

CHAPTER VI

Model verification and validation

6.1 Verification of the model

Verify the model again with product planning team; it is found that parts have not been screened out as much as wanted and team still need to put effort for business case input on items that will not be pursued. Thus, two processes and one comment were added to the beginning of the decision model. They are

- 1) When initiate first accessory list to markets, a note that regional team will not engineer any audio system or audio system upgrade to be announced. The reason is that with the new vehicle electrical system and audio system design, it would be difficult and prohibited to add on an item or tap out any currency from the vehicle system. The case company electrical design team decided to implement new electrical system structure for all new vehicles to integrate the latest technology and too complicated that they do not let any other non genuine part be able to attach to the system. In the case that marketing would like to have any feature, they have to inform vehicle team since the beginning of vehicle design and not to input any to the accessory development team.
- 2) From engineering team's lesson learnt and competitors recall data, in the case of safety and regulation/homologation related items, parts to be informed to vehicle engineering team and have the team decide whether or not the part will be pursue as vehicle item, have accessory team develop with support from vehicle team or drop the part. The case company would like to prevent all risks that can impact company's image as well as the risk to damage the vehicle.
- 3) To be able to screen out more parts, it is agreed that items that are considered unique part requested by one market where the part is not complicated will be dropped from the list and be pursue by local team. Management team also would like to drop parts with take rate less than 3% of the total vehicle sales in the region so that engineering team can concentrate only the parts that will justify business case unless the part revenue is obviously high enough for regional investment.

The model proposed to be used to validate with the two selected projects is then concluded as below.

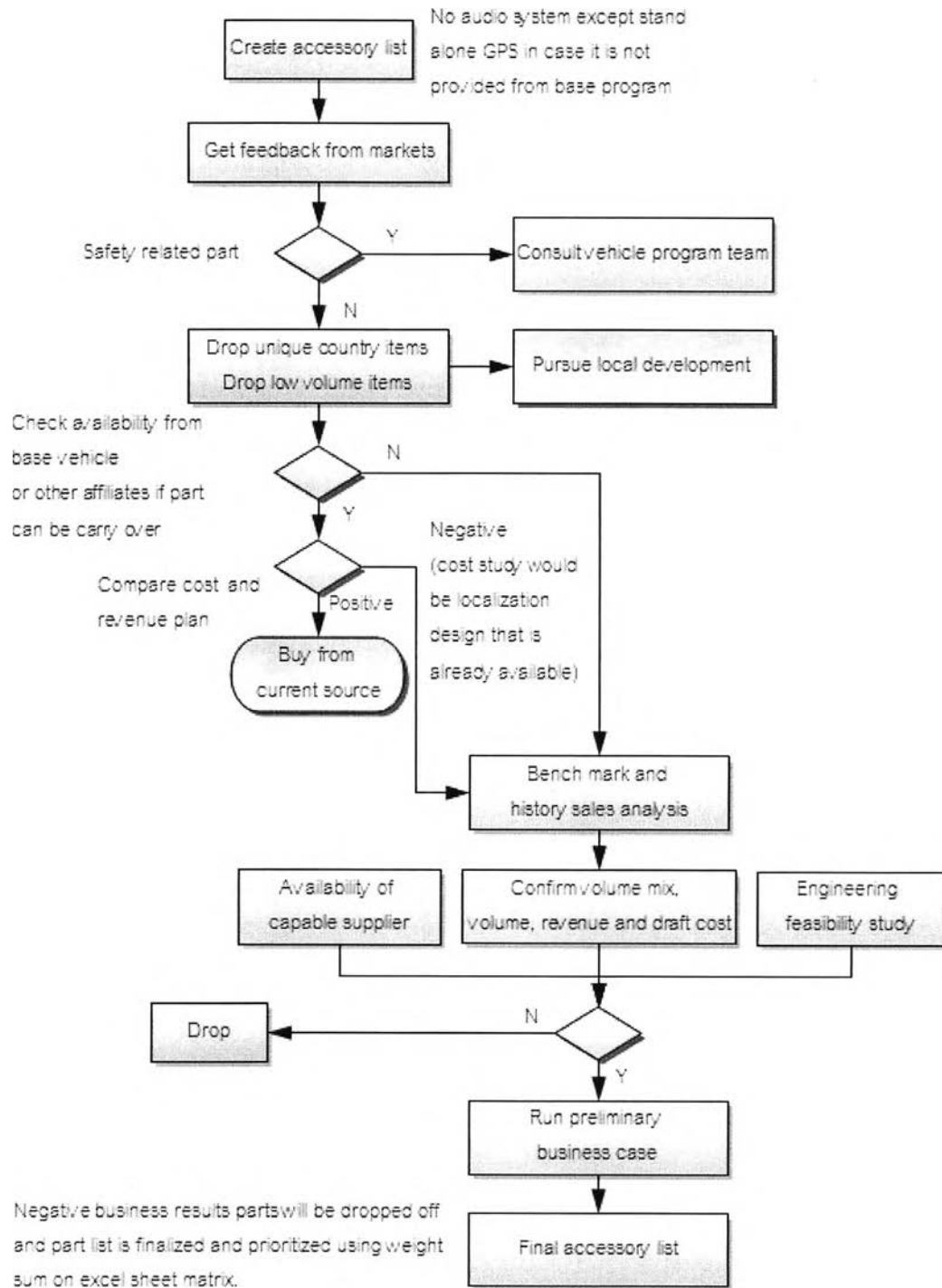


Figure 68: Decision model 2

The model will be incorporated with MCDM calculation sheet for item prioritization which is presented in excel sheet format, detail as below.

Sheet 1 VPP (Vehicle Program timing Plan)

