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Enhanced Investment Decision Based on  
the properties of Point X**

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## **Knowledge Theory and Investment;**

### **Enhanced Investment Decision Based on the properties of Point X**

**Bhekuzulu Khumalo**

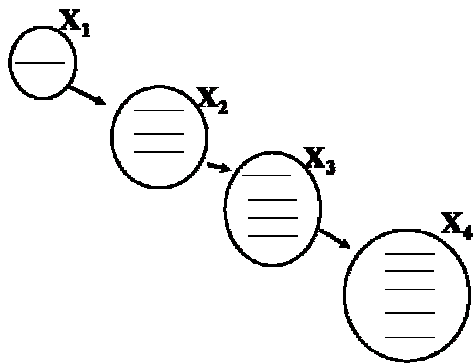
As defined in an earlier paper by the author (Point X and the Economics of Knowledge) Point X is a one dimensional point on the plain that is defined as the laws of existence that represents at least a single law of the universe or a single law that governs existence at its largest point. At its largest point X covers all the laws of existence.

An important property of point X is consistency. It is this property that allows an investigative process to take place. Consistency means that as we add to the knowledge base, what is arrived at cannot contradict what was before. If there is a contradiction then either we are talking of two different existences or one of the arguments is wrong. Point X at its most simple is one law of existence. When we investigate and the knowledge base grows then we move from a point X to a larger point X, say  $X_2$ , where  $X_2 > X_1$ .  $X_2 > X_1$  means that  $X_2$  has more information than  $X_1$ , meaning it has at least one law of existence more than  $X_1$ , and that there is no information within  $X_2$  that contradicts  $X_1$ . As point X is consistent it follows that all other points must also be consistent. All the point X's within a certain discipline must be consistent with the other points.

That awareness is the beginning of knowledge about anything - to recognize that it exists and has its own distinctive characteristics. Identification is the starting point of knowledge be it general or specific.

Figure 1 displays the importance of consistency through identification using the five senses - sight, smell, hearing, touch, and taste. These were the only tools of ancient human, yet with them, our ancestors could recognize existence. Today one can go much deeper in the identification process, but the five senses still aid the identification process.

In Figure 1 we can see the buildup of knowledge in a discipline.  $X_1$  is the point where people identify and isolate the subject. It is at this point that the discipline - economics for example - comes into being. It is separate from other disciplines because of its particular characteristics. The study of eagles begins when an observer identifies an eagle as such. Eagles are different from other birds because of their particular characteristics. While people identify eagles visually and economics mentally, both endeavors involve investigation of a distinctive subject matter.

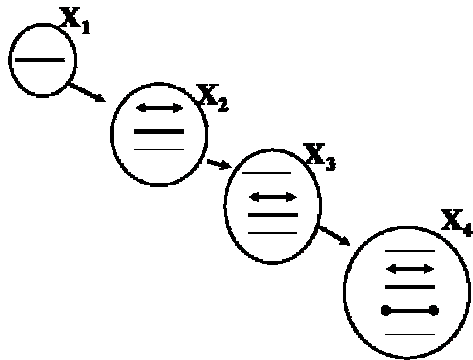


**Fig 1**

Once people have identified the subject matter, investigation will take place, leading to point  $X_2$ . We add further lines inside the circle - in the case of  $X_2$ , giving it three lines, while  $X_1$  has only one.

The additional two lines in  $X_2$  represent more laws governing the subject matter. The new laws have to be consistent with the first law in  $X_1$ . Remember that  $X_2$  must have the same information as  $X_1$  but more. An inconsistency between  $X_2$  and  $X_1$  will mean a contradiction; which means that one of them is wrong. The laws of existence within a subject cannot contradict themselves or they would lose the quality of consistency. Consistency in Figure 5.1 must exist from  $X_1$  to  $X_4$ , or there will be a contradiction. If a law is inconsistent with other laws it cannot exist. A law giving a certain quality to a subject matter and another taking away that quality will result in the non-existence of that quality. An eagle, for example, cannot have sharp talons and no sharp talons at the same time. No sharp talons is a law that governs other existences, not the eagle. To say what happens when an eagle loses its talons is beside the point. The law giving the eagle no sharp talons is contradictory and cannot exist as it is inconsistent.

