000 nos 1600 nos 8000 nos 994 nos 6000 nos

42 Gear Assembly 8 860 nos 3000 nos 1940 nos 4000 nos 1380 nos 4000 nos 340 nos 3000 nos

43 Gear Assembly 9 0 nos 0 nos 0 nos 0 nos 0 nos 0 nos 0 nos 0 nos

44 Gear Assembly 10 0 nos 0 nos 0 nos 0 nos 0 nos 0 nos 0 nos 0 nos

45

46 GEAR PRODUCTION & INVENTORY (FOR GEAR ASSEMBLIES 2-4 ONLY)

47

48

49 Apr-19 Apr-19 May-19 Jun-19 Jul-19

50 Sales & Production Model: Sales, Monitor: Performance



Microsoft Excel - Workbook1_2_Sales_Production_New_Data

Home Insert Draw Page Layout Formulas Data Review View

File Home Insert Draw Page Layout Formulas Data Review View

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

48

49

50

51

52

53

54

55

56

57

58

59

60

61

62

63

64

65

66

67

68

69

70

71

72

73

74

75

76

77

78

79

80

81

82

83

84

85

86

87

88

89

90

91

92

93

94

95

96

97

98

99

100

101

102

103

104

105

106

107

108

109

110

111

112

113

114

115

116

117

118

119

120

121

122

123

124

125

126

127

128

129

130

131

132

133

134

135

136

137

138

139

140

141

142

143

144

145

146

147

148

149

150

151

152

153

154

155

156

157

158

159

160

161

162

163

164

165

166

167

168

169

170

171

172

173

174

175

176

177

178

179

180

181

182

183

184

185

186

187

188

189

190

191

192

193

194

195

196

197

198

199

200

201

202

203

204

205

206

207

208

209

210

211

212

213

214

215

216

217

218

219

220

221

222

223

224

225

226

227

228

229

230

231

232

233

234

235

236

237

238

239

240

241

242

243

244

245

246

247

248

249

250

251

252

253

254

255

256

257

258

259

260

261

262

263

264

265

266

267

268

269

270

271

272

273

274

275

276

277

278

279

280

281

282

283

284

285

286

287

288

289

290

291

292

293

294

295

296

297

298

299

300

301

302

303

304

305

306

307

308

309

310

311

312

313

314

315

316

317

318

319

320

321

322

323

324

325

326

327

328

329

330

331

332

333

334

335

336

337

338

339

340

341

342

343

344

345

346

347

348

349

350

351

352

353

354

355

356

357

358

359

360

361

362

363

364

365

366

367

368

369

370

371

372

373

374

375

376

377

378

379

380

381

382

383

384

385

386

387

388

389

390

391

392

393

394

395

396

397

398

399

400

401

402

403

404

405

406

407

408

409

410

411

412

413

414

415

416

417

418

419

420

421

422

423

424

425

426

427

428

429

430

431

432

433

434

435

436

437

438

439

440

441

442

443

444

445

446

447

448

449

450

451

452

453

454

455

456

457

458

459

460

461

462

463

464

465

466

467

468

469

470

471

472

473

474

475

476

477

478

479

480

481

482

483

484

485

486

487

488

489

490

491

492

493

494

495

496

497

498

499

500

501

502

503

504

505

506

507

508

509

510

511

512

513

514

515

516

517

518

519

520

521

522

523

524

525

526

527

528

529

530

531

532

533

534

535

536

537

538

539

540

541

542

543

544

545

546

547

548

549

550

551

552

553

554

555

556

557

558

559

560

561

562

563

564

565

566

567

568

569

570

571

572

573

574

575

576

577

578

579

580

581

582

583

584

585

586

587

588

589

590

591

592

593

594

595

596

597

598

599

600

601

602

603

604

605

606

607

608

609

610

611

612

613

614

615

616

617

618

619

620

621

622

623

624

625

626

627

628

629

630

631

632

633

634

635

636

637

638

639

640

641

642

643

644

645

646

647

648

649

650

651

652

653

654

655

656

657

658

659

660

661

662

663

664

665

666

667

668

669

670

671

672

673

674

675

676

677

678

679

680

681

682

683

684

685

686

687

688

689

690

691

692

693

694

695

696

697

698

