GROSS MARGIN MANAGEMENT FRAMEWORK FOR MERCHANDISING DECISIONS IN COMPANIES WITH LARGE ASSORTMENT OF PRODUCTS

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Abstract

Gross margin management is a complex task as gross margin can't be too high or too low in order to deliver maximum sales and profit.

Objective of the article is to present framework which allows understanding and managing gross margin and gross profit in companies with large assortment of products. The framework has defined basic margin variances – pricing, cost, volume and mix. These variances enable to understand and interpret strategic and merchandising decisions of the company. Formulas are presented which translate specific merchandising decisions impact on gross margin and gross profit, formulas allow to simplify calculations without the need to recalculate all assortment on product by product basis multiple times.

Derivations of algebraic formulas are used to obtain gross margin variances impact on gross margin and gross profit. Cause and effect model is used as a method to integrate gross margin variance into the gross margin management framework. Boston Consulting Group matrix principle is used to establish and analyse typical gross margin management situations and interpret behavior of customers.

Conclusions – companies with large assortment of products have to manage financial results and gross profit through gross margin management by evaluating merchandising decisions impact on both gross profit and gross margin. Four gross profit and margin variances – price, cost, volume and mix, need to be used to understand business situations related to gross margin management and these four variances can be used as building blocks to analyse specific merchandising offers and strategic decisions.

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Keywords: *gross margin management, gross profit management, variance analyses, merchandising decisions.*

JEL Classification: *G39, M49.*

1. Introduction

Gross Margin management is one of the most important and one of the most complex areas in managing financial results of the companies. Companies which have higher gross margin tend to be more profitable and tend to have stronger free cash flow - high cash flow can be returned to shareholders or re-invested into the business, allowing the business to expand, without having to rely on debt. These companies are more resilient to external environment – impact from change in macroeconomics or actions of competitors. Gross margin management is complex task especially because gross margin can't be too high or too low in order to deliver maximum sales and profit and this is different comparing to management of operating expenses or cash flow where in many cases minimising expenses or inventory, accounts receivable etc. means maximising profit and cash flow. Gross margin management is even more complex in companies with large assortment of products – customers' behaviour influenced by merchandising decisions of the company impact product mix, product mix impacts actual cost of merchandising decisions and actual gross margin and gross profit.

Nowadays gross margin is quite widely discussed in business context – it is presented and

explained by companies to shareholders and analysts, consulting companies are ready to propose gross margin increase strategies as well exists quite extensive scientific research analysing separate gross margin aspects or decisions which impact gross margin. The ***problem*** is that due to the reason the subject is very wide therefore there is a lack of integrated approach to gross margin where gross margin analysis are linked to decisions and company strategy which should help select needed decisions. Cost accounting theory provides analyses of contribution or gross profit expressed in money terms but does not translate it to margin impact expressed in percentage points which is extremely important for companies with large product assortment. As well cost accounting is focusing on financial aspect in this way loosing link to merchandising and sales promotion. On the other side merchandising and sales promotion researches are focusing on sales and marketing side without the link to finance.

The objective of this article is to present framework which would allow understanding gross margin and gross profit drivers, linking it to product merchandising and strategic decisions and allowing using it in companies which have big assortment of products.

Gross profit and gross margin as performance indicators are chosen in order to make the framework practically easy applicable. Classical cost accounting (Horngren, Datar, Rajan, 2010) proposes contribution margin indicator which additionally takes into account expenses directly related to analysed situation or decision. In this article and in my proposed solution I limit analyses to the gross profit and gross margin without taking into account operating expenses for the simplicity purposes:

- Companies with large assortment is complex enough therefore business and decision analyses should be split into smaller steps. Gross profit and gross margin analyses should be one of the first steps.
- Companies which do not have developed sophisticated performance analyses system as a step 1 can start with my proposed gross margin analyses. Later on after the company is used and fully understand gross profit and gross margin it can add on operating expenses to their analyses and move to contribution margin indicator as a step 2.