Figure 2 depicts what is happening when there is an inconsistency with laws of existence.



**Fig 2**

This figure is the same as Figure 1 with the exception that it contains more laws.  $X_1$  is the first law and hence has the least depth and breadth. As a critical point, it has less depth and breadth than following points. The line representing this law has become broader and thicker and must be present from  $X_1$  through all the points to  $X_4$ . Remember the next point contains more new information, but also all the data from the previous point.

Advancing from  $X_1$  to  $X_2$  adds three strands of information (one a law indicated by two arrow endings), and moving from  $X_2$  to  $X_3$  brings yet two more. The push from  $X_3$  to  $X_4$  adds even more, including however, a law (represented by the two circles) that contradicts the two-arrow law. Therefore point  $X_4$  can never exist in reality. Point  $X_4$  will always be a theoretical point for argument. Existence cannot contradict itself.

Consistency is a powerful tool not only because of its involvement with point X, but because use knowledge, point U as described in the paper "Point X and the Economics of Knowledge," is itself a point of knowledge, the same characteristics of consistency must apply to point U.

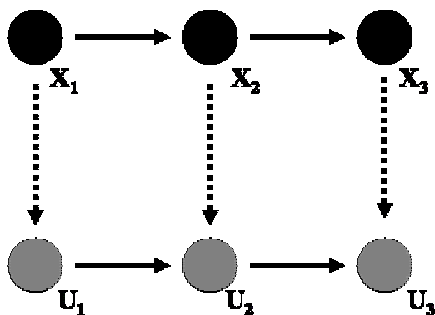
It is use knowledge that is useful to human beings, therefore understanding consistency in use knowledge will aide to understanding investment theory within a new light - with the assertion that it is knowledge that is the primary resource of all human beings. Every point U that exists is a derivative from a point X. Every

product that we see in the market represents a point U, and is derived from a law of existence. Wheat must be processed to make edible flour, a television set is derived from knowing the properties of the materials that go into it and constructing them in such a manner that actually get a television set. A television screen cannot be made of wood. And while water and copper are both made of atoms it is copper, with its unique qualities that differentiate it from water, that must be used for the construction of a television set.

Understanding consistency as it applies to use knowledge will allow us to further understand the concepts of investment to be covered later in this paper.

I think this next paragraph is a bit repetitive A product is a product, however to improve a product we need to be consistent with what we know. An automobile cannot be that and a calculator at the same time, though the modern automobile will have a calculator as well as a computer as part of its make up. One can not ride a calculator, as one can not exist inside a tablet but must use a tablet to cure any illness that they may have. Therefore in order to improve a product we must be consistent with the nature of that product even though it is man made.

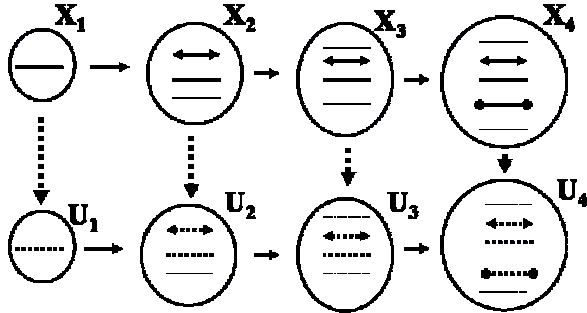
Every corresponding point U is derived from a point X. This is best illustrated by figure 3.



**Fig 3**

Essentially figure 3 is saying that to improve a product we need to understand the laws of existence in more depth or breadth so that we can get a corresponding improvement in a product. As point X is consistent it follows that the corresponding point U's themselves must be consistent. As explained earlier, an

inconsistency or contradiction in point X will mean that point X will never exist and therefore the corresponding point U can never exist.



**Fig 4**

Figure 4 is basically the same as Figure 2 except that it introduces a corresponding point U. From the previous explanation of figure 2 the conclusion was that point  $X_4$  can never exist in reality. Point  $X_4$  will always be a theoretical point for argument, existence cannot contradict itself, therefore point  $U_4$  will always be a theoretical point until proven wrong.