699

700

701

702

703

704

705

706

707

708

709

710

711

712

713

714

715

716

717

718

719

720

721

722

723

724

725

726

727

728

729

730

731

732

733

734

735

736

737

738

739

740

741

742

743

744

745

746

747

748

749

750

751

752

753

754

755

756

757

758

759

760

761

762

763

764

765

766

767

768

769

770

771

772

773

774

775

776

777

778

779

780

781

782

783

784

785

786

787

788

789

790

791

792

793

794

795

796

797

798

799

800

801

802

803

804

805

806

807

808

809

810

811

812

813

814

815

816

817

818

819

820

821

822

823

824

825

826

827

828

829

830

831

832

833

834

835

836

837

838

839

840

841

842

843

844

845

846

847

848

849

850

851

852

853

854

855

856

857

858

859

860

861

862

863

864

865

866

867

868

869

870

871

872

873

874

875

876

877

878

879

880

881

882

883

884

885

886

887

888

889

890

891

892

893

894

895

896

897

898

899

900

901

902

903

904

905

906

907

908

909

910

911

912

913

914

915

916

917

918

919

920

921

922

923

924

925

926

927

928

929

930

931

932

933

934

935

936

937

938

939

940

941

942

943

944

945

946

947

948

949

950

951

952

953

954

955

956

957

958

959

960

961

962

963

964

965

966

967

968

969

970

971

972

973

974

975

976

977

978

979

980

981

982

983

984

985

986

987

988

989

990

991

992

993

994

995

996

997

998

999

1000

1001

1002

1003

1004

1005

1006

1007

1008

1009

1010

1011

1012

1013

1014

1015

1016

1017

1018

1019

1020

1021

1022

1023

1024

1025

1026

1027

1028

1029

1030

1031

1032

1033

1034

1035

1036

1037

1038

1039

1040

1041

1042

1043

1044

1045

1046

1047

1048

1049

1050

1051

1052

1053

1054

1055

1056

1057

1058

1059

1060

1061

1062

1063

1064

1065

1066

1067

1068

1069

1070

1071

1072

1073

1074

1075

1076

1077

1078

1079

1080

1081

1082

1083

1084

1085

1086

1087

1088

1089

1090

1091

1092

1093

1094

1095

1096

1097

1098

1099

1100

1101

1102

1103

1104

1105

1106

1107

1108

1109

1110

1111

1112

1113

1114

1115

1116

1117

1118

1119

1120

1121

1122

1123

1124

1125

1126

1127

1128

1129

1130

1131

1132

1133

1134

1135

1136

1137

1138

1139

1140

1141

1142

1143

1144

1145

1146

1147

1148

1149

1150

1151

1152

1153

1154

1155

1156

1157

1158

1159

1160

1161

1162

1163

1164

1165

1166

1167

1168

1169

1170

1171

1172

1173

1174

1175

1176

1177

1178

1179

1180

1181

1182

1183

1184

1185

1186

1187

1188

1189

1190

1191

1192

1193

1194

1195

1196

1197

1198

1199

1200

1201

1202

1203

1204

1205

1206

1207

1208

1209

1210

1211

1212

1213

1214

1215

1216

1217

1218

1219

1220

1221

1222

1223

1224

1225

1226

1227

1228

1229

1230

1231

1232

1233

1234

1235

1236

1237

1238

1239

1240

1241

1242

1243

1244

1245

1246

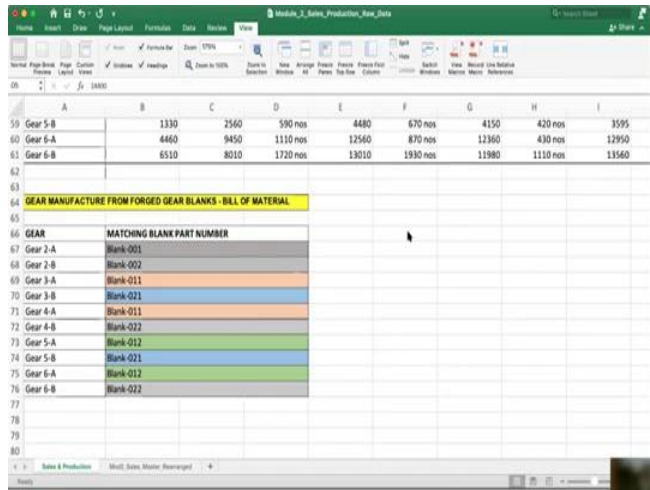
1247

1248

1249

1250

1251



IT Madras
BSc Degree

	A	B	C	D	E	F	G	H	I
59 Gear 5-B		1130	2560	590 nos	4480	670 nos	4150	420 nos	3595
60 Gear 6-A		4460	9450	1110 nos	12560	870 nos	12360	430 nos	12950
61 Gear 6-B		6510	8010	1720 nos	13010	1930 nos	11980	1110 nos	13560
62									
63									
64									
65									
66	GEAR	MATCHING BLANK PART NUMBER							
67	Gear 2-A	Blank-001							
68	Gear 2-B	Blank-002							
69	Gear 3-A	Blank-011							
70	Gear 3-B	Blank-021							
71	Gear 4-A	Blank-011							
72	Gear 4-B	Blank-022							
73	Gear 5-A	Blank-021							
74	Gear 5-B	Blank-011							
75	Gear 6-A	Blank-012							
76	Gear 6-B	Blank-022							
77									
78									
79									
80									

Siva Padmanabhan

Professor Milind Gandhe: Then the next table seems to be, I have, let me unfreeze this, and now let us look at this table. Okay.