A reference sheet for timing study

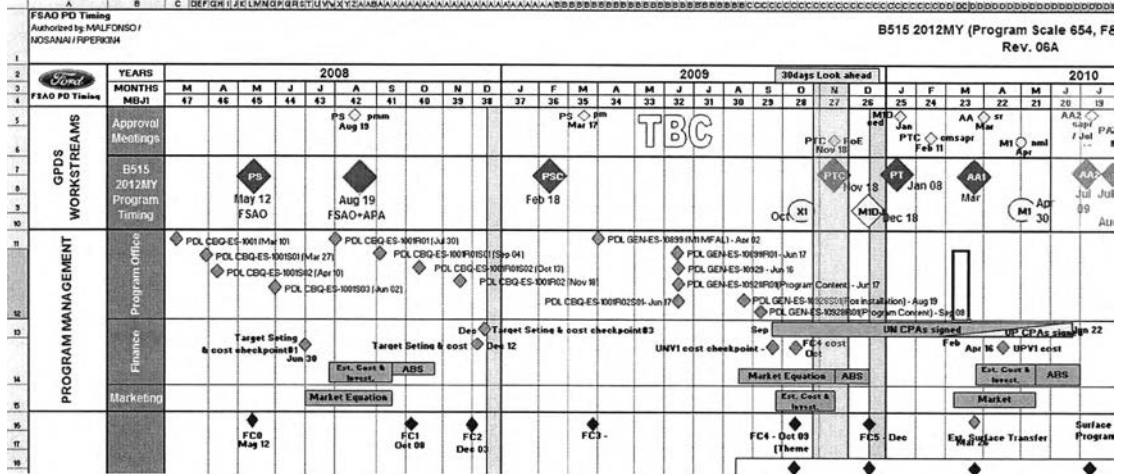


Figure 69: Calculation sheet – sheet 1 – timing

Sheet 2 Vehicle volume and model mix

A reference sheet used for accessory volume calculation

A	B	C	D	E	F	G	H	I	J	K	L	M	N	
5			Ford B SUV (B51E) Volumes – 2009B											
6														
7														
8	Markets		CY2012	CY2013	CY2014	CY2015	CY2016	CY2017		6 year Cyl Avg				
9														
10	India	Chennai	6.0	34.2	35.2	31.5	41.2	43.5		38.6				
11	Australia	Chennai	-	8.8	8.9	9.0	9.1	9.2		9.0				
12	South Africa	Chennai	-	5.2	5.4	6.0	6.1	5.9		5.7				
13	China	Chongqing	16.0	58.7	59.2	59.9	60.5	60.6		60.0				
14	Taiwan	Chongqing	0.1	0.5	0.5	0.5	0.5	0.5		0.5				
15														
16	Total		22.1	107.3	109.2	106.9	117.4	119.7		113.8				
17														
18														
19	E&G		-	6.2	6.2	6.2	6.2	6.2		6.2				
20														
21														
22	Mix and Rates													
23														
24				China	India	Australia	S Africa	Taiwan		AP&A		E&G		
25														
26	Series Mix													
27		Low		16.0 %	25.0 %	-	15.0 %	-		17.7 %		52.0 %		
28		Mid		38.0 %	25.0 %	70.0 %	65.0 %	-		40.7 %		40.0 %		
29		High		46.0 %	40.0 %	30.0 %	20.0 %	100.0 %		41.5 %		8.0 %		
30														
31	Powertrain													
32		1.5 TiVCT P		77.0 %	20.0 %	-	15.0 %	-		48.1 %		98.0 %		
33		1.0L Fox P		23.0 %	20.0 %	56.0 %	45.0 %	100.0 %		26.0 %		-		
34		1.5L DVS		-	60.0 %	44.0 %	40.0 %	-		25.9 %		2.0 %		

Figure 70: Calculation sheet – sheet 2 – vehicle volume

Sheet 3 Accessory list with pictures

This sheet is the initial sheet sent to all marketing and customer service team in each country in order to get wish list, revenue and volume feedback. Previously marketing will provide volume in numbers, however, as they have not studied vehicle mix and volume planned, those numbers will not reflect the true volume and thus business case calculation is not as close to reality. Volume assumption requested from marketing team is then changed to percent take rate of vehicle sales they think customer would choose a part. This is also easier for marketing team to provide the number from historical data. Discussion is also made with markets that the take rate should not be too conservative or else the part will be dropped off since first business case study. This phase depends on each individual's input.


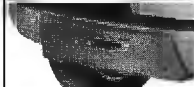




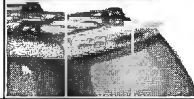

	A	B	C	D
4		No.	Items	Pic
5				
6		1	Front bumper applique	
7		2	Rear bumper applique	
8		3	Roof rack	
9		4	Parking sensor	
10		5	Fog lamp	
11		6	Rear skid plate	
12		7	Rear spoiler	
13		8	Front skirt	

Figure 71: Calculation sheet – sheet 3 – accessory wish list

Sheet 4 Bench mark analysis

This sheet is created by accessory planner who will look into information of vehicle marketing's position, targeted customer and competitors offer in the vehicle range throughout the region. Normally, accessory list of competitors can be found in websites but might lack of pricing information. Prices can be obtained with the aid of local team from motor shows and competitor's show room visit as well as market research. Even though, only numbers of competitors providing similar accessory is used for the calculation, benchmark pricing is benefit in order to check market price acceptability level. From questionnaire1 analysis, marketing team usually compare accessory price with aftermarket price, in this case, planner should weight the price of OEM and aftermarket to input to engineering team for initial design assumptions since it is not possible to produce a part at OEM level but aftermarket price.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		TW	TW	TW	TW	CH	CH	CH	AUS	AUS	AUS	AUS	TH	TH
2		C307	Corella	Civic	Nissan Tida	GM Cruze	VW Sagita	Nissan	C307	Corella	Civic	Tida	C307	Toyota Altis
3		NTD	NTD	NTD	NTD				AUD	AUD	AUD	AUD	THB	THB
4	Alloy Shift knob (MT)				1200									
5	Alloy wheel 15"									760.10	0	0		
6	Alloy wheel 16"					0				825	0			
7	Alloy wheel 17"	3276			4350	0			952	995.78				
8	Alloy wheel lock nut set			800				0	44		0	0		
9	Bike carrier								319		0	0		
10	Bluetooth		7000	8600							0			8500
11	Bonnet protector	800							79	71.5	0	0		
12	Boat scuff guard								57	48.68	0	0		
13	Bubble Weathershield								74					
14	Car cover							0			0		1590	1900
15	Cargo net		700	1200	480			0	94					950
16	Carpet floor mat - Premium				1700	0								
17	Carpet floor mat		2900		1500		0	0	74	82.5	0	0	1150	990
18	Carry bars 4dr								336	292.60	0	0		
19	Carry bars 5dr													
20	Chrome door handle cover	950						0						
21	Chrome exhaust tip	980	1200	1400		0	0	0			0			350
22	Chrome Fr lamp garnish 4dr	1300						0						
23	Chrome Fr lamp garnish 5dr							0						
24	Chrome fuel lid cover	400	700			0		0						
25	Chrome rear garnish 4dr	1400						0						
26	Chrome rear garnish 5dr	1600			1200	0		0						1350
27	Chrome Rr lamp garnish 4dr					0		0						
28	Chrome Rr lamp garnish 5dr				2200			0						5500

Figure 72: Calculation sheet – sheet 4 – benchmark analysis

Sheet 5 Calculation sheet

The calculation sheet is the most complicated sheet which consists of all data for calculations.

1) Accessory information

- Item name
- Design direction (whether to carry over existing design from previous program or other region) – this effects investment and man hour calculation

- Program duration (some part is likely to be affected from vehicle model change actions but some will not) – this effects volume calculation
- Draft business route (supplier location to be initially selection to be at highest volume country or current supplier location already producing same group of accessory) – this is an assumption for first business case study only

2) Marketing information

- Accessory volume is calculated from

$$\text{Accessory volume} = \text{vehicle (planned) volume} * \text{vehicle mix} * \text{project take rate}$$

Where;

Vehicle (planned) volume = information from sheet 2, numbers is updated every year

Vehicle mix = vehicle sub-line that the accessory can be fitted. For example, a reverse sensor might already been provided in sports series in each country. The information can be found in product direction letter in the case company's engineering system.

Project take rate = accessory take rate provided from marketing team in each country
- WSD (Whole Sale Delivery) – price which local marketing team expected to sell the product to dealer in local currency
- Other region's interests in the same item
- Target cost – calculated from WSD and benchmark data

3) Development information

- Estimated piece cost and tooling cost with provision (agreed number between product planner and product engineer)
- Engineering and support team man hour (provided by program engineer)
- Supplier development cost, engineering development and testing cost, prototype and sample part cost including logistics and provision (provided by product engineer)

4) Business case result

- All above data is submitted to finance team to calculate initial business case for each part. Results (ATROS, TARR, Payback) to be summarize into the sheet

5) Weight sum calculation and prioritization

- Calculation is done based on assumptions and scaling constant conversion indicated earlier
- Accessories are then listed in prioritization

The calculation sheet trial is agreed to be proceeded by management and product planning team. Comments from management team is the calculation sheet looks complicated, but planning team said it is good to have everything in one page. So, after the prioritization is completed, it might be useful to summarize accessory list with only the information of total volume, investment needed and business case result to be presented to management and chief program engineer for budget request.

6.2 Validation of the model with case projects

Two projects (new global small SUV and new C-car development) are selected in order to proof that the model is useful. Expected result of the model trial and the use of the model are

- The model should proof a more effective use of resource by
 - Reduction of process steps and gates
 - Reduce engineering and support team man hour
 - Projects that will not make profit will be screened out early
- To be able to prioritize the projects in order to ask for company's funding
- The model transparency should help reducing communication error in the input section of the product planning process
- Timing from accessory initial list to a final accessory list should be reduced

6.2.1 Accessory list creation and marketing feedback

Example of B515

A list of 32 accessories was created from product planner's experience including accessories that are currently available in all B-car, SUV line up and competitor's offer. The list was sent to 5 markets who will take the vehicle which are Australia, South Africa, China, Taiwan and India. Marketing team to confirm and provide their input on the item list as well as on the revenue and volume projection (accessory take rate). The list is shown in table 16.