Once a product has been created and named it is that. Consider the telephone invented by Alexander Graham Bell in 1876. Over the years with increments in the knowledge base the telephone has changed, becoming less bulky and more sophisticated. No material or product could be added to the phone that would contradict the original product. The phone is a communications device, that while today contains digital technology and microchips, exists for the same reason that it was created

With digitalization, more uses (music, camera, internet, email) can be incorporated into the phone, however this is only possible because there is no contradiction.

## II. Value of Point X and U

Value in the modern material concept refers to the monetary value of something. Therefore the value of point X and point U refers to the value of a law of existence, corresponding with point X and the value of a

product when corresponding to point U. Point U is the translation of the law(s) of existence into something of use to a society. For example, it is because we understand the laws of copper and how to make those laws useful to mankind that copper has a value. If we only vaguely understand the properties of other elements we may not as yet understand how to make those properties useful to mankind and therefore make a commodity from these elements. A commodity is something useful to mankind, having a market. There is no market for many newly discovered elements because we do not have enough knowledge of them. Oil was no commodity in the 17<sup>th</sup> century although the Middle East had plenty of oil. For something to become a potential commodity it first has to be discovered, researched and uses found so that a point U will exist.

All products are created by mankind. They do not exist in nature. A cup, simple as it is, does not exist in nature. Iron needs to be smelted from iron ore before it has any value and use to mankind. One could argue that originally humans, as hunter gatherers, lived off nature, eating berries and hunting game. When humans were hunter/gatherers they had no market.

When dealing with value, point X might be the source of point U, however the value of U generally has more value than X in terms of monetary value (i.e.  $U > X$ ). This is logical for the property of something has no real monetary value in the wider market unless it is turned into a product that can be sold in the market. The value of knowing that copper is a good conductor of electricity is only useful when one can turn the law that copper is a good conductor of electricity (point X), into cables, wires in electrical products, etc (point U). Newton was a great scientist, but in the marketplace there is no real value of gravity besides a great and well deserved honor.

Take DNA theory, as a stand alone theory it has no value. However when products can be created then DNA theory becomes very valuable, although it is the corresponding point U that has value. For example, DNA theory allows the creation of resistant plants and seeds which have value.

Point X will only have a monetary value if it is not freely available. Take for example nuclear technology, very few countries are willing to part with these secrets thus giving them a monetary value. The monetary value comes in the willing to pay someone ( a spy) to get the information. Military technology also falls into such a category - but then military technology involves a combination of both point X and U with military hardware clearly a point U.

Point X also has a value in private hands. Companies, particularly those in pure scientific research, also try to keep information confidential from their competitors.. However any good engineer with confidence can reverse engineer a product on the market and start his own process of manufacturing. Therefore point X has a value if it is not freely available, but a point X stating that copper is a good conductor of electricity truly has no monetary value, as this information is freely available to everyone.

Even if it has no monetary value point X must have value in and of itself. Value must be created by value, point X has what is termed intrinsic value - value that belongs to the law by its very nature. Therefore point X has value in being itself - value in having certain properties. Knowledge of point X does not come for free. Time must be spent on education or research. Time is a cost as it represents an opportunity cost in engaging in a particular activity when one could spend time engaged in another activity. The opportunity cost is even greater when one is engaged in pure research trying to discover unknown laws of existence.

With respect to investment, when one studies or looks for a point X, they are essentially hoping to turn that point X into point U and make a useful product for humanity. X in itself is important, for while goods can go out of fashion, X can never go out of fashion because it exists outside the will of mankind.

Acknowledging that X is vital to have a product means that new knowledge is important. This follows that in investment decision making X must play some role no matter how minor.

### **III. Point X, Point U and Importance of Investing into Research**



Research must play a role in enhancing the value of a stock of a company. There are three types of research that are easily identifiable as outlined in table 1.

	<b>Research Type</b>
<b>1</b>	$X_i \rightarrow X_{i+1}$
<b>2</b>	$X_i \rightarrow U_i$
<b>3</b>	$U_i \rightarrow U_{i+1}$

**Table 1**

Pure research, the type carried out by the likes of Maria Curie, Albert Einstein, Pavlov, and Newton would fall under type one. Type one is purely theoretical research.  $X_i \rightarrow X_{i+1}$ , means that one is investigating the laws of existence and discovering new laws.  $X_{i+1} > X_i$ , means  $X_{i+1}$  has more information than  $X_i$ . These laws may or may not become useful for increasing the luxury of mankind.