Only those merchandising decisions which directly impact financial result are in scope for this article, the impacts of these decisions can be measured by the proposed framework. So impacts of pricing, offers and promotions, up-sell, cross-sell, sampling and similar decisions are measured by the proposed framework. Merchandising elements such as visualisation, store design etc. with no direct attribution to financial result is out of scope for the proposed gross margin management framework.

Research on different aspects of Gross Margin or Merchandising decisions impacting gross margin is quite extensive, I would like to mention those most related to this article– Hurlbut (2005) states important aspects of gross margin management and lists most common mistakes related to gross margin in retail industry; Cushman (2011) links merchandising decisions to financials mostly for small business; Shah & Kumar (2012) analyse merchandising decisions, specifically cross-selling, impact on customers behaviour and impact on company profit; Goldratt, Eshkoli & Brownleer (2009) present a problem when incorrect merchandising and sales promotion decisions dilute financial performance of large assortment selling business, solution based on theory of constraints aligns merchandising decisions to right strategy which allows considerably improve profit, margin and return. Consulting companies propose ready to implement solutions directed to gross margin management – e.g. Boulder group's integrated gross margin improvement program focuses on gross margin management process, strategic and tactical decisions; Siburg Company has a margin increase solution focusing on pricing, cost and other gross margin drivers.

2. Theoretical background - Gross profit, Gross Margin and its' variances in the context of merchandising decisions

Gross profit is the difference between revenue and cost of goods sold. Gross Margin is the ratio of gross profit to revenue. Depends on situation or decision analyzed both or one of these two performance indicators can be more suitable. For merchandising decisions in company with large

assortment of products gross profit expressed in money terms needs to be used when measuring financial result on the level of all product assortment or on the level of big product group. This allows to see what is the overall financial result without digging into details. Gross margin expressed in percentage is more useful when we look at the details – e.g. we can't plan exactly the gross profit from particular product because we don't know exact quantities we are going to sell because customer has wide range of similar products to choose in companies with large assortment. Differently to gross profit, gross margin can be planned quite exact on product level as company itself sets price, defines discount, promotional offer etc. and company knows the cost to produce or buy. As well margins expressed in percentage are more suitable when comparison between products or product groups needs to be done as gross profit expressed in money terms can vary very much depending on product is expensive or not, is on promotion or sold at regular price etc. Therefore both indicators – gross profit and margin are important to track when making and analyzing merchandising decisions.

Cost accounting theory has variance analyses which can split profit variance into groups based on nature of variance. Bhimani, Horngren (2008) define selling price, cost per unit and quantities sold variances. Sold quantities variance is further split into sales-mix variance and sales-volume variance. I am using these classical cost accounting variances as a building blocks for the gross margin management framework. Table 1 presents how the proposed framework simplifies (marked grey) and enhances (marked light blue) the variances of cost accounting.

Table 1. Comparison of Variance analyses – the gross margin framework vs. classical cost accounting

	Classical Cost acc.	**Proposed framework**	**Comment**
Variances:	Price Cost Quantity: - Sales Mix - Sales volume	Price Cost Quantity: - Sales Mix - Sales volume	No difference
Variance expressed in	Absolute profit (money)	Absolute profit (money) & Gross Margin points	More convenient to plan and make assumptions for large assortment of products
Variance measures difference in	Contribution	Gross profit and Gross Margin	Classical cost acc. takes into account expenses; the framework proposes practical solution for companies with large assortment and does not take in scope operating expenses
Variances of Actual vs. plan or last year are calculated at the level of	Product by product and summed up	One of the component (e.g. Gross profit variances) is calculated at product by product basis. Translation to other component (e.g. Gross margin) is done with simple formula with no need to recalculate at product by product level	No difference in effort
Variance for analysing potential investment or saving decision in planning stage is done at the level of	Product by product and summed up	Assumption can be directly translated into variance by using formula	Less effort, no need to recalculate on product by product basis

3. Gross profit and Gross margin variances

From gross profit (1) and gross margin (2) formulas we can see that variance can occur due to change in Price, Cost and quantities or in other words different mix sold.

$$GP = Revenue - CostofGoods = \sum_n Q_n(P_n - C_n) \quad (1)$$

$$GM = \frac{GP}{Revenue} = \frac{\sum_n Q_n(P_n - C_n)}{\sum_n Q_n P_n} \quad (2)$$

GP - gross profit;
GM - gross margin;
P - price of specific product excl. value added tax;
C – cost of specific product per unit;
Q - quantity of specific product sold.