Professor Siva Kumar Padmanabhan: Now, this one is about production. So, we talked earlier in the case study how, based on how much you are selling, you want to start producing enough so that you do not miss any sales. You have enough product to sell depending on the customer demand.

If the customer is demanding 10,000 then if I have only 9000, I am going to lose the 1000 of sales. Basically, I do not want to do that. I want to make enough so that I can satisfy all the demand that is there. But I do not want to make too much because if I make too much, then that product will lie idle as inventory, either with me or in the regional distribution center or somewhere. That is also not good.

Another thing that is important from a production planning perspective is you do not want production to go up and down as much as the variation in sales. Sales may suddenly peak in one month and drop in another month, because there are many factors. Like for example, if there is a strike, a labor unrest in a car manufacturer's factory and as you all follow the headlines, Toyota had such a major unrest in 2019, for example, that they had to shut down the factory for several months.

Then what happens is, suddenly your demand from your customers going to drop in one month or it could be a new model that is getting launched by that manufacturer, and initial months you have very high demand, because customers are just trying to get their hands on the product as quickly as they can. A recent example is Mahindra where they introduced the new Thar, the Thar SUV and the demand is so much that even if they produce for one whole year, they cannot catch up to the waiting list. Those types of things happen when the demand is fluctuating a lot.

But you cannot flex your production, you do not want to change your production so rapidly, because then you mean, then it means that number of labors will be idle for some time, and suddenly they will be overworked, and we would not have enough labor. What do you want as a production that is smoother? It should be responsive to demand, but just not be as much jacked, going up and down rapidly, like the demand. You must have a production plan that is smoother and follows the sales plan.

What you see in this table is for all of the 10 assemblies that we make, you will see the thing called beginning inventory, which means at the start of the month, how many of those products were already in my store, finished goods store or in my warehouse, and then you see how much was actually produced that month, then you will see the ending inventory, which is at the end of the month how much products do they have on hand, at the end of the month.

For every single one of those months, from April '19 to March '21, you will see the beginning inventory of the gear assembly 1, for example. You will see how much of gear assembly 1 was produced that month. And then you will see how much of the inventory still line with me at the end of the month. And I think as you can logically imagine the ending inventory, the inventory that I have at the end of the month will be equal to how much did I have at the beginning, how much did I make, and then how much did I sell.

Logically, you can put those three things together to find what is the ending inventory. And so similarly, you will have that data for all the 24 months for all the 10 products. So, that is what you see in this table. One thing you will see is that production does vary. So, if we look at gear assembly 1, we produce 7000 in April, we increased to 9000 in May, and then we kept 9000 for some months, and probably then we start decreasing or increasing depending on the customer demand. You see that 10,000 in September and so on. There is a pattern to this.

But if you see the same gear assembly 1 in the previous table, if you see the sales, if I can go back to the first table on the top, you see the sales of gear assembly 1 it was 8960, then it fell to 7960, then it suddenly increased to 10,960 and then 5960 and so on. You see that there is a lot of ups and downs in the sales of the product. But production is also going up and down. But it is not going as rapidly up and down.

And this is the job of the, what we call that the sales and operations planning that we saw on that chart earlier that says, how is my sales going to behave, and therefore, how is my production should look for each month. The sales and operation planning and the market production scheduling, which is the next step we saw. These two activities will make sure that we produce the right amount and that we produce it in a smooth way and not so up and down as much as the sales.

Professor G. Venkatesh: Siva just for my understanding, I mean, do I understand that each gear assembly is manufactured by a different machine and has different, as people associated with that manufacturing, because the reason I am asking that question is that we are trying to smooth each row and we are not taking the total and smoothening the total right?

Professor Siva Kumar Padmanabhan: Yes. That is an excellent question. We should also be smoothing the overall production. So, that is also what NPS tries to look at, like what is the resources available. So, to your question, it is all shared. It is not dedicated lines. You will see later in the production scheduling part of the case study that the same hobbing machine is used to make two gears in different ways. Yes, it is all shared. And the goal is, like you said, to smooth not only one product, but to smooth the entire system.

Professor G. Venkatesh: Okay.

Professor Milind Gandhe: Two observations I had Siva. First is, this table that you have shown us seems very similar to the ledger that we were seeing in the e-commerce case, because there what we saw was that opening stock plus incoming goods minus sales was equal to closing stock. And it seems to me, at least at first glance, that you are looking at something similar here.