Type two research could be termed experimental research, this type of research tries to find how one can use laws of the universe to create a product. Now obviously the product would not be in the market, but the advantage is that the law of existence is already known to mankind. One does not have to start looking for radium again (which is already known), one must just look for a use for radium. At first the product would be theoretical, but experimentation would have to enter the research. DNA research by James Watson and Francis Crick was at first purely theoretical. Today, however, research in DNA has a more to do with experimentation as researchers look at how to use the knowledge of DNA to create products.

Type three research, the improvement of products, is mainly carried out by companies. The laws of existence are known and the company merely wants to improve products.

Would it be worthwhile for a finance institution or individual to be involved in the first type of research,  $X_i \rightarrow X_{i+1}$ . Give the financial and human resources costs involved type one research is the riskiest First of all

the  $X_{i+1}$  point must be arrived at. In history only a handful of people (Newton, Einstein, Watson, Crick, Cherenkov) have discovered new laws of the universe from theoretical research and experimentation.

The second type of research is less risky than the first.  $X_i \rightarrow U_i$  is less risky because the  $X_i$  is already known, one may reasonably know what type of products can be created from the particular  $X_i$ . This type of investment though risky generally has more private funding as evidenced by private medical firms whose stock appreciates considerably when they have discovered a new medicine or drug.

Professional investors usually do a lot of research, in the case of  $X_i \rightarrow U_i$ , the researcher has to look at the possibilities of what the firm is trying to do. Take a biotech firm. A researcher would need to know what it is that the biotech firm hopes to achieve, whether something of this nature ever been done before, and what is the possibility of success. The researcher would need to make his or her own assessment

One must also consider similar materials, remember  $X_i$  is a point of knowledge that may contain one law or several laws and has the properties  $X_{i-1} < X_i < X_{i+1}$ . As  $X_{i+1}$  might be unknown, assume it is unknown because we are dealing with  $X_i \rightarrow U_i$ . However  $X_{i-1}$  is a known quantity unless  $X_i$  is a totally new material like radium was when discovered by Maria Curie. However even when Maria Curie discovered radium she had a previous  $X_{i-1}$  to understand that radium was a new material and been radioactive and less potent than other radioactive substances. This tells us that knowing  $X_{i-1}$ , we basically have some idea of what can be achieved with  $X_i$  from the products that could and could not be created from  $X_{i-1}$ .

Knowing  $X_{i-1}$  to a great degree lessens the risk for the investor, this gives a “gut feeling” to what can be done. But gut feelings are not enough. The researcher still needs to understand the relationship between  $X_{i-1}$  and  $X_i$ . It is this relationship that will speed up time in actualizing any product from  $X_i$ .

In type two research, the risk of success must be calculated. The risk of firm success is not difficult to ascertain particularly if that firm is an established player. One can only look at the statistics, how many

successes historically, (S) over the number of tries of new products (T). Therefore the formulae would be S/T. The past, however, is not always an indication of the future.

What does the researcher do with a new firm, one with no history, starting out and looking for money. The researcher would need to look at the industry risk, S/T for the industry as a whole, at the historical achievement of the firms individual researchers, and their individual risk profiles.

Type three research is the most common,  $U_i \rightarrow U_{i+1}$ . If we return to figure 3 above  $U_2$  is derived from both  $U_1$  and  $X_2$ , therefore as a product  $U_2$  has more knowledge going into it, but remember that in terms of knowl, (a knowl being the unit of measurement for knowledge)  $U_2$  is not more knowledge. All the knowledge that goes into it ends up as no increase in knowl - a static 250 knowl as was described in a 2006 paper by the author, which measured a societies' knowledge base . Figure 3 demonstrates a scenario as if  $X_2$  and  $U_2$  are being investigated at the same time, with a little thought this is impossible,  $X_2$  will always come before  $U_2$ . Type two research  $X_i \rightarrow U_i$  is dealing with new products into the market, products that never existed before. However with  $U_i \rightarrow U_{i+1}$ , type three research, the product is already there,  $U_i$ , and the firm basically wants to improve the product and arrive at  $U_2$ . This is witnessed annually in the motor industry. Every year car manufacturers try to introduce new models that are usually better in some way than the last model. This type of research takes place in most major corporations around the world that are involved in creating products.