To calculate variances formulas (3-6) should be used, alternatively 4 scenarios need to be calculated and difference of gross profit and margin between scenarios would show variance:

- Sales quantity or Volume variance can be obtained by proportionally reducing all the units in base scenario in order to arrive at actual units sold while prices per product and costs per unit need to stay as in base scenario. Difference of Gross profit and margin between this recalculated scenario (example in Table 4) and base scenario (Table 2) would give Volume variance.
- Mix variance can be obtained by keeping Prices per product and cost per unit as in budget scenario but units sold replacing with actual quantities. Difference of this scenario (Table 5) and previously described volume variance scenario would give Mix variance.
- Price variance can be calculated by keeping actual quantities sold and actual prices per product and just cost are as in budget. Difference of this scenario (Table 6) versus Mix calculation scenario would give Price variance.
- Cost variance is calculated by deducting Gross profit and gross margin of Actual scenario from price variance scenario.

Graphical presentation and summary of example analysed in Tables 2-7 is in Figure 1.

$$PriceVar = \sum_n Q_{An}(P_{An} - P_{Bn}) \quad (3)$$

$$CostVar = \sum_n Q_{An}(C_{An} - C_{Bn}) \quad (4)$$

$$VolumeVar = \sum_n (Q_{AT} - Q_{BT}) \times M_{Bn} \times GP_{Bn} \quad (5)$$

$$MixVar = \sum_n Q_{AT} \times (M_{An} - M_{Bn}) \times GP_{Bn} \quad (6)$$

Q_{An} - quantity in units of product n actually sold;

Q_{AT} - total quantity of all units actually sold, from product 1 to product n;

Q_{BT} - total quantity of units projected to sell in base scenario, e.g. budget or last year;

P_{An} - Actual price per unit of product n;

P_{Bn} - Price per unit of product n in base scenario;

C_{An} - Actual cost per unit of product n;

C_{Bn} - Cost per unit of product n in base scenario;

M_{Bn} - Mix percentage in base scenario of product n, e.g. if plan is to sell 3 units of specific product and total units sold plan is 100 then mix percentage of this product is 3%;

M_{An} - Mix percentage of product n in actual scenario;

GP_{Bn} - gross profit of 1 unit of n product in base scenario.

Table 2. Budget Scenario

Product	Budget					
	Quantity	Price	Cost per unit	Sales	Gross Profit	Gross Margin
A	10	20	3	200	170	85.0%
B	20	10	4	200	120	60.0%
Total	30			400	290	72.5%

Table 3. Actual Scenario

Product	Actual					
	Quantity	Price	Cost per unit	Sales	Gross Profit	Gross Margin
A	55	15	6	825	495	60.0%
B	5	20	4	100	80	80.0%
Total	60			925	575	62.2%

Table 4. Volume variance Scenario

Product	Volume Variance scenario							
	Quantity	Price	Cost per unit	Sales	Gross Profit	Gross Margin	Volume variance	
A	20	20	3	400	340	85.0%	170	0.0%
B	40	10	4	400	240	60.0%	120	0.0%
Total	60			800	580	72.5%	290	0.0%

Table 5. Mix variance Scenario

Product	Mix Variance scenario							
	Quantity	Price	Cost per unit	Sales	Gross Profit	Gross Margin	Mix variance	
A	55	20	3	1100	935	85.0%	595	0.0%
B	5	10	4	50	30	60.0%	(210)	0.0%
Total	60			1150	965	83.9%	385	11.4%

