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Contents

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Editorial

It gives me great pleasure to introduce you to this, the second issue of the ITB Journal, the academic journal of the Institute of Technology Blanchardstown. It uniquely offers the opportunity for the members of ITB, visitors and guest contributors to publish an article on their research in a multidisciplinary journal. The hope is that by offering the chance to bring their work out of their specialised area into a wider forum, they will share their work with the broader community at ITB and other academic institutions.

In this issue we again have papers treating a wide range of subjects. Stephen Sheridan looks at non-deterministic processing in neural networks while outlining the biological foundations and the massive parallelism of the brain, A linguistic analysis of the reflexive and reciprocal in modern Irish is undertaken by Brian Nolan. These are interesting because of the difficulties they provide for the generative tradition of linguistics. These difficulties do not present themselves within the functional approach presented here. Pauline Logue explores the treatment of rape in Christian theology. Patrick McGarty examines the area of ethics as they apply to the modern business environment. In a related group of papers on succeeding in business, Maura O Connell examines the skills and factors that entrepreneurs need while Liam Lenihan discusses human resource management as a dynamic process of supporting an organisations development. Finally, the management of projects within a commercial environment is explored by Ann Murphy.

We hope that you enjoy the range of topics in this edition of the ITB Journal.

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Non Deterministic Processing in Neural Networks

An Introduction to Multi-Threaded Neural Networks

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Abstract

Since McCullough and Pitts first published their work on the Binary Decision Neuron much research has been accumulated in the area of neural networks. This work has for the most part centred on network topologies and learning algorithms. The neural networks that have found their way into devices such as handheld PC's are the fruit of NN research that has spanned 57 years. There is a simplistic beauty in the way that artificial neural networks model the biological foundations of the human thought process, but one piece of the jigsaw puzzle is still missing. We have so far been unable to match the massive parallelness of the human brain. This paper attempts to explain how multithreaded neural networks can be used as a basis for building parallel networks. By studying simple concurrent networks is hoped that significant inroads can be made into a better understanding of how neural network processing can be spread across multiple processors. The paper outlines some biological foundations and introduces some approaches that may be used to recreate software implementations of concurrent artificial neural networks.

1. Biological foundations

The human brain has been at the centre of much argument since Aristotle's time to the present. Arguments aside one has to marvel at the speed at which the human brain operates. Imagine for one moment you were required to build a robot capable of driving an ordinary everyday car for a distance of 100 meters avoiding some obstacles along the way. Now imagine the thousands of computations the robots artificial brain would have to make for every split second of the cars movement. This is most definitely a huge task for our Robot's artificial brain, but what about the human brain? How can the human brain deal with situations like the one explained above with apparent ease while simultaneously having a conversation with one of the cars passengers? Surely the human brain must be capable of computation speeds way beyond our wildest dreams in order to carry out the complex tasks that

constitute our everyday lives. In order to understand how the human brain is capable of such Herculean feats it is important that we understand some basic biological foundations.

1.1 Biological Building Blocks

The functioning of the brain involves the flow of electrical impulses through an intricately woven tissue of 100 billion (give or take a few million) basic computational units called neurons. Each neuron consists of three main sections, the Soma (cell body), Axon, and Dendrites.
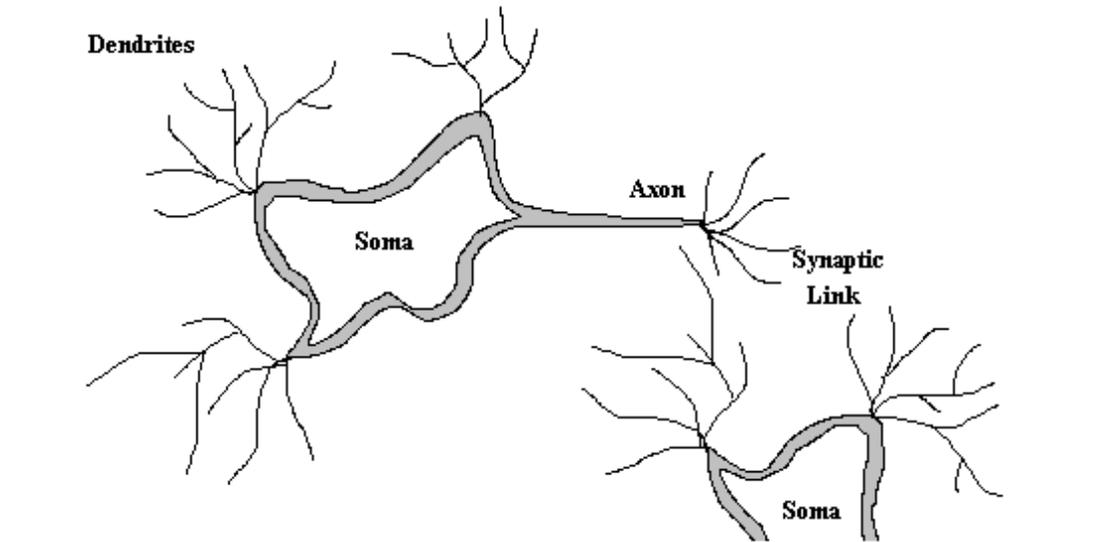