Professor G. Venkatesh: Except that I would, the only thing is that their incoming can be anything. Variation incoming is not a problem there. But here it must be smooth, because for whatever we discussed just now, production needs to be smoother. You cannot just have variability in production.

Professor Milind Gandhe: The second sort of thing that immediately strikes me is that if production is smooth and sales are sort of variable, and the amount that I have in my warehouse will keep changing constantly actually. It will have big shift, big swings and that would be another challenge perhaps for the warehouse manager to manage.

Professor Siva Kumar Padmanabhan: Yes, absolutely, Milind. That is very true. And that is the role the inventory plays slightly. Inventory is both bad and good or good and bad. The bad aspect of inventory is, if you have a lot of inventory, then it is idle products, it is locked up capital, it is not actually being used in the, further in the value chain. But the good part of inventory is that it helps you to do the smoothing. It makes sure that your sales do, your production does not exactly match your sales, because you can dip into the inventory when you need more and if you are producing more you can add to the inventory.

But as you said rightly the inventory is a very important thing to manage the store, the space that is required and the security that is required to manage the inventory, the warehousing, and sometimes some production, like we know in the case of vaccines, now cold storage is required, not in this room this kind of product, but those things are all part of the inventory management is do you have the right storage, do you have the right conditions, ambient conditions for storage, do we have enough security and control over the inventory. So, that is very important.

So, one of the questions that therefore I will have in this is how do you manage inventory from a warehouse manager perspective? How much is the maximum and the minimum? And therefore, what kind of percentage variation I am having in that inventory over the 24 months? So, how big a space should I take, like or should I, what is the level of variation that you see in the inventory is an important question in this exercise.

Professor Milind Gandhe: Siva you have given us the inventory data as well. And to me at first glance it seems very similar to the production plan. What is the difference between the two? Maybe you can explain this table and tell us what is the difference from the production?

Professor Siva Kumar Padmanabhan: Yes. So, the first table we just saw was the, is called the production plan for the finished product. If you think back on that slide, we saw there is two stages in this production. First, we must take the blanks and we must make the gears. And then we must assemble the gears together and test and pack and ship it. These are the two stages.

What you see in this table, here on the screen is the finished product assembly production plan. So, that means I must make 7000 assemblies in April 2019. That is what you see there. But to make 7000 assemblies, I need to have the two components available to make the assembly. So, what you see in the below table is the plan for the first stage, which is how do I make the two gears and how much do I make each month so that I can then create assembly in the second stage.

What you see here is the gears 2-A, 2-B, 3-A, 3-B and so on, so these are the gears required to make the assemblies 2, 3, 4, 5, and 6. So, we are showing the 6 just for the sake of managing the amount of data. For each of those assemblies there are two gears that are required. And what is the production plan for those two gears? So, this is how we go level by level.

We start with how much should we produce for finished product; how much should we produce at each of the sub-assemblies and how much should we produce of each of those parts and so on. What you see here is the production plan for the individual gears themselves because the hobbing and broaching are the two steps required to make the individual gear. And then the assembly is the next stage where we put the gears together, test it and aligned it in packed little chip.

Professor Milind Gandhe: That, then my natural question is, what is, what was the term that you used the bluff material?

Professor Siva Kumar Padmanabhan: Yes, here we are seeing the bill of material in action.

Professor Milind Gandhe: And that should be a little bit of comfort for us with perhaps because then from a purchasing perspective I can smooth out the purchases because the same blank is being used into products.

Professor Siva Kumar Padmanabhan: Absolutely, absolutely. Even if you have, let us say, more demand for 3-A but at the same month you have less demand for 4-A that means you do not have to change your purchasing of blank 011 because there will be more use in one place and less use at another place. So, the more we have common components, the more you can smooth your production and make the product structure less complex. And this is the reason that automotive manufacturers go for platforms, the strategy of platforms.

If you look at many cars, they can be built on the same platform. So, for example, right now the Volkswagen Group is launching a platform called MQB A0 IN in India. And on top of this single platform which uses common components in the chassis and common engines, they can make a SUVs, they can make compact sedans, they can make midsize sedans, they can make hatchbacks so all of these and the strategy behind that is exactly this, you have fewer components, you have fewer of assemblies on which you can build multiple different types of products.

Professor Milind Gandhe: Very, very interesting. Siva all the other Excel sheets have the same data, right? There is no other raw data.

Professor Siva Kumar Padmanabhan: Yes. There is one more aspect. So, here we are seeing the scheduled production of finished product, sales of finished product, then regional sales, then we saw the production of finished products, then we saw the production of the gears themselves and then there is the aspect of scheduling which is shift by shift how much do I need to make in the hobbing machine and in the broaching machine. That is the data you have not probably seeing it and then there is also data on purchasing.

Professor Milind Gandhe: Okay.