Table 6. Price variance Scenario

Product	Price Variance scenario							
	Quantity	Price	Cost per unit	Sales	Gross Profit	Gross Margin	Price variance	
A	55	15	3	825	660	80.0%	(275)	-5.0%
B	5	20	4	100	80	80.0%	50	20.0%
Total	60			925	740	80.0%	(225)	-3.9%

Table 7. Cost variance Scenario

Product	Price Variance scenario							
	Quantity	Price	Cost per unit	Sales	Gross Profit	Gross Margin	Cost variance	
A	55	15	6	825	495	60.0%	(165)	-20.0%
B	5	20	4	100	80	80.0%	-	0.0%
Total	60			925	575	62.2%	(165)	-17.8%

It is very important to make calculations in the order as described above – first calculate volume then mix then price and lastly cost variance. Calculation of scenarios in different order would give different result and would not have economic sense – e.g. if by mistake we calculate price variance by keeping budgeted units and costs, replacing prices to actual and comparing it to budget scenario then in case of price increases we would observe overestimated pricing impact as difference in price we would multiply by budgeted volume which probably was higher when price increase was not planned.

In companies with large assortment of products volume variance can be meaningless if company sells very different products especially when price points are very different. In such case decrease in volume of expensive product does not have equal economic meaning as decrease in volume of cheap product. Solution would be to measure volume variance by comparable product categories and after that to group volume variance together with mix variance when comparing on the level of all assortment.

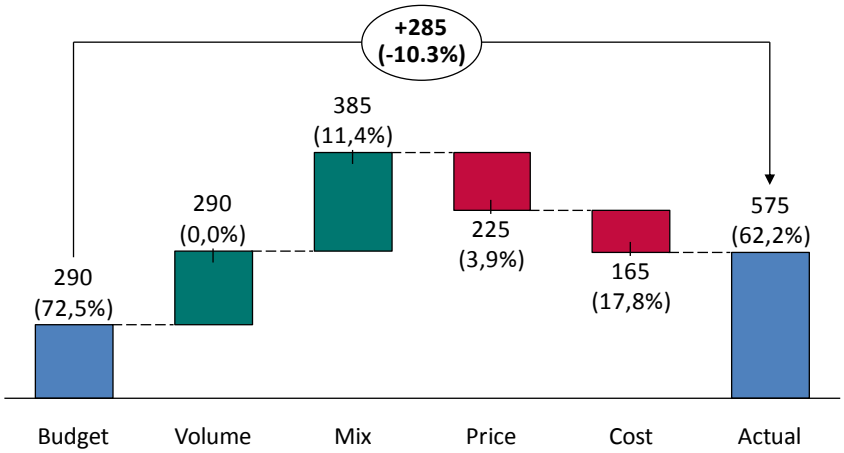

Figure 1. Presentation and summary of Gross profit and margin variance for analysed example

Formulas 3-6 calculates gross profit variances. To calculate gross margin variances we can do multiple recalculations as presented in tables 2-7, but for the large assortment it would be resource consuming therefore already having gross profit variances it is easy to translate it to gross margin variances. Formulas were derived by the author of this article using algebraic formulas derivation method. As we know volume variance has no margin impact therefore in all cases gross margin impact due to volume will be equal to zero. Gross margin Mix, Price, Cost variances can be calculated using formulas 7-9.

$$PriceVar_{GM\%} = \frac{PriceVar\,(C_{AT} + CostVar)}{S_{AT}\,(S_{AT} + PriceVar)} \tag{7}$$

$$CostVar_{GM\%} = \frac{CostVar}{S_{AT} + PriceVar} \tag{8}$$

$$MixVar_{GM\%} = GM_{AT\%} - GM_{BT\%} - PriceVar_{GM\%} - CostVar_{GM\%} \tag{9}$$

$PriceVar_{GM\%}$ - Gross margin price variance for all assortment or part of the assortment expressed in gross margin points;

$CostVar_{GM\%}$ - Gross margin cost variance for all assortment or part of the assortment expressed in gross margin points;

$MixVar_{GM\%}$ - Gross margin mix variance for all assortment or part of the assortment expressed in gross margin points;

$PriceVar$ - Gross profit price variance expressed in money terms;

$CostVar$ - Gross profit cost variance expressed in money terms;

C_{AT} - Actual total cost of all assortment or part of the assortment, can be taken from P&L report;

S_{AT} - Actual total sales of all assortment or part of the assortment, can be taken from P&L report;

$GM_{AT\%}$ - Gross margin of all assortment or part of the assortment in Actual scenario, can be taken from P&L report;

$GM_{BT\%}$ - Gross margin of all assortment or part of the assortment in Base scenario, can be taken from P&L report.