Figure 1.1 Biological Neuron

The soma or cell body ranges from 10 to 100 micrometers in size from which a number of fibrous branches protrude. Each soma has many dendrites that act as 2receptors for incoming electrical signals and one axon that act's as a transmitter. Electronic impulses are transferred between neurons at special connection points called synaptic links. Receiving stimulus or inputs from other neurons through dendrites, the soma or the body of the cell decides when and how to respond. When the cell body receives enough stimulus or input to excite it, it transmits a response to other neurons through the axon. The more a link between two neurons is excited the stronger the link becomes. Each neuron in the human brain may have somewhere in the order of a thousand to 100,000 synapses (connection points). This figure depends on the amount of dendrites a neuron has and its proximity to other neurons. This means that the human brain has as many as 100 trillion synapses making possible the vast and hugely complex computations we carry out through our everyday lives. Although certain areas of the human brain have been attributed with capabilities such as vision [1], speech, and hearing through the study of electrical activity within the brain, individual neuron activity is completely non-deterministic.

1.2 Synaptic Transmission

Neurons communicate through a combination of electrical and chemical reactions. Each neuron is capable of generating an electrical signal that emanates from the soma and then travels down the axon

at about 300 feet per second (200 miles per hour) until it reaches the end of an axon fibre. At this point a chemical reaction is required in order for the electrical impulse to jump across the gap between axon and dendrite (the synaptic cleft). This jump is achieved through molecules called neurotransmitters that travel from one side of the synaptic cleft to the other where they are received by the dendrites of a neighbouring neuron and converted back to an electrical impulse. This electro chemical conversion delays the inter-neuron communication process by a few milliseconds.

1.3 Brain Speed

So if the human thought process operates within a millisecond time frame surely we should be able to recreate it using modern day processors that are capable of crunching more than a million bits per second. The key however is not speed; to the brain a delay in the order of a few milliseconds is negligible because each of its 100 billion neurons can fire simultaneously at about 10 million billion times per second. So the computational power of the human brain is not just based on the speed of its connections but on the fact that all of its neurons are working in parallel.

The table below shows a comparison of processor speeds and their comparable brainpower [7].

Processor	Brain Power
SUN 4 (200 million bps)	100,000 neurons (Snails Brain)
Cray-3 (100 billion bps)	65 million neurons (Rats Brain)
???	100 billion neurons (Human Brain)

As one can see form the comparisons made above processor speed still has a long way to go in order to match the processing speed of the human brain. Even if we can create a processor comparable to 100 billion neurons it will only be comparable in speed not in function. So where does this leave us?

It seems logical that since the brain has many simple computational units that work in parallel [5] that we should concentrate our efforts not on faster and faster machines but on simple processing units that are interconnected with many other simple processing units.

2. Inherent Parallel Features of Artificial Neural Networks (ANN's)

In order to understand the inherent parallel features [6] of artificial neural networks we must take a brief detour and cover some of the milestones in ANN development [4].

In 1949 Donald Hebb realized that the strengthening of the synaptic link could account for human memory. Hebb proposed that short-term memory was established by a reverbitory circuit in an assembly of neurons and long-term memory was based on some kind of structural change between

neurons based on prolonged activity. From this neurophysiological research Hebb proposed his Learning Rule [2]:

'When an axon of a cell (A) is near enough to excite cell (B) and repeatedly takes part in firing it, some growth process or metabolic change takes place in one or both of the cells. Such that (A)'s efficiency of firing (B) is increased.'

