Applying Lanchester's Laws of Concentration

To Sales Campaign Success

Based on

The Works of F.W. Lanchester

(1868-1946)

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Introduction

Who was Lanchester?

F.W.Lanchester was an English inventor, who, in 1892, developed a theory of aerodynamics, but was persuaded not to publish such outlandish theories for fear of ruining his reputation and future career as a serious engineer.

By 1896 he had built with his brother the first petrol car in England. He went on to produce a cars with a number of “firsts” with a mid mounted engine, disc brakes, a water cooled engine and a system of twin balancing shafts (that are used today on modern designs), the crankshaft damper, fuel injection, turbochargers, steering wheels, the accelerator pedal, detachable wire wheels, stamped steel pistons, piston rings, hollow connecting rods, the torsional vibration damper, the harmonic balancer, and tinted glass.

Not content with this, on the outbreak of the First World War, he turned his brain to the war effort, designing engines, and developing theories of flight, which included the design for aircraft which remains the basis for almost all aircraft design to this day. He also developed theories for predicting the outcome of aerial combats.

His theories have been taken up by the USA, and renamed Operational Research, and were used against the Japanese in the Second World War, especially in encounters between aircraft carrier fleets in the Pacific. The Japanese went on to adopt his theories to overrun many US and European Industries in world trade by applying his theories to their Marketing, and Operational decisions.

What does Lanchester Theory Teach?

Lanchester developed two Laws, called, unsurprisingly, Lanchester's First and Second Laws.

The first law states that where combat effectiveness is equal and combats take place on an individual basis, the side with the greater number of men will destroy the side with the lesser number of men, and will have the difference in number between the two forces as survivors. So the smaller force will loose, and the difference between the two sides' losses will be arithmetic.

The second law states that where combat effectiveness is equal, but combat takes place where any number of individuals can engage with any number of opposing individuals, (called a Stochastic engagement) then the side with the greater numbers will destroy the side with lesser numbers at a geometric rate, i.e. the difference in kills between the two sides will be vastly larger in favour of the more numerous side than in an engagement fought under the first law of individual combats.

His formulas also show that where combat effectiveness is different between the two opposing forces, this relative difference will have a bigger relative effect on kill rates in individual combats than in stochastic engagements.

In Lanchester's own words he summarises individual combats as:

"…when weapon directly answered weapon, the act of defence was positive and direct, the blow of sword or battleaxe was parried by sword and shield….one man would ordinarily end himself opposed to one man. Even were a general to concentrate twice the number of men on any given portion of the field to that of the enemy, the number of men actually wielding their weapons at any given instant (so long as the fighting line was unbroken), was, roughly speaking, the same on both sides."

Again in his own words he says the following about stochastic combats:

"…the defence of modern arms is indirect: tersely, the enemy is prevented from killing you by your killing him first, and the fighting is essentially collective."

"With modern long-range weapons-fire arms, in brief-the concentration of superior numbers gives an immediate superiority in the active combatant's ranks, and the numerically inferior force finds itself under a far heavier fire, man for man than it is able to return. The importance of this difference is greater than might casually be supposed."

Below is a mathematical breakdown of the two laws. If you are not into maths, just look at the pictures and read the **bold** summary, and just accept that larger forces win much more effectively by engaging in stochastic combats, and combat effectiveness is more important to smaller forces and to individual combats. This is shown simply and pictorially after the equations. If you are into maths; take a deep breath and dive in.

First law (Law of Single Combat)

The effect of numbers of combatants

Let's look at the result under this Law of a combat between army M with 5 men, and army N with 3 men.

The initial number of army M minus the survivors of army M equals the difference in weapons effectiveness times the initial number of army N minus the survivors of army N or;

Mo -M=E(No-N)
5-M2=E(3-N)

If weapons effectiveness is equal i.e. E =1, then we have;

Mo -M=No-N
5-M=1x(3-N)

And if you wish to work out the difference in survivors when the smaller side is annihilated (so if N is the smaller side then N=0) you get;

Mo -M=No
5-M=3-0

You can rearrange this to show that buy subtracting the numbers of the smaller army from the numbers of the larger army, you end up with the number of survivors in the lager army when the smaller army reaches zero.