Merchandising decisions impact all 4 types of variances. Usual logic of merchandising is to invest in gross margin in order to increase sales and gross profit. Table 8 presents examples of offers used and its' impact on gross profit and gross margin through variances in situation when company increase spending in the offers versus base scenario. If company decrease spending in the offers then impacts on variances are opposite to those mentioned in the table.

Table 8. Merchandising promotion offers impact on profit and margin variance when company increase investment in the offers

Promotion example	Volume	Mix	Price	Cost	Overall impact to Gross profit & margin
Discount – e.g. 40% price off for particular product. Coupons – e.g. price is lower with presented coupon.	Discount should increase volume therefore gross profit volume variance will be positive with no impact to gross margin due to nature of volume variance.	Discounted products volume will increase and it can cannibalize sales of other products so their volumes can decrease. Impact to margin & profit is positive if promoted product margin is above average vs. the margin of total assortment and negative if promoted product margin is below average	Gross profit and gross margin will decrease as discount impacts price	No impact to gross profit and margin due to cost	Promotion is successful if overall gross profit variance is positive - gross profit price var. is more than off-set by sum of volume and mix variances. Overall Gross margin variance will be negative unless discounted products remain with higher than average gross margin even after discounting
- Loyalty reward programs – e.g. collect miles/points and redeem it for additional product or services. "Kids eat free" "Buy 1 & get 1 free" or "3 for the price of 2"	Volume should increase as clients tend to choose our company vs. competition to obtain benefits therefore gross profit volume variance going to be positive, no impact on gross margin.	No mix variance as usually loyalty rewards are given on full assortment	No change to price therefore no price variance	Cost var. is negative for gross profit & margin. Negative gross profit var. equals to cost of products which can be redeemed from collected points. Gross margin variance equals cost of redeemed products divided by revenue.	Offer is successful if gross profit negative cost variance is more than off-set by positive volume variance. Overall Gross margin variance will stay negative due to this offer.

Promotion example	Volume	Mix	Price	Cost	Overall impact to Gross profit & margin
Free sampling	Volume gross profit variance positive as customers are going to buy more of those products which they tried through sampling	Mix is going to be positive if sampled products have higher than average gross margin and negative if sampled products have lower than average gross margin	No change to price therefore no price variance	Cost variance is negative for gross profit & margin. Negative gross profit variance equals cost of samples. Gross margin variance equals cost of samples divided by revenue.	Offer is successful if gross profit negative cost var. is more than off-set by sum of volume and mix var. Overall Gross margin variance will stay negative due to this offer.
"Bonus pack" – e.g. price of 1 liter is the same as 0.75 l	Volume of 'Bonus pack' product will increase and it will result in positive gross profit variance	Mix is positive if 'bonus pack' product has higher than average gross margin and opposite if 'bonus pack' has lower gross margin comparing to total assortment	No change to price therefore no price variance	Negative cost var. for profit and margin equals to increase in product costs – bonus package vs. regular package cost multiplied by actual quantity sold	Offer is successful if gross profit negative cost var. is more than off-set by sum of volume and mix variances. Overall Gross margin var. will stay negative due to this offer.
"Loss leader" – selling one or few products at loss or little profit in order to attract customers to buy other products	Volume variance is positive	Mix depends on volume increase of products with higher than average gross margin vs. volume increase of products with lower than average gross margin	Price variance negative for both gross profit and gross margin	No cost variance	Promotion is successful if gross profit price variance is more than off-set by sum of volume and mix variances. Overall Gross margin variance will be negative.
Money refund offer – e.g. buy products at regular price but you can return products if you don't like them	Volume variance is positive as cautious customers are going to try	Mix variance is positive if products with higher gross margin will be driven by this offer	No price variance	Gross profit cost var. is negative and equals to the cost of returned products which can't be resold. Gross margin variance is cost of returned un-salable products divided by revenue.	Offer is successful if negative cost variance is more than off-set by sum of volume and mix variances.