Type three research is the most common and is financed everyday by financial institutions, and individuals. Points X's and U in knowledge theory can greatly help an investor understand what must be supported, but again traditional investment theory such as capital asset pricing method, and portfolio selection theory are not reduced to spectators - indeed they remain crucial. Knowledge theory, however, greatly helps to enhance what an investor needs to understand,

Before discussing the third type of research we must clarify the risks and why one type of research is riskier than another type of research in terms of investment. One must remember that research is essentially about

creating something useful for mankind and that the product created has a market. Investment is about the desire to get returns on a product that has a market.

The first consideration shall be time. In research time is never constant - it can speed up or even stand still in terms of knowledge. Time has a big factor in deciding risk levels.

#### **IV. Time and Risk**

Risk is associated to how time is likely to play out given different research types (type one to type three in our analysis). Time is important because when one makes an investment the time period decides the returns. After all if one firm takes too long the would be research might be obsolete.

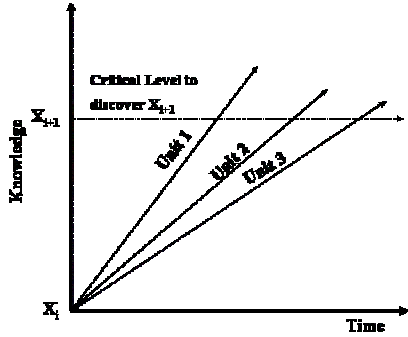
The concept of time is the reason why type one investment is the riskiest investment. Time is a relative concept, successfully proven by many scientists, and understood by people for millennia, Consider “funny how time flies when you are having fun,” In terms of research one will see clearly that time is never constant. This inconsistency in time can be demonstrated by looking at figure 5.

Figure5 shows three units involved in research to get from point  $X_i$  to  $X_{i+1}$ . These units (or investigators) could be government, academic institutions, or private firms. All three units have the objectives of getting to  $X_{i+1}$ . Clearly from figure 5, Unit 1 arrives at  $X_{i+1}$  first and Unit three is the last to discover this point  $X_{i+1}$ , assume that the units are in competition and therefore will not share information with each other. Sharing information will mean less revenue in the future when  $X_{i+1}$  can create a  $U_{i+1}$ ,

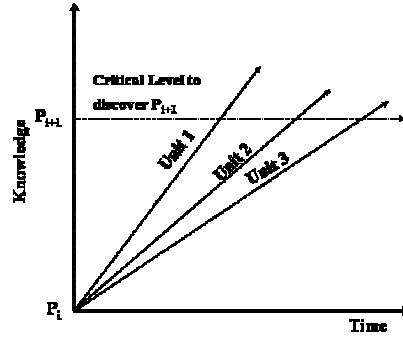
Let us take a closer look at what is really going on in terms of time.

Figure 5 demonstrates that all the units arrive at  $X_{i+1}$ , however, unit 1 arrives there the fastest. If we are looking purely at research and understanding that time is distance covered in the knowledge plane, then it would be correct to say that time for unit 1 moved faster than unit 2 and time for unit 2 was faster than time

for unit 3. The ideal situation is to have time sped up, then more can be covered. More can be achieved in terms of cyclical time. Cyclical time is the normal time, time based on the rotation of the moon and sun. Every 30 days or so there is a full moon, after twelve of these moons the earth has about gone around the sun.



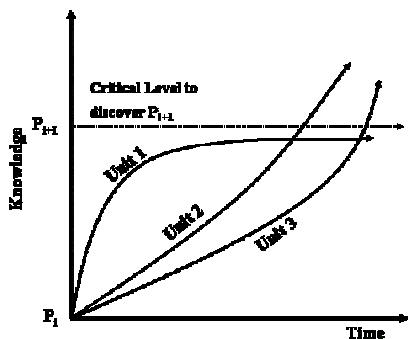
**Fig 5**



**Fig 6**

We can alter figure 5 to be more realistic, take out  $X_i$  and call it a point, the point can be any point between  $X$  and  $U$  and therefore replace point  $X$  with point  $P$  that can be either point  $X$  or point  $U$ . Figure 5 then becomes figure 6. This is so that we do not need too many diagrams. Figure 6 represents all three research types.