Within 2 weeks, markets returned the accessory list with items that they preferred along with revenue and take rate target. The list is now expanded to 65 items as shown in table 17. Although the project involved only 5 from 11 markets in APA, it can be seen that, there're differences among the market take rate and item list. India, seen as a high accessory take rate country would like to offer a lot of parts to their customers while Taiwan is very conservative and does not think accessory will sell well with this vehicle. Moreover, the WSD provided by the countries also reflect the study of the standard price that India, China, Taiwan and South Africa are all among price sensitive markets.

Note that main competitors of this segment vehicle are Suzuki S4, Suzuki Swift, Nissan Liva, Chevy Lova, Zotye and Renault Logan


































6.2.2 Accessory availability check

The next step is to screen out audio system related parts and unique item, low volume (3% of total vehicle sales projection is about 3,400 units) and separate safety items. The list is then reduced to 41 items. It is note that for the part that is already offered in other vehicle line, even though the volume is low, there is an opportunity to carry over part or test item, the part would be kept in the list.

Checking availability from base program, 7 more parts were separated. One of the part which is side skirt, will be 100% fitted from production plant so the part is dropped out of the list. Chrome exhaust tip is also dropped out since in base program design, exhaust system pointed downward and covered by rear bumper. 5 parts are considered safety related items and those will also be discussed with base program team, whether or not the part to be pursue. This vehicle line is new so there's no carry over item from other vehicle line that can be considered.

Total of 39 parts (including base program part and safety related item parts) is continue to the next step where product planning and marketing team study the cost, bench mark and sales analysis. In the case that the take rate from any market is lower than history sales, the market will be forced to increase, otherwise, reason and argument should be presented. This action is done on revenue side as well. In the mean time, engineering team will study feasibility and estimate engineering cost need to develop the parts. Purchasing will also look into possible supplier candidate list. All parties input will be summarized in the sheet, for B515, total of 29 items information is sent to finance team for business case study. (see detail in table 18)

Table 16: First accessory list for B515

No.	Items	Pic	FOA		CFMA		FLH		FMCSA		FIL	
			Vol	WSD	Vol	WSD	Vol	WSD	Vol	WSD	Vol	WSD
1	Front bumper applique											
2	Rear bumper applique											
3	Rear skid plate											
4	Side skid											
5	Rear spoiler											
6	Front skirt											
7	Rear skirt											
8	Roof rack											
9	Weather shield											
10	Bonnet protector											
11	Step bar											
12	Side rocker											
13	Chrome exhaust tip											
14	Carpet mat (standard)											
15	Carpet mat (premium)											
16	Rubber mat											
17	Trunk tray											
18	Trunk net											
19	Spare wheel cover (soft)											
20	Spare wheel cover (hard)											
21	Shift knob											
22	Seat cover (fabric)											
23	Seat cover (Nylon)											
	Seat cover (leather)											
24	Door sill protector											
25	Audio system upgrade (TBD)											
26	Trailer hitch (B299/FSAO)											
27	Scuff plates (B299)											
28	Sports pedal (B299)											
29	Parking sensor (base)											
30	Fog lamp (base)											
31	Mud guard (base)											
32	Rear camera system + rear view mirror (base)											

FOA – Australia, CFMA – China, FLH – Taiwan, FMCSA – South Africa, FIL – India

Table 17: Second accessory list for B515

No.	Items	CFMA		FLH		FOA		FMCSA		FIL		Total Annual Volume	FSAO (ref)		Total Annual Volume
		proj	WSD (CNY)	proj	WSD (NTD)	proj	WSD (AUD)	proj	WSD (RAND)	proj	WSD (INR)		Vol	WSD (Real)	
1	Front bumper applique	5%	610	5%	2,000	5%	157	5%	1,765	5%	1,585	5,689	2,800	120	8,489
2	Rear bumper applique	5%	610	5%	2,000	5%	157	5%	1,655	3%	1,585	4,918	2,800	100	7,718
3	Roof rack	5%	635	6%	3,000	10%	157	3%	1,120	10%	2,645	5,440			5,440
4	Parking sensor			10%	3,692	8%	220	5%	900	3%	1,055	2,213	2,940	150	5,153
5	Fog lamp			9%		8%	158			8%	1,585	1,851			1,851
6	Rear skid plate			5%	2,000	5%	157			10%	1,585	4,331			4,331
7	Rear spoiler			6%	2,000	7%	189	5%	1,344	10%	2,115	4,804	3,500	250	8,304
8	Front skirt	4%	530	5%	2,000	5%	157	5%	1,765	5%	1,585	5,089	2,800	700	7,889
9	Rear skirt	4%	530	5%	2,000	5%	157	5%	1,655	5%	2,115	5,089	2,800	700	7,889
10	Weather shield (slimline)	5%	185			8%	50	10%	415	5%	1,055	6,224	3,500	120	9,724
11	Bonnet protector			3%	776	8%	90					737			737
12	Headlight Protectors					8%	44	10%	375			1,297			1,297
13	Chrome exhaust tip	5%	350	6%	720	10%	28			10%	525	7,786			7,786
14	Carpet mat (standard)	6%	195	90%	700	8%	37			40%	525	20,159	28,000	30	48,159
15	Carpet mat (premium)			3%	1,000	15%	47			10%	663	5,226			5,226
16	Rubber mat	6%	175	3%	200	8%	32			50%	525	23,617			23,617
17	Trunk tray	5%	175	5%	900	10%	113			100%	345	42,490	2,100	95	44,590
18	Trunk net	5%	145	3%	600	3%	57			3%	212	4,441	2,100	80	6,541
19	Spare wheel cover (soft)	5%	435	5%	950							1,402			1,402
20	Spare wheel cover (hard)	5%	610	3%	2,000	50%	189	3%	414	100%	2,115	44,511	28,000	100	72,511
21	Shift knob (MT/AT)			3%	700	3%	63			5%	525	2,213	1,400	20	3,613
22	Seat cover (fabric)					3%	75			3%	1,055	1,428			1,428
23	Seat cover (vinyl/neoprene)					7%	75			10%	2,385	4,489	2,100	600	6,589
24	Door sill protector	5%	235	3%	800	5%	60			10%	525	7,321			7,321
25	Scuff plates	5%	190	5%	1,100	6%	75	5%	440	10%	1,055	7,707	2,100	60	9,807
26	LED scuff plates	5%	460									2,999			2,999
27	Sports pedal (AT)	6%	175	4%	480	3%	95			3%	525	2,625	2,100	35	4,725
28	Sports pedal (MT)	6%	175			3%	95			3%	525	2,420			2,420
29	Mud guard	7%	115	7%	600	5%	32	10%	400	100%	265	43,821			43,821
30	Bike Rack					3%	189					271	2,100	150	2,371
31	Roof Rails									12%	2,115	4,628			4,628
32	Rear Ladder									10%	3,175	3,856			3,856
33	Trailer hitch					10%	189	5%	918			1,191	10,500	300	11,691
34	Interior Ambient Lighting									5%	1,585	1,928			1,928
35	Chrome Fender Mirror									12%	928	4,628			4,628
36	Chrome Tail lamp Garnish									12%	1,055	4,628			4,628
37	Chrome Mirror Cover Garnish									12%	525	4,628			4,628
38	Chrome Door Handle Cover									12%	1,055	4,628			4,628
39	Ford Mechanical Gear Locks									5%	1,055	1,928			1,928
40	Step bar	4%	855	5%	4,500					12%	6,885	7,050	10,500	400	17,550
41	Reverse camera system (+ rear view mirror (base))			5%	4,000	5%	378			5%	2,645	2,403			2,403
42	Side skirt	4%	350	5%	5,700	5%	157			5%	2,645	-			-
43	Stripe Stickers	6%	260			5%	189			3%	663	5,207			5,207
44	Car Cover									50%	636	19,282			19,282
45	Xenon Headlamp Bulbs									10%	795	3,856			3,856
46	Seat cover (leather)									3%	5,295	1,157			1,157
47	Audio system upgrade (TBD)			5%	23,000	5%	378					475			475
48	Roof Luggage Pod					5%	378					452			452
49	Sat Nav					5%	220			5%	6,885	2,380			2,380
50	17" Alloy Wheels					5%	630					452			452
51	Subwoofer speaker					6%	189			10%	3,175	4,399			4,399
52	Ski/Snow board roof racks					4%	189					362			362
53	Watercraft/Canoe roof racks					1%	189					90			90
54	Nudge Bar					5%	315					452			452
55	Boot Storage Compartments					4%	120					362			362
56	Rear DVD Player					4%	945			3%	9,010	1,518			1,518
57	Boot scuff Guard					5%	40					452			452
58	Sporty Front Grille									3%	795	1,157			1,157
59	Two Tone Leather Steering Wheel									1%	1,585	386			386
60	Themocooler									1%	2,645	386			386
61	In Car Refrigerator									3%	5,295	1,157			1,157
62	Bonnet Air Scoop									6%	525	2,314			2,314
63	Rain Sensor									3%	1,055	1,157			1,157
64	Tyre Pressure Sensor									3%	1,585	1,157			1,157
65	Wood Grain IP Trim									4%	1,585	1,543			1,543