4. Gross margin management framework

Now we know that gross profit and margin needs to be analyzed by calculating variances which helps to identify the reason or driver for increase or decrease in profit and margin. To apply this theory in practice and make it meaningful in managing the company we need to take into account company strategy and merchandising decisions which are made to drive sales. Combining strategy and merchandising decisions with gross margin/profit variances analyzes allows to measure where do we go in terms of direction defined by strategy and ensures merchandising decisions are aligned with strategy.

Strategy will give us an answer to question - how company does want to develop. Let's say company has a strategy to grow through introducing new products. In this case our gross profit and margin analysis needs to split all assortment into groups depending on time of products introduction. After calculating gross profit and gross margin investment or di-investment for each group we know exactly how much and where do we invest in each product group. Similarly company can have a strategy to grow through few strategic categories of product and finance the growth through price increases in price non-sensitive products. In this case we split assortment into groups based on strategic priorities and measure investment (di-investment) for each group separately. Figure 2 presents example where we can see that company was driving new products by investing in cost (improvement of product quality or stronger merchandising offer of the new product impacting cost variance) and at the same time increasing prices and growing volume in this product group. Last year's products were increasing volume due to decrease in prices and at the same time company was saving on cost of last year's products. Overall result was deteriorated by products which finish life cycle – volume was declining even with price decreases and decline of gross profit from these products were not off-set by newly introduced products therefore overall gross profit and margin of the company declined.

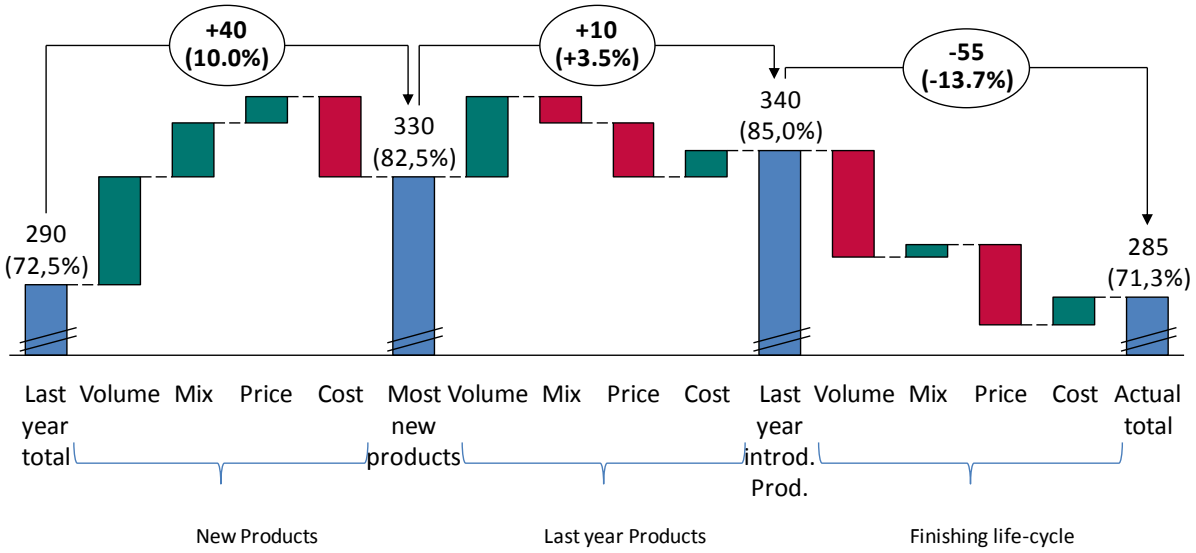

Figure 2. Example of analyzes of strategic product groups gross profit & margin

Merchandising decisions drive sales and growth of gross profit. It is very important to measure success and impact of each decision therefore to have good quality of information we can split all assortment of products by type of promotion and measure success of each offer. If discounting decision with X points of margin and Y dollars gross profit investment in pricing results in greater volume and mix variance then the offer is successful and in this way we can measure return of each type of offer. For example return on investment of sampling offer described in table 8 can be calculated by dividing overall gross profit increase driven by sampling by cost variance of sampling offer.