Frank Rosenblatt described the first operational model of neural networks in 1958 by putting together the work of Hebb, McCulloch & Pitts. The perceptron shown in figure 2.1 was based on McCulloch, Pitts (1943) Binary Decision Unit (BDN), it takes a weighted sum of its inputs and sends an output of 1 if the sum is greater then its threshold value, otherwise it outputs 0. The perceptron itself consists of the weights, the summation processor, and an adjustable threshold processor. Figure 2.1 also shows the similarities between the biological neuron and the perceptron
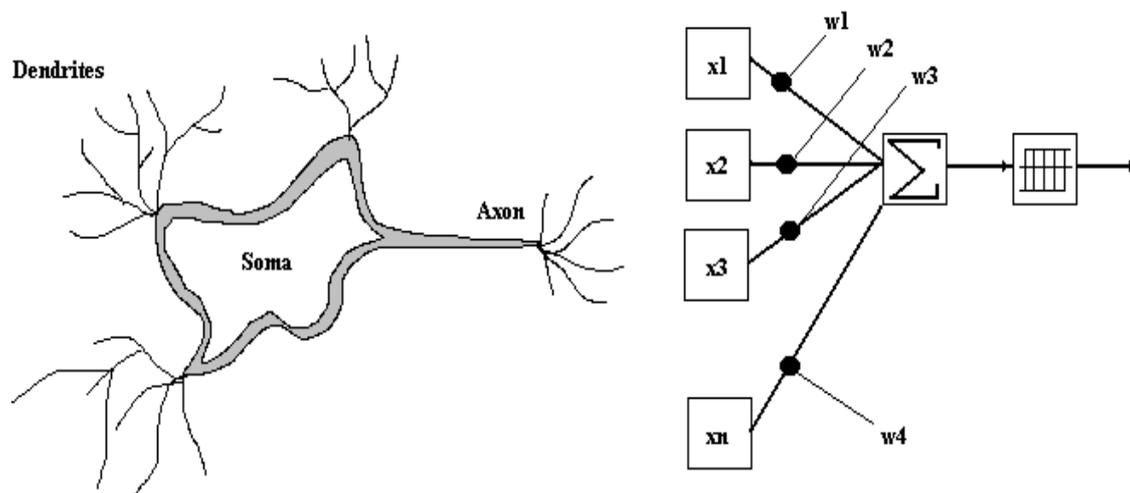
Figure 2.1 A Biological Neuron and a Perceptron

Although the perceptron itself is only capable of solving toy like problems, many perceptrons can be connected together to solve more complex problems. As the network above has only one computational unit there is not much potential for parallel computation.

Consider however the network in figure 2.2, this network has more than one computational unit each of which can operate in parallel.

When values from the input units $(x1 - xn)$ are propagated forward through the network each computational unit receives stimuli from every input unit. This means as soon as a computational unit has received a full set of stimuli it can work. As there is no interconnection between units on the same layer each computational unit is completely independent from its adjacent units and can compute in parallel.
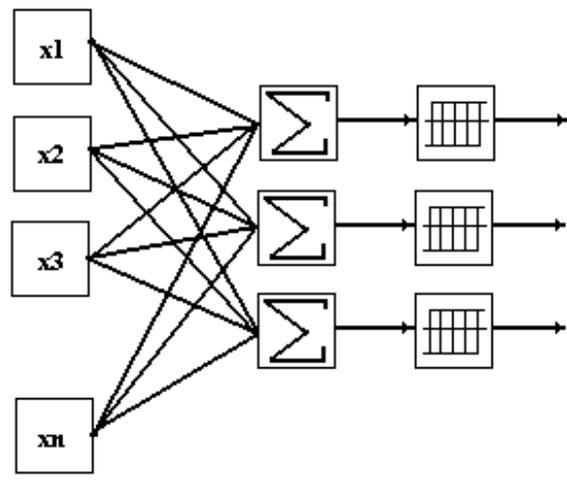
Figure 2.2 A Perceptron with many inputs and outputs

One drawback of the perceptron is that it can only solve problems that are linearly separable. The classification problem shown in figure 2.3 is linearly separable because a line can be drawn to separate both output categories. The line separating the two categories is sometimes called the decision surface.
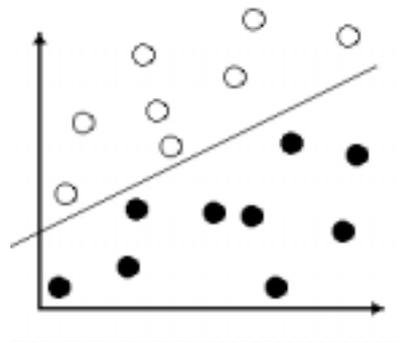
Figure 2.3 Linearly Separable Pattern Classification Problem

These simple computational units are found in all neural networks and their independent behaviour gives rise to a huge potential for parallel computation. Two such networks (ADALINE, and Backpropagation) and their potential for parallel computation are described in the following sections.