Table 18: B515 inputs to finance team for business case

No.	Items	CFMA										Total Annual Volume	Piece Price Exclude Tooling amortization		Tooling Cost		Ford Engineering Hours	China Support Team Allocation Hours				Thailand Support Team Allocation	Supplier and Engineering Cost				
		CFMA		FLH		FOA		FMCSA		FIL			USD	Provision (%)	USD	Provision (%)		Hours	Purchase	PM	Finance		STA	Hours	USD	USD	USD
		adj vol	WSD (CNY)	adj vol	WSD (NTD)	adj vol	WSD (AUD)	adj vol	WSD (RAND)	adj vol	WSD (INR)																
1	Roof rack	480	635	27	3,000	904	157	172	1,120	3,856	2,645	5,440	150	5%	60,000	5%	800	26	35	35	50	50	20,000		1,000	3%	
2	Rear skid plate			23	2,000	452	157			3,856	1,585	4,331	24	5%	40,000	5%	380	26	35	35	50	50	17,568		400	3%	
3	Rear spoiler			27	2,000	633	189	287	1,344	3,856	2,115	4,804	35	5%	15,000	5%	466	26	35	35	50	50	15,750		287	3%	
4	Front skirt (RIM)	2,399	530	23	2,000	452	157	287	1,765	1,928	1,585	5,089	42	5%	55,000	5%	300	26	35	35	50	50	19,516		168	3%	
5	Rear skirt (RIM)	2,399	530	23	2,000	452	157	287	1,655	1,928	2,115	5,089	45	5%	55,000	5%	243	26	35	35	50	50	17,568		180	3%	
6	Weather shield (slimline)	2,999	185			723	50	574	415	1,928	1,055	6,224	40	5%	3,600	5%	480	26	35	35	50	50	1,200		198	3%	
7	Bonnet protector			14	776	723	90					737	25	5%	3,000	5%	480	26	35	35	50	50	1,200		125	3%	
8	Carpet mat (standard)	3,598	195	411	700	723	37			15,426	525	20,159	12	5%	0		181	26	35	35	50	50	4,100		60	3%	
9	Carpet mat (premium)			14	1,000	1,356	47			3,856	663	5,226	16	5%	0		181	26	35	35	50	50	7,500		80	3%	
10	Rubber mat	3,598	175	14	200	723	32			19,282	525	23,617	15	5%	10,000	5%	181	26	35	35	50	50	7,500		75	3%	
11	Trunk tray	2,999	175	23	900	904	113			38,564	345	42,490	18	5%	0		220	26	35	35	50	50	5,000	6,000	7,500	3%	
12	Trunk net	2,999	145	14	600	271	57			1,157	212	4,441	28	5%	0		220	26	35	35	50	50	7,000	1,500	200	3%	
13	Spare wheel cover (soft)	1,379	435	23	950							1,402	14	5%	8,000	5%	260	26	35	35	50	50	6,000		0	3%	
14	Spare wheel cover (hard)	1,379	610	14	2,000	4,519	189	34	414	38,564	2,115	44,511	35	5%	97,000	5%	260	26	35	35	50	50	14,000		0	3%	
15	Shift knob (MT/AT)			14	700	271	63			1,928	525	2,213	18	5%	3,000	5%	380	26	35	35	50	50	29,411		500	3%	
16	Seat cover (fabnc)					271	75			1,157	1,055	1,428	60	5%	0		200	26	35	35	50	50	40,000		350	3%	
17	Seat cover (wnyl/neoprene)					633	75			3,856	2,385	4,489	125	5%	0		200	26	35	35	50	50	40,000		550	3%	
18	Door sill protector	2,999	235	14	800	452	60			3,856	525	7,321	18	5%	10,000	5%	260	26	35	35	50	50	20,000		300	3%	
19	Scuff plates	2,999	190	23	1,100	542	75	287	440	3,856	1,055	7,707	13	5%	15,000	5%	150	26	35	35	50	50	4,300		52	3%	
20	LED scuff plates	2,999	460									2,999	26	5%	48,000	5%	250	26	35	35	50	50	33,000		300	3%	
21	Mud guard	4,198	115	32	600	452	32	574	400	38,564	265	43,821	12	5%	65,000	5%	251	26	35	35	50	50	9,600		200	3%	
22	Rear Ladder									3,856	3,175	3,856	100	5%	8,000	5%	466	26	35	35	50	50	69,706		600	3%	
23	Interior Ambient Lighting									1,928	1,585	1,928	90	5%	0			26	35	35	50	50	100,000		10,000	3%	
24	Chrome Fender Mirror									4,628	928	4,628	10	5%	38,000	5%	300	26	35	35	50	50	100,000		600	3%	
25	Chrome Tail lamp Garnish									4,628	1,055	4,628	15	5%	40,000	5%	246	26	35	35	50	50	12,000		180	3%	
26	Chrome Mirror Cover Garnish									4,628	525	4,628	30	5%	40,000	5%	300	26	35	35	50	50	12,000		360	3%	
27	Chrome Door Handle Cover									4,628	1,055	4,628	12	5%	80,000	5%	268	26	35	35	50	50	12,000		144	3%	
28	Ford Mechanical Gear Locks									1,928	1,055	1,928	15	5%	720	5%		26	35	35	50	50	12,500		450	3%	
29	Reverse camera system (+ rear view mirror (base))			23	4,000	452	378			1,928	2,645	2,403	45	5%	10,000	5%	400	26	35	35	50	50	65,000	200	1,100	3%	
	Fog lamp						158			1,851	1,585	1,851															
	Front bumper applique	2,999	610	23	2,000	452	157	287	1,765	1,928	1,585	5,689															
	Rear bumper applique	2,999	610	23	2,000	452	157	287	1,655	1,157	1,585	4,918															
	Roof Rails									4,628	2,115	4,628															
	Parking sensor			46	3,692	723	220	287	900	1,157	1,055	2,213															
	Step bar	2,399	855	23	4,500					4,628	6,885	7,050	140	5%	100,000	5%	800	26	35	35	50	50	17,142		650	3%	
	Headlight Protectors					723	44	574	375			1,297	25	5%	6,000	5%	480	26	35	35	50	50	5,600		125	3%	
	Trailer hitch					904	189	287	918			1,191	115	5%	1,000	5%	800	26	35	35	50	50	61,000		150	3%	
	Sports pedal (AT)	2,399	175	18	480	152	95				116	525	2,625	9	5%	20,000	5%	480	26	35	35	50	50	6,000		200	3%
	Sports pedal (MT)	1,259	175			119	95			1,041	525	2,420	9	5%	20,000	5%	480	26	35	35	50	50	6,000		200	3%	

6.2.3 Business case analysis

Business case example is as follow.