The gross margin management framework analyses assortment by splitting it into groups

depending on company strategy and each promotion type within assortment is analysed separately. Investment or divestment is measured by calculating gross profit and gross margin variances (Figure 3).

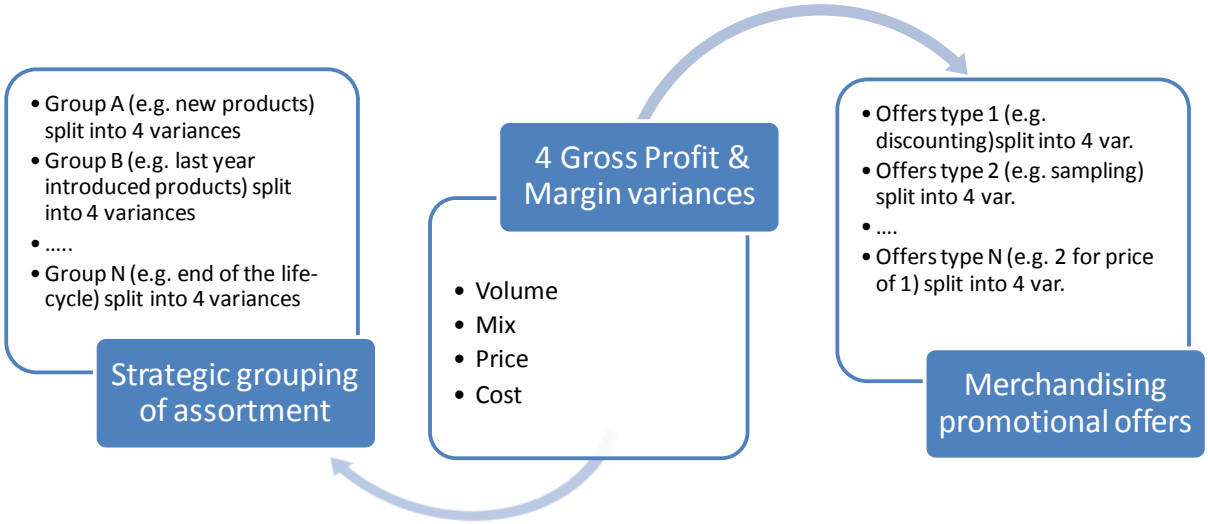

Figure 3. Gross margin management framework

5. Why is not enough to measure only gross profit variance

Classical cost accounting measures profit or contribution variances where variance is expressed in money terms. The framework proposed by this article additionally measures margin variance. It is important to understand not only gross profit but as well gross margin variance as gross margin variance gives additional dimension to understand behavior of customers. Figure 4 presents top level two-dimensional customer behavior analysis when both dimensions gross profit and gross margin variance are analyzed. Going deeper into variances we still need to look at both profit variance and margin variance, e.g. Figure 5 presents example of conclusions which can be made when analyzing inter-relation of gross margin mix variance with gross profit volume variance. Similarly when analyzing particular offer, e.g. discounting we can see what has happened to price variance in relationship to quantity and together quantity and mix variance. Gross margin price variance is the input to analyze offers impacting prices such as discounting – if price variance was negative means company invested in the offer more than in base scenario (e.g. last year) and if quantity variance was positive means customers liked the offer, if gross profit quantity and mix variance was positive this discounting offer didn't cannibalize other offers.