Figure 6 depicts a situation where all three units increase their knowledge, but in reality time can stand still, this is the largest risk for any investor, that time will stand still. Time stands still when nothing is achieved, time standing still is demonstrated by figure 7.



**Fig 7**

Figure 7 demonstrates the three business units, units one to three in a different light. Units 2 and 3 achieve reaching the next level  $P_{i+1}$ . Note taking into account the three research types,  $P_{i+1}$  could be either  $X_{i+1}$ ,  $U_i$ ,

or  $U_{i+1}$ . In the same light it follows that  $P_i$  taking the three investment types could be  $X_i$  or  $U_i$ . In figure 7 unit 1 never attains the next level, for unit 1 time stood still in terms of research, they are basically at the same level they were when they started. However for units 2 and 3 though initially slower at collecting information achieved what they sought out to do hence time did not stand still for them.

An investor desires a situation where time does not stand still for if time stands still they will not make any money on their investments. The investor desires a situation where time is faster than the alternative investments. Given full insight the investor prefers a unit that will have time move faster relative to the competition as this will mean been with a leader. Being with a leader also has advantages in that once having reached the next level, the leading unit also has the opportunity to move on to a level greater than  $P_{i+1}$  before the other competitive units. At the least the leader has time to consolidate a position. How then is it best for a unit not to waste time and give itself the best chance to reach the next level thus attracting investors?

The concept of consistency and knowledge is important to the investor. Consistency makes sure that time is not wasted, at the least it reduces the risk of time not been wasted. Remember getting to the next point especially with theoretical and experimental research might require information that mankind has not yet uncovered through the focused investigative process therefore all the consistency will lead to no gain because key information cannot be extracted from the laws of the universe that are known .

An investor needs to understand consistency, particularly a professional investor whose role is to advise people and institutions. Consistency is explained above, but we need to understand it in relationship to time. If there is inconsistency the investment specialist will immediately know that what the firm is attempting cannot be achieved. Time will merely stand still for that unit. If an investor suddenly heard that a firm is seeking funds to mass produce a car that runs on water the investigator must look at consistency, feasibility, and the technology - essentially is there a corresponding point  $X$  that would allow the creation of the point  $U$  being the water engine.

## V. Risk Outlined

Table 2 attempts to illustrate risk involved with each type of research. Clearly for private individuals and investment firms the least risky is  $U_i \rightarrow U_{i+1}$ .

	Type of Research	Risk	Type of Investor	Priority for Private Investment
1	$X_i \rightarrow X_{i+1}$	Highest	Government, Foundations, higher education	least
2	$X_i \rightarrow U_i$	Middle	Same as above, as well as private	Some
3	$U_i \rightarrow U_{i+1}$	Lowest	Private	Highest

**Table 2**

Table 2 gives a reasonable outline for risk associated with each type of research. *Note that successful nations do have government involved in research. The internet was at first a government/ higher education institute initiative. The space program would never have got off its feet if it where not for the government. Perhaps in the future governments will not be needed for these giant initiatives, but government remaining out of the economy and research are two different arguments. The private sector afterall will not carry out research if it sees no immediate profits. The risks are just too high in many instances when dealing with theoretical and expensive experimentation research. One could counter with the aircraft industry, but both Boeing and Airbus receive substantial subsidies - Boeing in terms of military contracts and Airbus directly from governments, therefore it is private public partnership.*

## VI. Least Riskiest Research

The least riskiest investments as discussed above and illustrated in table 2 is type 3 research,  $U_i \rightarrow U_{i+1}$ . In terms of time, a business unit is more likely to move forward rather than have time stand still if it researches in type 3 research. The list risky investors would likely be more interested in this type of research. For the most part Fortune 500 (excluding the resource companies) mostly need to be in the

forefront of technology. The research they mostly undertake is type 3 research improvement of products. Being the least riskiest of investments, this is where the greatest competition is with slight gradual improvements in products each year, as witnessed in the automobile industry, telecommunications industry, electronics industry, and media. Incidentally, the investment banking industry should be counted as an industry that is involved in research because investment bankers are the ones most actively involved in purchasing stock of these corporations, thus they indirectly own these massive corporations.

As this type of research is so competitive knowledge theory will aide the investor in understanding which investment to choose.