**VEHICLE PERSONALIZATION
RE-DEALER ACCESSORY - MUD GUARD**
(Attractable Business Structure)

PROJECT DETAIL											
PIL No:											
Market:		Australia, Thailand, Indonesia, Philippine, India, CFMA, Taiwan, South Africa									
Total Volume:		131,462 units									
EXPENDITURE		2012									
		(100 US\$)									
Tooling Cost		3% Provision		980							
Development Cost		2% Provision of tooling		281							
Maintenance (FA - FA, zero tooling)						(94)					
VOLUME		Program Cycle									
		2012	2013	2014	2015	2016	2017	2018	Total		
		(Units)	(Units)	(Units)	(Units)	(Units)	(Units)	(Units)	(Units)		
FOA	Nov 2012 - Oct 2015 (3 yrs)	75	452	452	377	-	-	-	1,356		
CFMA	Aug 2012 - July 2015 (3 yrs)	1,749	4,198	4,198	2,449	-	-	-	12,596		
FLH	Aug 2012 - July 2015 (3 yrs)	5	32	32	27	-	-	-	96		
FIL	Nov 2012 - Oct 2015 (3 yrs)	6,427	38,581	38,581	32,137	-	-	-	115,569		
FMCSA	Nov 2012 - Oct 2015 (3 yrs)	96	574	574	479	-	-	-	1,723		
Total		8,363	43,821	43,821	35,458	-	-	-	131,462		
WSD		FOA		CFMA	FLH	FIL	FMCSA	FOT	FS&O		
		(Units)	(Units)	(Units)	(Units)	(Units)	(Units)	(Units)	(Units)		
		32	115	600	600	400	-	-	-		
ACCESSORY PROFITABILITY											
	Volume	WSD Revenue	Material Cost w/ Provision	Freight & Duty	Other Variable Cost	Tooling Amortization	Engineering Cost	FCSD profit allocation	PBT	Project ATROS	
	units	per unit (USD)	per unit (USD)	per unit (USD)	per unit (USD)	per unit (USD)	per unit (USD)	per unit (USD)	per unit (USD)	per unit (USD)	
FIL CSO	15,769	16	(13)	(3)	(1)	(1)	-	-	3	-	
FOA	1,556	25	(18)	(3)	(1)	-	(3)	3	8	20%	
CFMA	12,595	19	(16)	(4)	(1)	-	(3)	3	0	0%	
FLH	96	21	(18)	(5)	(1)	-	(3)	3	2	5%	
FIL	115,693	14	(13)	(3)	(1)	(1)	(3)	-	0	1%	
FMCSA	1,723	46	(16)	(5)	(1)	(3)	(3)	3	25	36%	
PROFIT AND LOSS STATEMENT											
	2012	2013	2014	2015	2016	2017	2018	Total			
	(100 US\$)	(100 US\$)	(100 US\$)	(100 US\$)	(100 US\$)	(100 US\$)	(100 US\$)	(100 US\$)			
WSD Revenue	127	655	687	547	-	-	-	1,919			
Material Cost	(100)	(526)	(526)	(426)	-	-	-	(1,578)			
Material Cost Provision	(5)	(26)	(26)	(21)	-	-	-	(79)			
Freight	(3)	(9)	(9)	(7)	-	-	-	(29)			
Import Duty	(4)	(10)	(10)	(7)	-	-	-	(31)			
Inland Freight	(3)	(13)	(13)	(10)	-	-	-	(39)			
Other Variable Expense	(5)	(21)	(21)	(18)	-	-	-	(65)			
Variable Expense	(120)	(605)	(605)	(485)	-	-	-	(1,815)			
Variable Margin	7	50	62	62	-	-	-	181			
Tooling Amortization	(4)	(23)	(23)	(18)	-	-	-	(68)			
Other Fixed Cost	-	-	-	-	-	-	-	-			
PBT	2	27	39	44	-	-	-	112			
Engineering Cost	(28)	-	-	-	-	-	-	(28)			
Total PBT	(24)	27	39	44	-	-	-	89			
ENTERPRISE VARIABLE PROFIT											
	2012	2013	2014	2015	2016	2017	2018	Total			
	(100 US\$)	(100 US\$)	(100 US\$)	(100 US\$)	(100 US\$)	(100 US\$)	(100 US\$)	(100 US\$)			
FOA	0	2	2	2	-	-	-	7			
CFMA	(8)	(11)	(9)	(5)	-	-	-	(33)			
FLH	(1)	(2)	(2)	(1)	-	-	-	(6)			
FIL	10	46	65	53	-	-	-	164			
FMCSA	2	13	13	12	-	-	-	40			
Total	7	50	62	62	-	-	-	181			
ENTERPRISE PROFIT											
	2012	2013	2014	2015	2016	2017	2018	Total			
	(100 US\$)	(100 US\$)	(100 US\$)	(100 US\$)	(100 US\$)	(100 US\$)	(100 US\$)	(100 US\$)			
FOA	0	2	2	2	-	-	-	7			
CFMA	(8)	(11)	(9)	(5)	-	-	-	(33)			
FLH	(1)	(2)	(2)	(1)	-	-	-	(6)			
FIL	9	23	33	34	-	-	-	99			
FMCSA	2	13	13	12	-	-	-	40			
Total	(28)	27	39	44	-	-	-	89			
CASH FLOW - AFTER 35% TAX											
	2012	2013	2014	2015	2016	2017	2018	Total			
	(100 US\$)	(100 US\$)	(100 US\$)	(100 US\$)	(100 US\$)	(100 US\$)	(100 US\$)	(100 US\$)			
Tooling Investment	(98)	-	-	-	-	-	-	(98)			
PAT	(15)	18	25	28	-	-	-	66			
Tooling Amortization	4	23	23	18	-	-	-	68			
Total	(79)	40	48	47	-	-	-	69			
Status		ATROS	TAR	Payback (Months)							
		4%	91%	27							
Remark: ABS Methodology is CSO Method (Incremental Analysis)											
Exchange Rate # (USD/IDR)											
2012	2013	2014	2015	2016	2017	2018	2019	2020	2021		
USD/IDR	13,200	13,200	13,200	13,200	13,200	13,200	13,200	13,200	13,200		
USD/IDR	13,200	13,200	13,200	13,200	13,200	13,200	13,200	13,200	13,200		
USD/IDR	13,200	13,200	13,200	13,200	13,200	13,200	13,200	13,200	13,200		
USD/IDR	13,200	13,200	13,200	13,200	13,200	13,200	13,200	13,200	13,200		
USD/IDR	13,200	13,200	13,200	13,200	13,200	13,200	13,200	13,200	13,200		

Figure 73: B515 business case calculation sheet

VEHICLE PERSONALIZATION
B515 DEALER ACCESSORY - MUD GUARD
 (Irreducible Business Structure by Country)