2.1 ADALINE Network

The ADALINE network developed by Bernard Widrow (1963) is a simple processing element capable of sorting a set of input pattern into two categories. This sorting task may sound like a trivial

classification problem but the characteristic that sets the ADALINE apart from traditional methods is its ability to learn through a supervised learning process.

The ADALINE is trained by repeatedly presenting it a training set composed of input patterns and their desired outputs. Learning occurs as the ADALINE minimizes the number of errors it makes when sorting the patterns into their correct categories. Once trained the ADALINE can categorize new inputs according to the experience it gained through the learning process. It is this learning phase that constitutes the vast majority of network processing time as running the network in normal operation (actually using its experience) is a simple matter of propagating a set of values through the network and checking the output.

The architecture of the ADALINE is the simplest of all neural networks. As shown in figure 2.4 the ADALINE consists of two layers, an input layer and an output layer. The input layer contains an input unit for each input to the network and a bias unit. The output layer contains only the ADALINE unit which produces the output for the network. Each unit in the input layer is connected to the ADALIINE unit with a link. Each input pattern presented to an ADALINE during training or normal operation should have its components normalized into a predetermined range (typically -1.0 to 1.0). This normalization prevents one component of the input pattern from dominating and possibly interfering with the networks operation. The desired outputs used in the training set should always be one of two values corresponding to the two categories (usually -1.0 and 1.0).
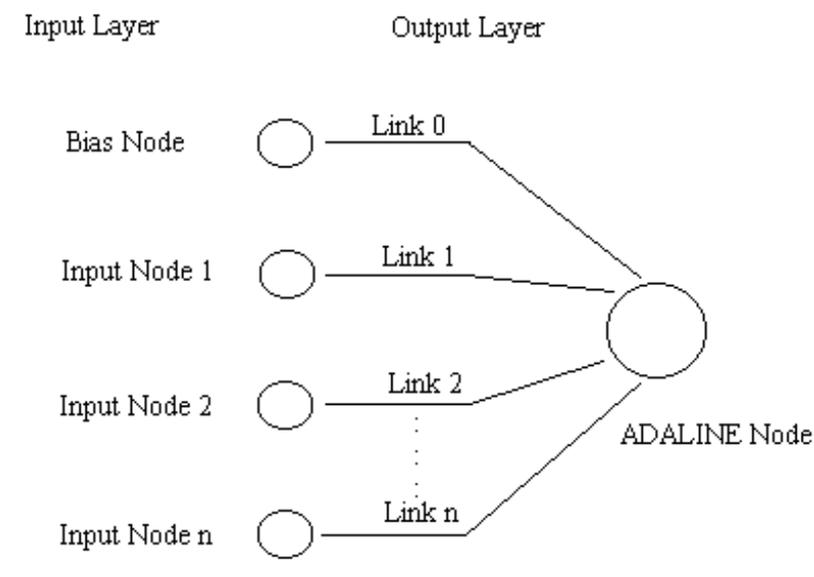

Figure 2.4 ADALINE Network

The ADALINE unit produces only two output values; one corresponding to each of the categories the network can discriminate from. This value is computed by summing the product of each input unit value and its corresponding links value. A threshold function is then applied to the weighted sum

forcing the output value into one of the two categories. As shown in figure 2.5 the threshold function transforms any positive sum into a value associated with category (1.0) and any negative sum into a value associated with category (-1.0).
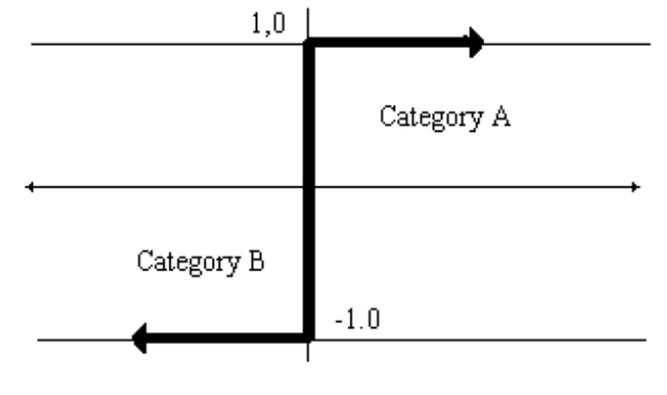
Figure 2.5 ADALINE Threshold function

The ADALINE network learns by modifying the weight values associated with the links during the training process. Training is possible due to an approach Widrow and Hoff (1960) devised to minimize the ADALINE's error by adjusting the link values with a learning law commonly referred to as the delta rule.