Mo -No=M
5-3=M

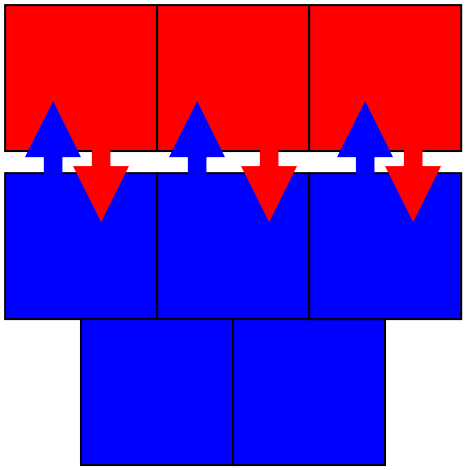
Giving you the actual number of survivors in the victor's army;

M = 2

What this means that when a conflict takes place under the First Law between a 5 man army and a 3 man army, where their weapons effectiveness is the same, the 3 man army will be annihilated whilst the 5 man army will only loose 2 men.

Simply and Pictorially under The First Law the following will happen:

Step 1



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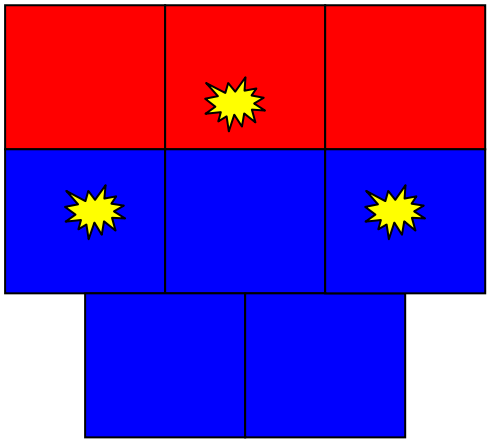

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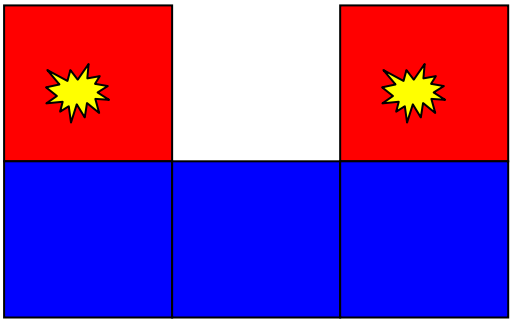


Step 4

Effect of increasing combat effectiveness (E)
The initial number of army M minus the survivors of army M equals the difference in weapons effectiveness times the initial number of army N minus the survivors of army N or;

Mo -M=E(No-N)
5-M2=E(3-N)

If weapons effectiveness is double in N's favour i.e. E =2, then we have;

Mo -M=E(No-N)
5-M=2x(3-N)

And if you wish to work out the difference in survivors when the smaller side is annihilated (so if N is the smaller side then N=0) you get;

Mo -M=E(No)
5-M=2(3-0)

You can rearrange this to show that buy subtracting the numbers of the smaller army from the numbers of the larger army, you end up with the number of survivors in the lager army when the smaller army reaches zero.

Mo –E(No)=M
5-6=M

Giving you the actual number of survivors in the victor's army;

M = -1

As you can't end up with a minus quantity in the real word it means that in actual fact M looses to N, and it is N that has 1 unit left when all of M is destroyed.

What this means that when a conflict takes place under the First Law, combat effectiveness "E" can radically change the outcome of the engagement, allowing a numerically inferior group to defeat a numerically larger group.

Second law (N Squared Law/Law of Stochastic Combat/Law of Concentration)

The effect of numbers of combatants

Let's look at the result under this Law of a combat between army M with 5 men, and army N with 3 men.

The square of the initial number of army M minus the square of the survivors of army M equals the difference in weapons effectiveness times the square of the initial number of army N minus the square of the survivors of army N or;

Mo2 -M2=E(No2-N2)
5squared-M2=E(3squared-N2)

If weapons effectiveness is equal i.e. E =1, then we have;

Mo2 -M2=No2-N2
25-M2=1x(9-N2)

And if you wish to work out the difference in survivors when the smaller side is annihilated (so if N is the smaller side then N2=0) you get;

Mo2 -M2=No2
25-M2=9-0

You can rearrange this to show that buy subtracting the square of the numbers of the smaller army from the square of the numbers of the larger army, you end up with the number of survivors in the lager army squared when the smaller army reaches zero.