PCA		2012	2013	2014	2015	2016	2017	2018	Total
		(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)
WSD Revenue	410.52	2	11	11	10	-	-	-	34
Material Cost		(1)	(7)	(7)	(8)	-	-	-	(23)
Freight	10%	(0)	(1)	(1)	(1)	-	-	-	(3)
Import Duty	5%	(0)	(0)	(0)	(0)	-	-	-	(1)
Inland Freight	2%	(0)	(0)	(0)	(0)	-	-	-	(1)
Other Variable Expense	3.9% of Mkt	(0)	(0)	(0)	(0)	-	-	-	(1)
Variable Expense		(1)	(9)	(9)	(9)	-	-	-	(27)
Variable Margin		0	2	2	2	-	-	-	7
PBT		0	2	2	2	-	-	-	7
CFMA		2012	2013	2014	2015	2016	2017	2018	Total
		(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)
WSD Revenue	0.97 715	32	79	81	48	-	-	-	240
Material Cost		(29)	(69)	(69)	(40)	-	-	-	(206)
Freight	10%	(3)	(7)	(7)	(4)	-	-	-	(21)
Import Duty	10%	(3)	(8)	(8)	(4)	-	-	-	(23)
Inland Freight	2%	(1)	(2)	(2)	(1)	-	-	-	(6)
Other Variable Expense	7.0% of Mkt	(2)	(5)	(5)	(3)	-	-	-	(14)
Variable Expense		(9)	(90)	(90)	(53)	-	-	-	(237)
Variable Margin		19	(11)	(9)	(5)	-	-	-	(30)
PBT		10	(11)	(9)	(5)	-	-	-	(30)
FLH		2012	2013	2014	2015	2016	2017	2018	Total
		(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)
WSD Revenue	1.70 403	0	1	1	1	-	-	-	2
Material Cost		(0)	(1)	(1)	(0)	-	-	-	(2)
Freight	10%	(0)	(0)	(0)	(0)	-	-	-	(0)
Import Duty	15%	(0)	(0)	(0)	(0)	-	-	-	(0)
Inland Freight	2%	(0)	(0)	(0)	(0)	-	-	-	(0)
Other Variable Expense	1.3% of Mkt	(0)	(0)	(0)	(0)	-	-	-	(0)
Variable Expense		(0)	(1)	(1)	(1)	-	-	-	(3)
Variable Margin		(0)	(0)	(0)	(0)	-	-	-	(0)
PBT		(0)	(0)	(0)	(0)	-	-	-	(0)
FL		2012	2013	2014	2015	2016	2017	2018	Total
		(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)
Domestic Sales									
WSD Revenue	2.61 483	89	538	547	468	-	-	-	1,642
Material Cost	0.90 12	(77)	(463)	(463)	(359)	-	-	-	(1,362)
Freight	5%	(4)	(23)	(23)	(19)	-	-	-	(69)
Inland Freight	2%	(2)	(10)	(10)	(8)	-	-	-	(29)
Other Variable Expense	2.7% of Mkt	(2)	(13)	(13)	(11)	-	-	-	(39)
Variable Expense		(85)	(509)	(509)	(424)	-	-	-	(1,827)
Variable Margin		4	29	39	42	-	-	-	114
Export Sales									
WSD Revenue	20% GSD Markup	32	86	68	55	-	-	-	239
Material Cost	0.90 12	(23)	(61)	(61)	(40)	-	-	-	(185)
Material Cost Provision	5%	(1)	(3)	(3)	(2)	-	-	-	(9)
Inland Freight	2%	(0)	(1)	(1)	(1)	-	-	-	(4)
Other Variable Expense	2.7% of Mkt	(1)	(2)	(2)	(1)	-	-	-	(6)
Variable Expense		(24)	(69)	(69)	(44)	-	-	-	(206)
Variable Margin		6	17	17	11	-	-	-	50
Tooling Amortization		(4)	(23)	(23)	(18)	-	-	-	(68)
PBT		6	23	33	34	-	-	-	96
FLMCA		2012	2013	2014	2015	2016	2017	2018	Total
		(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)
WSD Revenue	24.9 430	4	26	26	23	-	-	-	79
Material Cost		(2)	(9)	(9)	(8)	-	-	-	(28)
Freight	10%	(0)	(1)	(1)	(1)	-	-	-	(3)
Import Duty	21%	(0)	(2)	(2)	(2)	-	-	-	(7)
Inland Freight	2%	(0)	(0)	(0)	(0)	-	-	-	(1)
Other Variable Expense	2.7% of Mkt	(0)	(0)	(0)	(0)	-	-	-	(1)
Variable Expense		(2)	(13)	(13)	(11)	-	-	-	(39)
Variable Margin		2	13	13	12	-	-	-	40
PBT		2	13	13	12	-	-	-	40
Engineering Cost		2012	2013	2014	2015	2016	2017	2018	Total
		(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)
Engineering Cost		(26)	-	-	-	-	-	-	(26)
Europe Price (PCSE) (P 73)		2012	2013	2014	2015	2016	2017	2018	Total
		(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)	(000 USD)
TRM USD		23,200.5	32,085.6	32,200.0	33,000.0	33,000.0	33,000.0	33,000.0	231,000.0
CMV USD		6,300.0	6,700.0	6,800.0	6,800.0	6,800.0	6,800.0	6,800.0	54,000.0
AWP USD		1,200.0	1,200.0	1,200.0	1,200.0	1,200.0	1,200.0	1,200.0	9,600.0
TRM USD		26,100.5	39,785.6	39,800.0	40,800.0	40,800.0	40,800.0	40,800.0	295,600.0
ZAV USD		2,700.0	2,800.0	2,800.0	2,800.0	2,800.0	2,800.0	2,800.0	22,400.0
TRM USD		27,800.5	42,585.6	42,600.0	43,600.0	43,600.0	43,600.0	43,600.0	318,000.0

Figure 73 (continue): B515 business case calculation sheet

From the table negative business result items will definitely be dropped from the consideration but parts with positive business case but not align with company's financial target will be studied further by product planning team. The parts can either be pursuing by local team or by any supplier and supplied as supplier branded accessories.

Before do the same process with C346 program, it is noticed that the part should be re-arranged. In some cases, right hand drive and left hand drive parts are inputted from different country with different vehicle sales volume and left hand drive part might be the only part getting positive business case. To be able to keep more parts in the list, it is recommended that the parts are listed as commodity to share engineering costs and combine volume.

From initial list of 63 items, C346 final result is to precede 18 part commodities for budget approval.

Table 20: C346 final accessory list for budget approval request

Item	Commodity	Investment	ATROS	TARR	Payback	Benchmark	Priority
1	Waterproof trunk Tray (Anti slip mat) 5dr 后挡泥板4门	27,230	12%	76374%	11	20	4.426
	Waterproof trunk Tray (Anti slip mat) 4dr	36,983	14%	positive	9	13	3.829
2	Carpet floor mat (LHD/RHD)	35,921	23%	positive	3	18	4.284
	Carpet floor mat - Premium RHD	23,577	26%	positive	6	5	3.173
3	Mud flaps 4dr 后挡泥板4门	58,604	20%	193%	7	15	4.018
	Mud flaps 5dr 后挡泥板5门	58,604	21%	174%	7	15	4.021
4	Front bumper skirt 前裙边	278,513	53%	positive	3	16	3.913
	Side Skirt 侧裙边	278,626	46%	positive	4	16	3.894
	Rear bumper skirt (5dr) 后裙边	278,532	46%	positive	6	11	3.463
	Rear bumper skirt (4dr) (molding) 后裙边	46,351	35%	positive	5	8	3.456
5	LED scuff plate (front) LED门踏板	86,936	39%	positive	3	13	3.898
6	Pedal set AT 踏板套件自动	38,539	37%	positive	6	12	3.806
7	Alloy wheel 17" 铝合金轮圈17寸	75,204	32%	positive	2	11	3.706
	Alloy wheel 16" 铝合金轮圈16寸	74,787	35%	positive	2	9	3.542
8	Reverse sensing	26,900	22%	positive	1	11	3.679
9	Rear spoiler 5dr (RIM) 后扰流板5门	49,833	17%	positive	5	9	3.493
10	Rear bumper step plate 4dr 后保踏板	16,727	23%	positive	5	6	3.392
	Rear bumper step plate 5dr 后保踏板	16,727	22%	positive	6	6	3.389
11	Chrome door handle cover 镀铬门把手	55,041	51%	positive	1	6	3.328
	Chrome Rr lamp garnish 4dr 电镀尾灯装饰框4门	58,101	37%	positive	6	5	3.204
	Chrome Rr lamp garnish 5dr 电镀尾灯装饰框5门	58,101	36%	positive	7	5	3.201
	Chrome Fr lamp garnish 电镀前大灯装饰框	58,101	31%	positive	6	5	3.187
12	Rubber floor mat (LHD/RHD) 橡胶地垫	26,953	24%	positive	3	6	3.254
13	Rear spoiler 4dr - wing type (molding) 后扰流板4门	36,945	10%	180%	13	11	2.746
14	Wheel arch molding 轮眉	46,429	42%	positive	4	4	3.131
15	Stainless fuel tank cover 4dr 不锈钢油箱盖4门	13,332	12%	positive	9	2	3.017
	Stainless fuel tank cover 5dr 不锈钢油箱盖5门	13,332	10%	positive	11	2	3.012
16	Fog lamp cover (chrome) 雾灯装饰框	26,713	37%	positive	2	2	2.945
17	Chrome rear garnish 5dr 不锈钢后装饰条	40,869	22%	511%	13	7	2.435
	Chrome rear garnish 4dr 不锈钢后装饰条	40,869	12%	162%	16	3	2.063
18	LED rear garnish 5dr LED后装饰条	29,010	12%	1183%	12	4	2.149
Base program	Headlamp guard 前大灯保护罩	20,754				8	
	Tow bars 4dr kit incl wiring	218,068				5	
	Tow bars 5dr kit incl wiring	218,068				5	
buy FOE	Alloy Shift knob (MT) 换挡球头	84,075				7	
	Stainless scuff plate 4dr 不锈钢门踏板4门	28,423				17	
	Stainless scuff plate 5dr 不锈钢门踏板5门	28,423				7	
buy FNA	Slim line Weathershield 窄挡雨条	14,290				20	
	Bonnet protector	16,962				7	