Take two similar business units (unit 1 and unit 2) involved in a similar industry and competing in similar markets. Say both companies manufacture similar widgets. The investor needs to decide which unit he will invest in or give a recommendation for. Both units are operational, both units are in good financial standing. Both units are covering their variable costs. Therefore the investor needs to look at the widgets to decide which product to choose. The investor needs to understand what has gone into the different widgets manufactured by the different business units.

<b>Law</b>	<b>Unit 1</b>	<b>Unit 2</b>
<b>X<sub>1,1</sub></b>		●
<b>X<sub>1,2</sub></b>	●	
<b>X<sub>1,3</sub></b>	●	
<b>X<sub>1,4</sub></b>	●	
<b>X<sub>1,5</sub></b>	●	●
<b>X<sub>1,6</sub></b>		●
<b>Total</b>	<b>U<sub>w1</sub></b>	<b>U<sub>w2</sub></b>

**Table 3**

Table three gives a breakdown of the two different widgets manufactured by the two different business units. To simplify the explanation assume that each point X demonstrated in table 3 is unique, and it is all information contained within point X<sub>1</sub>. Therefore point X<sub>1,1</sub> = X<sub>1,2</sub> = ... = X<sub>1,6</sub>. Therefore all point X<sub>1,i</sub> are equal and all are information that make up point X<sub>1</sub>. Therefore point X<sub>1,1</sub> – X<sub>1,6</sub> are all information, laws of



the universe that make up point  $X_1$ , it must not be forgotten that a point  $X$  at its most simple is one law and at its largest it is all the laws existence. The total is the two different widgets,  $U_{w1}$  and  $U_{w2}$ .

Though  $X_{1,1} = X_{1,2} = X_{1,3} = \dots = X_{1,n}$ , it is  $X_{1,1}$  that is discovered first, and  $X_{1,2}$  second and the  $n^{\text{th}}$  discovered law is  $X_{1,n}$ .

Looking at the illustration given to us by table 3, the investor need to make a decision by purely looking at the product, because the finances and ability to over fixed and variable costs is assumed to be equal for both firms. It is only the product that can convince the investor of the company that he/ she shall choose in which to invest.

There are two products,  $U_{w1}$  and  $U_{w2}$ , on which the investor must decide. The first widget  $U_{w1}$  has four laws that go into its make up, whilst he second widget,  $U_{w2}$  has four laws that go into its make up. As  $X_{1,6}$  is the latest law discovered only  $U_{w2}$  has this law whilst  $U_{w1}$  might have more laws but does not use the most up to date law, widget  $U_{w2}$  is the safer investment. After all the earlier laws might very well be obsolete. Having decided on  $U_{w2}$  the investor has done the best he/ she can do in terms of service to his/ her clientele. This can be seen everyday in the market place, the latest cell phones make the earlier cell phones obsolete even though the earlier cell phones still work perfectly, however humans seem to always prefer new and better products.

Why look at the product? The reason to look at the product is because in the long run the company that has a superior product will, for the most part, have superior financials to its competitors.. One can merely look at the troubled auto industry of the USA compared to the flourishing auto industry of Japan and South Korea, and some European manufacturers. The US auto industry could not keep up with competitors in introducing better products into the market.

The real world is not static. Assume still that the financial aspects of the two business units are the same, as the above explanation, however the business units are not static, the firms are constantly trying to improve

their products, the investor now has another problem to solve and must now add new analysis over and above the product. The investor must attempt to look at the future. Take table 3 above, in a static world the investor would not be wrong in choosing to invest with Unit 2, however now that we have introduced a non static world, the investor needs to answer more questions before he can say he has made the rationally best choice with the information given.

The main question to ask is given its inferior product how is business unit 1 going to react, The investor needs to be able to have a reasonable prediction of what business unit 1 will do. This comes about by understanding theory of firm behavior that has been adequately explained. Firm behaviour is made more fulfilled by game theory that has come a long way since Emile Borel studied poker games and having its origins in the East six hundred years before Christ.

The company with the most to lose by not reacting is unit 1, This has been adequately explained by game theory but let's look at how the firm should react. We will adapt game theory to our scenario - the scenario being that unit 1 must catch up, and unit 2 must keep ahead.