Mo2 -No2=M2
25-9=M2

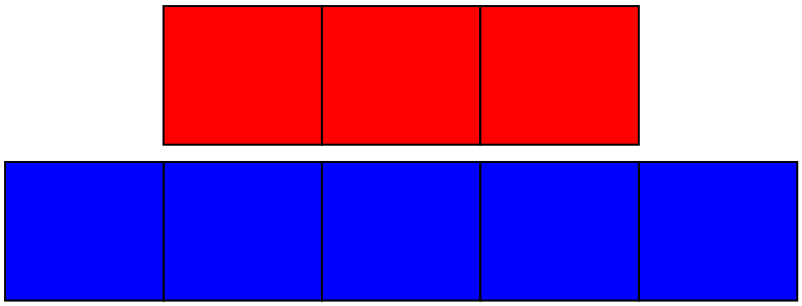
So if you find the square route of this result you get the actual number of survivors in the victor's army;

M2 = 16 so M (the survivors from the bigger army) = 4

What this means that when a conflict takes place under the Second Law between a 5 man army and a 3 man army, where their weapons effectiveness is the same, the 3 man army will be annihilated whilst the 5 man army will only loose 1 man.

Simply and Pictorially under The Second Law the following will happen:

Step 1



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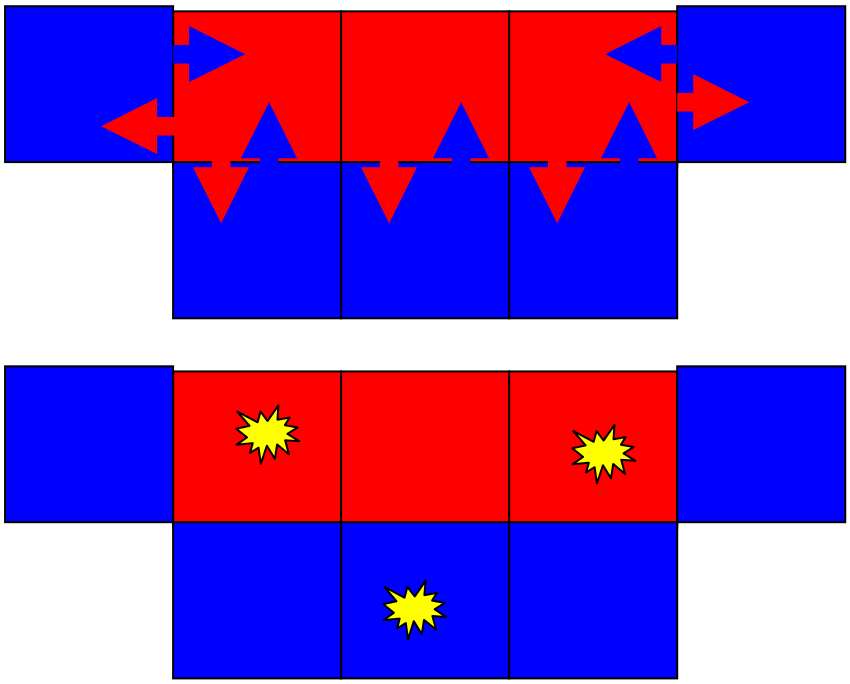

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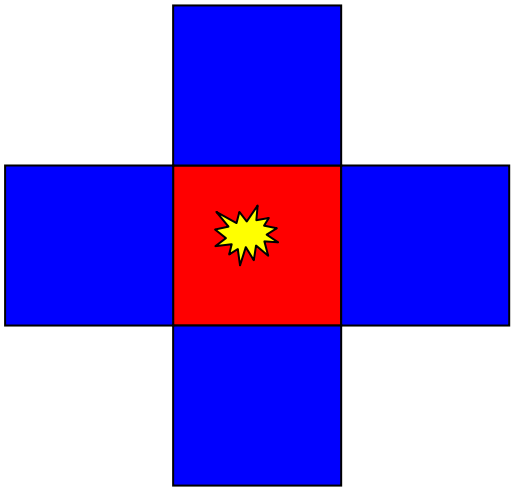

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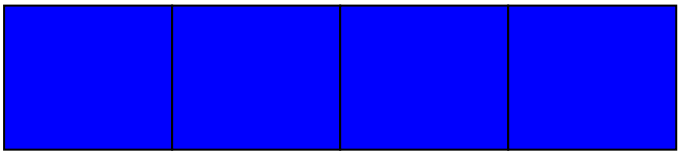

The effect of combat Effectiveness "E"

The square of the initial number of army M minus the square of the survivors of army M equals the difference in weapons effectiveness times the square of the initial number of army N minus the square of the survivors of army N or;

Mo2 -M2=E(No2-N2)
5squared-M2=2(3squared-N2)

If weapons effectiveness is double in favour of the smaller force i.e. E =2, then we have;

Mo2 -M2=No2-N2
25-M2=2x(9-N2)

And if you wish to work out the difference in survivors when the smaller side is annihilated (so if N is the smaller side then N2=0) you get;

Mo2 -M2=No2
25-M2=2x9-0

You can rearrange this to show that buy subtracting the square of the numbers of the smaller army from the square of the numbers of the larger army, you end up with the number of survivors in the lager army squared when the smaller army reaches zero.