A summary of parts passes through the gates on both case study projects can be summarized as below.

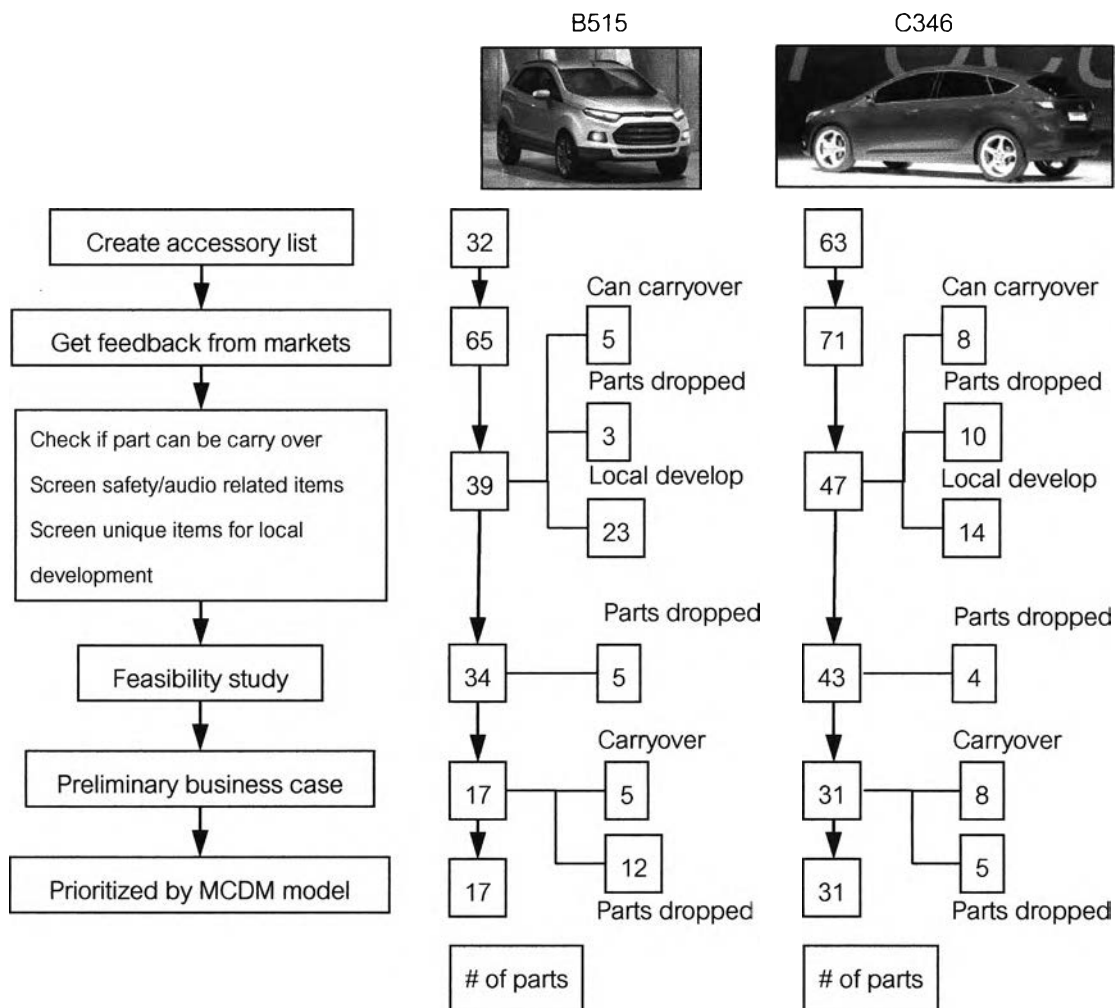


Figure 74: Number of parts passing through the decision model on two case projects

6.3 Validation of the model from user's feedback

Another questionnaire (to be called questionnaire 2 in this paper) is drafted based on the following topics in order to validate user's satisfaction of the model and the model's results. (Questionnaire 2 can be found in Appendix B)

- Model compatibility, correctness, validity, ease of use and reliability
- Model result usefulness, relevance, clarity, transparency and consistency
- User interface and model maintainability

Twenty questions sixteen scale rating questions (close questions) and four open questions are used and the ratings are defined as below.

- 1 – Strongly disagree
- 2 – Disagreed
- 3 – Neither agreed or disagreed
- 4 – Agreed
- 5 – Strongly agreed

Questionnaire 2 was sent to four direct users, two product planners (100%), one purchaser and one financier who will use this model forward and the results are as follow.

Table 21: Results from questionnaire 2

Group	Question in evaluation form	Strongly disagreed	Disagreed	Neither agreed or disagreed	Agreed	Strongly agreed	Average
		1	2	3	4	5	
model compatibility	The model fit to accessory business environment	0	0	1	2	1	4
model compatibility	The objective of the model is clear	0	0	2	0	2	4
model compatibility	The process and technique use is appropriate	0	0	0	2	2	4.5
model ease of use	Information required can be obtained easily	0	0	1	2	1	4
model ease of use	The model is not too complicated to follow	0	0	0	2	2	4.5
model maintainability and appropriate user interface	Modifying some of the parameter did not change the overall result	0	0	3	1	0	3.25
model maintainability and appropriate user interface	It is easy to add or change decision parameters	0	0	2	2	0	3.5
result correctness and consistency	Wanted parts are not dropped too early	0	1	1	2	0	3.25
result correctness and consistency	Parts likely not to justify business case are dropped early	0	1	0	2	1	3.75
result correctness and consistency	Information required are best estimations	0	0	0	4	0	4
result correctness and consistency	Factors used in the calculation are appropriate and relevance	0	0	1	3	0	3.75
result correctness and consistency	Calculations are done correctly	0	0	1	3	0	3.75
result correctness and consistency	The outputs can be used as input to next process	0	0	0	3	1	4.25
result reliability	Knowledge and experiences of the user can be used as a source of information	0	0	0	3	1	4.25
result usefulness	The outputs of the process were worth the time put in	0	0	0	3	1	4.25
result usefulness	The outputs facilitate decision making	0	0	0	3	1	4.25