		<b>Unit 2</b>	
		<b>Remain</b>	<b>Improve to <math>X_{1,7}</math></b>
<b>Unit 1</b>	<b>Remain</b>	<b>0, 1</b>	<b>0, 1</b>
	<b>Use <math>X_{1,6}</math></b>	<b>0, 1</b>	<b>0, 1</b>
	<b>Improve to <math>X_{1,7}</math></b>	<b>1, 0</b>	<b>0, 1</b>

**Fig 8**

Figure 8 above is the payoff matrix for each strategy that the two firms will face given that Unit 2 is already using the latest technology and Unit 1 is not. The investor must understand these reactions. Figure 8 above shows that if the situation remains as is (i.e. both remain with the widgets they have on market) Unit 1 will lose and in the long run will be driven out of business. In this matrix 1 stands for win and 0 for lose.

If Unit 2 keeps its strategy as is and Unit 1 improves its product line to include  $X_{1,6}$  Unit 1 will still lose, because in the real world Unit 2 would have built up a client base and a brand name. Unit 1 will be coming from behind, unless it sells its new widget at a lower price than Unit 2 (although Unit 2 would be expected to react by also lowering its price). However, if Unit 1 improves to  $X_{1,7}$  and Unit 2 remains with its widget without change then it would be a reasonable expectation that Unit 1 would become the leader and Unit 2 would have to play catch up. In such a situation the investor would in the long run be expected to shift money from Unit 2 to Unit 1.

The second half of the matrix indicates that no matter what Unit 1 does, it will always be the loser if Unit 2 goes to  $X_{1,7}$  because its widgets would always be better, in addition to having a loyal client base.

Clearly once the dynamics have started it is only profitable for the investor to move away from Unit 2 to Unit 1 if, and only if, Unit 1 brings out better and more suitable technology than Unit 2.

Business units are not static. Given figure 8 above once Unit 1 for example moves to a widget with  $X_{1,7}$ , then the short term solution is that Unit 2 would lose, but Unit 2 would, of course, not like to lose, and therefore must react. Therefore game theory in reality must look at a dynamic situation. Dynamic game theory would suggest that in order to survive a firm would do anything necessary because an investment has taken place and investors want to achieve maximum returns given the situation. Moving onto  $X_{1,7}$  and Unit 2 remaining with the same widget, the investor must re-evaluate his or her standings and a new matrix is to be drawn up for the investor to consider given that Unit 1 is now the leader. The new matrix is represented as figure 9.

		<b>Unit 2</b>		
		<b>Remain</b>	<b>Improve to <math>X_{1.7}</math></b>	<b>Improve to <math>X_{1.8}</math></b>
<b>Unit 1</b>	<b>Remain</b>	<b>1, 0</b>	<b>1, 0</b>	<b>0, 1</b>
	<b>Improve to <math>X_{1.7}</math></b>	<b>1, 0</b>	<b>1, 0</b>	<b>1, 0</b>

**Fig 9**

Figure 9 shows the new dynamism that the investor faces once Unit 1 takes the lead and Unit 2 remained complacent remaining at  $X_{1.6}$ . Now the investor is better off investing with Unit 1. The dynamics again will change if Unit 1 remains with a widget that has its latest law as  $X_{1.7}$  whilst Unit 2 moves ahead  $X_{1.8}$ .

Game theory for business is not static. The game is dynamic with advantages being constantly gained and lost. In business there is usually a second chance to stay alive. Despite being written off by many the US auto industry has survived – albeit a bumpy survival at times.

All things being equal, knowledge is the major factor. The product is what the firm sells, although some firms are trying to aesthetics besides the product. If a firm knows it has high prices and cannot change its pricing structure it might still win customers by selling aesthetics, offering bio-friendly bags rather than plastic bags.

Knowledge in no way takes away from the investor the need to look at financial. However knowledge shows that looking too far into the future using merely financial fundamentals and not looking at the reaction of other firms can lead to misleading results (remember game theory must be dynamic).

The above Unit 1 and Unit 2 examples does not take into account firms that may make multiple models of widgets. A firm can have many different models of widgets, whereby failure with one model could mean success with other models.

Nonetheless this paper gives the basis of investing using knowledge theory. At the end of the day it is the better the product that will drive the better financials.

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