Mo2 -No2=M2
25-18=M2

So if you find the square route of this result you get the actual number of survivors in the victor's army;

M2 = 7 so M (the survivors from the bigger army) = approx 2.65

This means that when a conflict takes place under the Second Law between a 5 man army and a 3 man army, where the weapons effectiveness of the 3 man army is double that of the 5 man army, the 3 man army will be annihilated leaving approx 2.65 men in the 5 man army. So the 5 man army will loose about half of its strength, compared to only loosing a fifth of its strength where combat effectiveness was equal as in the first example.

So differences in combat effectiveness will have a greater proportionate effect on the outcome of an engagement in single combats than in Stochastic combats.

Why is Lanchester important for your Sales Campaigns?

Because Lanchester's Laws allow you to decide on the best Strategy and Tactics to adopt depending on the relative strengths of your own forces and those of your competition, both in terms of numbers of participants, and combat (sales/product) effectiveness.

It is always in the interest of more numerous forces to attempt to fight Stochastic engagements, especially where their less numerous opponents have superior individual combat effectiveness ("E"). Conversely it is always in the interest of less numerous forces to fight local battles, especially where their E (combat effectiveness) is greater than their more numerous opponents. Where forces and effectiveness are more or less even, either both sides will slug it out indecisively for most of the engagement and it's ultimate outcome will come down to chance, or one side will manoeuvre its opponent into a position where its forces can be split, locally outnumbered, and destroyed in detail.

Why is this important in Sales situations? Because it allows you to calculate your relative strength versus your competition taking into account both numbers and effectiveness, and thereby dictates the type of tactics to adopt if you are stronger, weaker or equal to your competition. It also allows you to estimate the likely effect of your "weapons" efficiency in specific engagements, and whether this should affect your tactics.

It shows you the best way of concentrating your forces, or stretching your opponent's forces to concentrate your advantages or dilute any advantages your opponent may posses.

The conclusion is that if you can engage under the first law, you must ensure that your E is as high as possible in relation to your opponent.

To achieve an effective encounter under The Second Law, you must outnumber your opponent at the points of engagement. If superior numbers cannot be brought to bear, a smaller force with a greater weapons effectiveness or E factor will be able to defeat a larger force with a lower E factor.

Conversely a larger force with a lower E can defeat a smaller force with a higher E if you can avoid one on one combats, and the larger force's advantage will be far more than the difference in numbers.

How you apply Lanchester's Theories to Sales Situations

Estimate Strengths and Decide Approach

1. Decide if you are able to bring more resources to bear on the campaign than your competitor.
2. Decide if your E is higher than your competitor.
3. If both your resources and E are higher than your competitor then you should win quickly and easily no matter what you do, provided you do not make any mistakes, therefore fight a conservative campaign with the emphasis on not making mistakes or taking any unnecessary risks.
4. If both your resources and E are lower than your opponent then you will probably loose no matter what you do and should probably not choose to engage, look for a different engagement where you have some advantage.
5. If your resources are greater but your E is lower than your opponent then follow the Strategy of Numbers.
6. If your E is higher but your resources are lower, then follow the Strategy of Concentration.
7. If you are roughly equal then follow the Strategy of Equals (Division).

Weaker, Stronger, or Equal

	Your E is Greater	Your E is Equal	Your E is Smaller
Your Numbers are Greater	Immediate Stochastic Engagement	Tactics of Numbers	Tactics of Numbers
Your Numbers are Equal	Tactics of Concentration	Tactics of Equals	Avoid Engagement, Use Tactics of Equals if forced to engage
Your Numbers are Smaller	Tactics of Concentration	Avoid Engagement, Use Tactics of Equals if forced to engage	Avoid Engagement

Caveats

1. In your estimates of relative numerical strength, only count people who will actually be engaging with the customer, anyone not directly interacting with the customer doesn't count.
2. Most companies believe they have the best product, not all of them can be right at the same time. Be objective about your claims and your competitor's claims. Remember for the sake of these calculations that; customer perception = customer reality. Objective truth is less relevant.