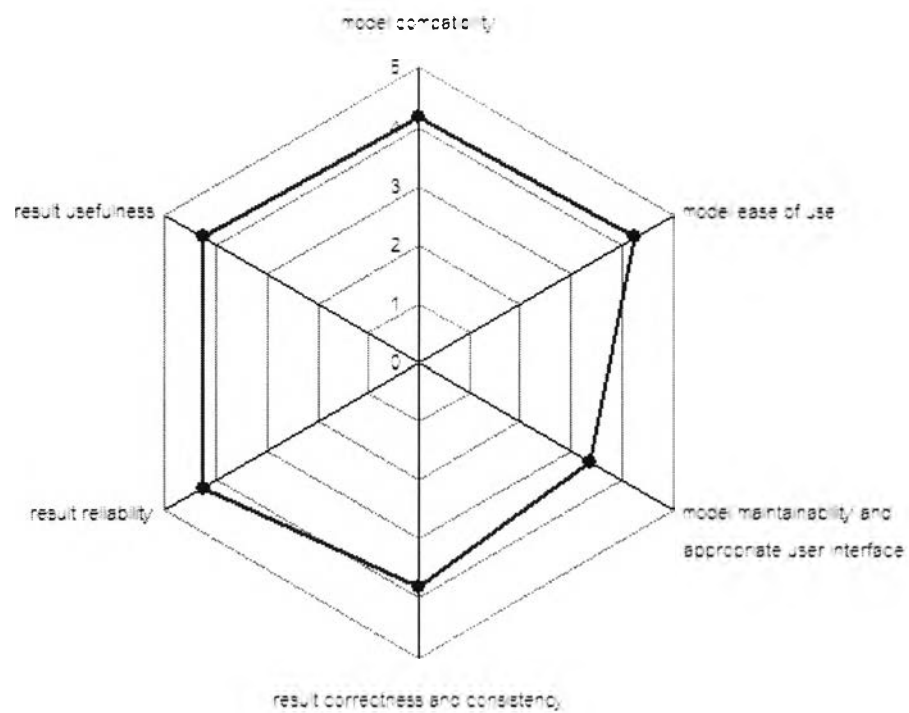


Figure 75: Users' satisfaction to the model from questionnaire 2 result

The overall satisfaction rate is 79% with less satisfaction on the model maintainability and user interface area. Comments from users are as follow.

- 1) Explanation of the input for business case study and bench marking still need to be done when proposed the list as most of the information used is surrogate data and best estimation but it is good enough in answering the objective of the model.
- 2) Additional steps on who will continue to develop what and how the product development direction is finalized should be added to the model in order that persons who are not involved to the calculation have better understanding of the overall process.
- 3) Supplier's capability doesn't clearly state at any of the process, however, this point has been clarified that it is included in engineering feasibility steps.
- 4) Purchaser claimed that parts are dropped too early but planners agreed that this will fit with the current company situation and the limited resource the team has for regional development.

5) Strong points of this new model are

- It is much simpler, systematically ordered and easier to use than the old one
- The model supports company's objective as well as the regionalization plan
- With less resources used upfront in the program the total resource used in accessory development can be reduced

6) Improvement points of this new model are

- Each accessory development time should be included as a factor when considering prioritizing accessories.
However, due to the fact that the overall accessory development timing is included to base vehicle development timing, the concern on long lead development item should not be considered as issues anymore.
- Payback period of 12 months should be changed. It is recommended to the case company planning team to discuss with finance support team that payback period should be extended to the vehicle cycle life as this will add more parts into the development list.
- If continuous improvement can be done on the model usability, it is recommended that a looser agreed accessory development specification comparing to vehicle development specification to be written. This will bring down accessory development cost and make better business case, thus, a wider accessory range can be offered from regional development team.
- As futuring of accessories can not be planned for more than one or two years since fashionable and technology products life cycle is short, company should reserve some budget for these unplanned accessories as well to keep the flexibility in the development system.

After taking into account all the feedbacks, the final accessory decision model is proposed as follow.

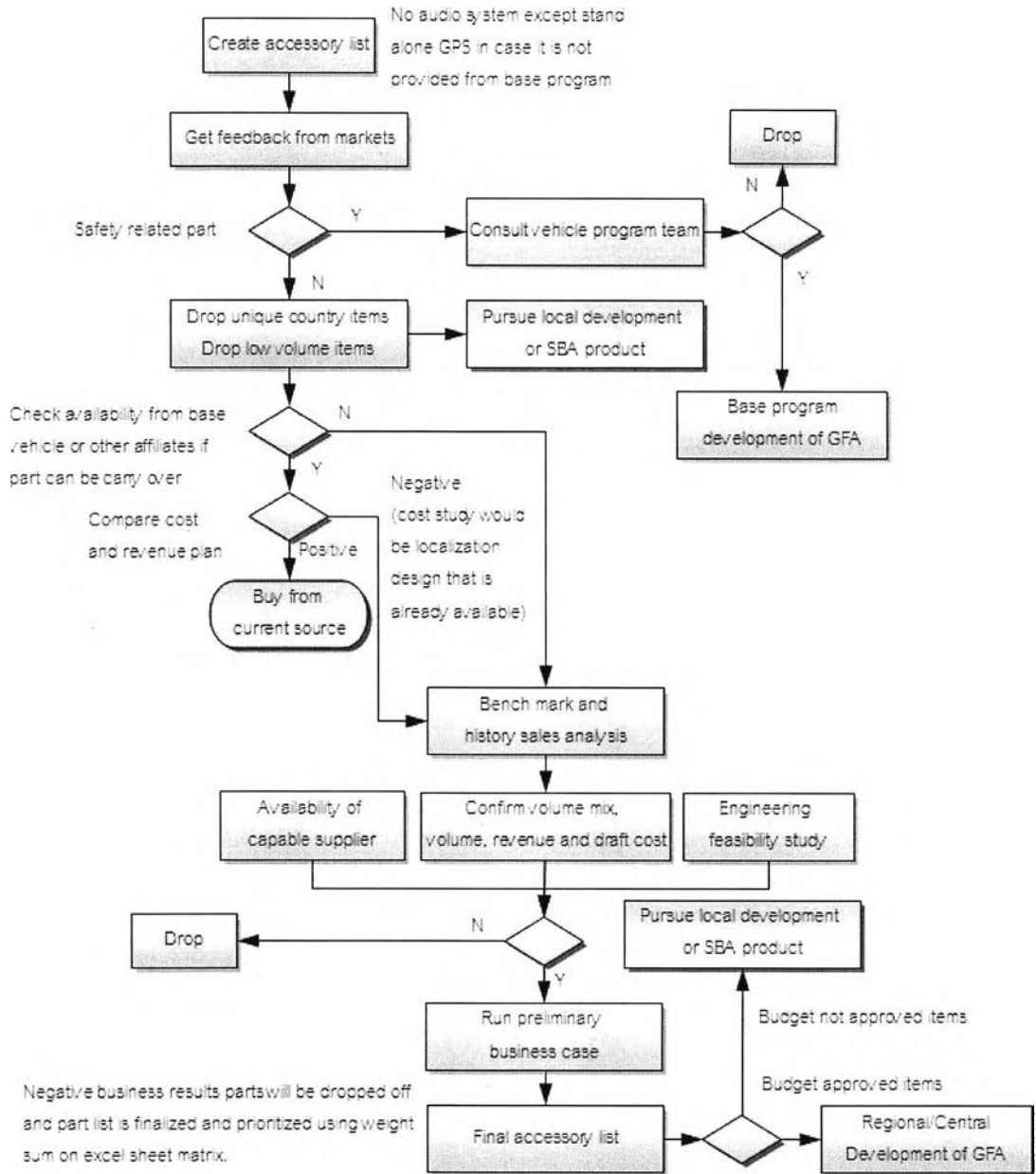


Figure 76: Final regional accessory decision making model