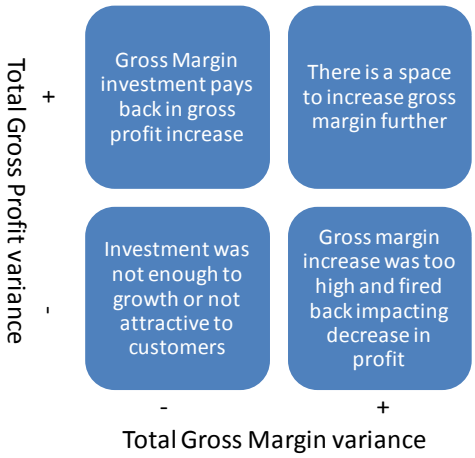

Figure 4. Two-dimensional analysis of merchandising decisions

This article is limited with description of few situations when analyzing gross profit and margin variance as it is impossible to list all the situations and present big variety of conclusions which are possible to make by using the proposed framework and analyzing big assortment by business using two dimensions – gross profit and gross margin combined with classical 4 variances – price, cost, volume, mix.

6. Conclusions

Both gross margin and gross profit need to be analyzed when evaluating strategic and merchandising decisions of the company.

Companies with large assortment of products have to rely on gross margin management vs. gross profit management when planning at a detailed level.

Classical price, cost, mix, volume variance is a tool to analyze gross profit and margin drivers.

Profit and margin variance formulas allow to make calculations in shorter way without the need of multiple recalculations.

Gross margin management framework presented in the article allows to evaluate strategic decisions and calculate return of different merchandising offers.

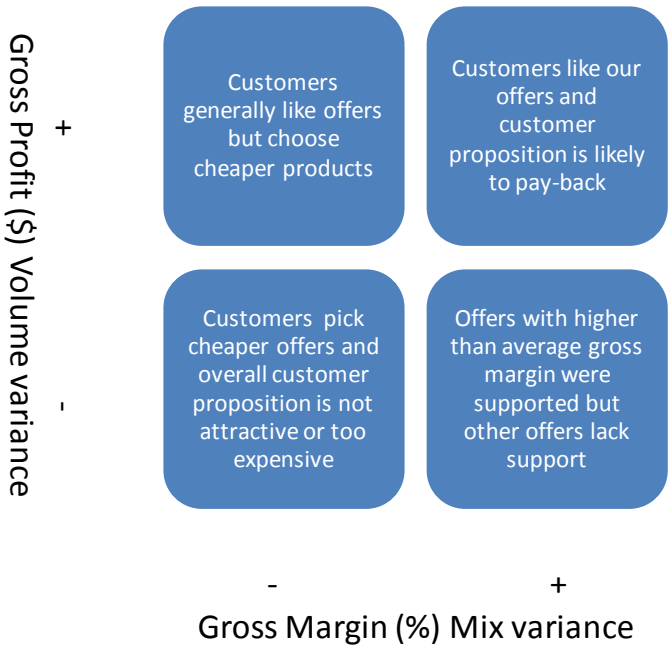

Figure 5. Customer behavior analysis from volume and mix variances

References

Bhimani, A., Horngren, Ch., Datar, S.M., Foster, G. (2008). Management and Cost accounting, 4th edition. Pearson Education Limited.

Cushman, L.M. (2011). A Practical Approach to Merchandising Mathematics. Fairchild Books.

Goldtratt, E.M., Eshkoli, I., Brownleer, J. (2009). Isn't It Obvious? North River Press Publishing Corp.

Horngren, Ch., Datar, S.M., Rajan, M. (2010). Cost Accounting, 14th edition. Prentice Hall.

Hurlbut, T. (2005). Gross Margin – the Overlooked Metric. Inc Magazine, September.

Shah, D. & Kumar, V. (2012). The Dark Side of Cross-Selling. Harvard Business Review, December, 21-23

http://www.inc.com/resources/retail/articles/200509/hurlbut.html

http://www.thebouldergroup.net/whitepages/marginmax2.pdf

http://www.thesiburgcompany.com/articles/Managing_Gross_Margin-The_Siburg_Company.pdf