The Strategy Concentration

If you believe that you are weaker in forces then your opponent than adopt The Strategy of Concentration.

The Strategy of Concentration boils down to: Single Point Concentration (SPC). If you are weaker in numbers than your competition you must do three things to increase your chances of beating them:

1. Compete on a narrow front, where their superior numbers are of no advantage. This is the Positional aspect of a Single Point Concentration.
2. Fight serial, local battles, where you can outnumber your opponent in the immediate engagement. This is the Temporal-Spatial tactical element of a Single Point Concentration.
3. Increase your combat effectiveness "E" to give you a significant advantage in local engagements. This is the Combat element of a Single Point Concentration.

The Positional tactical element of a Single Point Concentration.

1. **Knowledge** of the critical pinch point.
2. **Initiative** to take that point first.
3. **Tenacity** to hold it until your competition's plans are thwarted.

The Temporal-Spatial tactical element of a Single Point Concentration.

1. **Deconstruct** the engagement to its basic parts
2. **Urgency** in delivery
3. **Concentration** of forces consecutively

The Combat tactical element of a Single Point Concentration.

1. **Criteria** should be set for a specific need
2. **Unique** ability to delivery must be demonstrated
3. **Emphasise** deficiencies and risks of less efficient delivery

The Strategy of Numbers

If you believe that you are stronger in forces than your opponent then adopt The Strategy of Numbers.

The Strategy of Numbers boils down to one thing: Prevent the smaller opponent from operating the Strategy of Concentration.

You must do two things:

1. Study your competitor's weapons and tactics then copy them. This will reduce any actual or perceived advantage of "E" they may posses. If E=1 in the equation, then your more numerous resources will win all encounters, as long as you can bring them to bear, and even if your E is inferior to your opponent's you can still win decisively if Stochastic engagements are sought. This is called a Matching Strategy, and forms the Combat element of the Strategy of Numbers.

2. Compete where your superior resources will stretch your opponent to breaking point, i.e. where their actual physical ability to respond to your initiatives is exceeded. This is called a Stretching Strategy, and provides the Positional and Temporal-Spatial aspects of the Strategy of the Strong.

Matching Strategy

1. Match weapon (product) for weapon (product); by re-arming to match your competitor's weapons (products).
2. Match propaganda (marketing) for weapon (product); if it is not possible in the short term to develop a similar product to your competitor, then announce that you will be developing such a product in the near future.
3. Match tactic for tactic; whenever your weaker competitor develops a new tactic, i.e. price cuts, vertical market concentration, etc, you must match them with the same or a similar offer.

Stretching Strategy

1. Seek Stochastic Engagements where superior resources form a much more important element than E factors. Stochastic battles are ones where probability is a major factor.
2. Use products with overlapping features to force a smaller competitor to compete on many different fronts on non-core issues.
3. Use VARs to pitch your product with different bells and whistles into a competitive engagement will force your smaller competitors to fight on many fronts on non-core issues, and may stretch them to breaking point.

Strategy of Division

If you believe that you are equal in forces to your opponent than adopt The Strategy of Division.

The strategy of Division is to turn the current situation into one where you can outnumber your opponent at the critical time. You must bring about an engagement at the time and place of your choosing in order to separate your opponent's forces into smaller chunks so that they can be defeated in detail.

1. Use small detachments to distract larger portions of your opponent's resources in non-critical areas, use the rest of your forces to attack his now smaller portion of resources in critical areas.
2. Use superior speed to attack any separated units of your opponent's overall resources in detail, so that you can always manoeuvre larger numbers to attack his smaller numbers.

Summary: What to do

Stage 1 Decide on relative strength and Combat effectiveness

1. Decide if you are numerically stronger than, equal to, or weaker than your opponent.
2. Decide if your E is greater than, equal to, or less than your opponent.

Stage 2 Follow the relevant strategy

1. If you are stronger than your opponent and have greater E, engage in a stochastic engagement as quickly as possible, do not take any risks.
2. If you are stronger than your opponent, but lower in E, adopt the strategy of Numbers.
3. If you are more or less numerically equal to your opponent and equal in E, adopt the strategy of equals.
4. If you are weaker than your opponent, but higher in E adopt the strategy Concentration.
5. If you are numerically weaker than your opponent, and have a lower E, then do not engage at this time.
6. If you are uncertain of your relative numerical strength, and relative E factors, adopt the strategy of equals until a clearer picture is forthcoming.