Error = Desirder_Output - ADALINE_Output
*New_Weight = Weight + Learning_Rate * Error * Input_Value*

The delta rule uses the error produced by the ADALINE (sorting a pattern into the wrong category) to correct the link values so the correct answer will be produced the next time the input pattern is presented. Since the desired output is either -1 or 1 and the ADALINE's output is either -1 or 1, the error can only be -2 or 2. The delta rule changes the weight values by a percentage called the learning rate (usually around 25-50%). Unfortunately, when the link value is adjusted to give the correct output for the current input pattern, it may cause other input patterns that were producing correct outputs to produce incorrect outputs. The training set must be presented many times before all of the input patterns will produce the desired outputs. If the total error for training set is plotted for all possible link values, the error surface will be a paraboliod as shown in figure 2.6, whose low point is the set of link values that produces the minimum error for each input pattern in the training set. The delta rule traverses the error surface downhill until it reaches the minimum point in the paraboliod. Therefore, the initial link values are not important and can be set to a random value (usually between -1.0 and 1.0) before training begins.

Although the ADALINE works quite well for many applications, it is restricted to a linear problem space. The input patterns in the ADALINE's training set must be linearly separable, otherwise the

ADALINE will never categorize all of the training patterns correctly even when it reaches the low point of the error surface. However compared to other network architectures like backpropagation the ADALINE network is guaranteed to reach its minimum error state since there are no obstacles along the error surface (like local minima) to interfere with the training process.
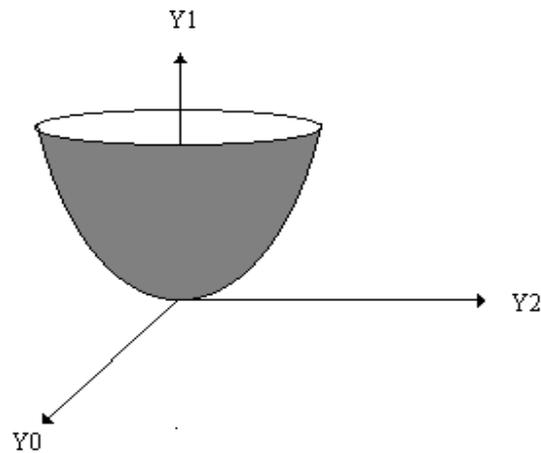
Figure 2.6 Error Surface Produced by ADALINE

The ADALINE network just like the perceptron has only one computation unit thus the potential for concurrent processing is limited. However, more complicated multi-layer networks such as backprop use multiple ADALINE like computation units so a multithreaded ADALINE unit could be utilized by a backprop network. Section 3 of this paper deals with developing a multithreaded version of the ADALINE network.

2.2 BackPropagation Network

The backpropagation (backprop) neural network first formalized by Werbos (1974) and later by Parker (1985), and in 1996 by Rumelhart and McClelland [1] is essentially an extension of the ADALINE network. Instead of having one processing unit, the backprop network is a collection of units (each very similar to the ADALINE unit) organized into interconnected layers. The layered structure of the backprop network allows it to escape the ADALINE's linear separability limitation making it a much more powerful problem-solving tool. Also, the backprop network is not limited to a single binary output, it can have any number of outputs whose values fall within a continuous range. The backprop network is ideal for problems involving classification, projection, interpretation and generalization.

Just as the ADALINE network contains an input and output layer, the backprop network contains these layers as well as one or more middle (hidden) layers. The example in figure 2.7 shows a sample backprop network with one middle layer, two input layer units and two output layer units. The units in the backprop network are interconnected via weighted links, and each unit in a layer is generally connected to each unit in the succeeding layer leaving the output layer unit to provide output for the

network. When an input pattern is presented to the backprop network, each input layer unit is assigned one of the input pattern component values. The units in the next layer receive the input unit values through the links and compute output values of their own to pass to the next layer. This process continues until each output layer unit has produced an output for the network.
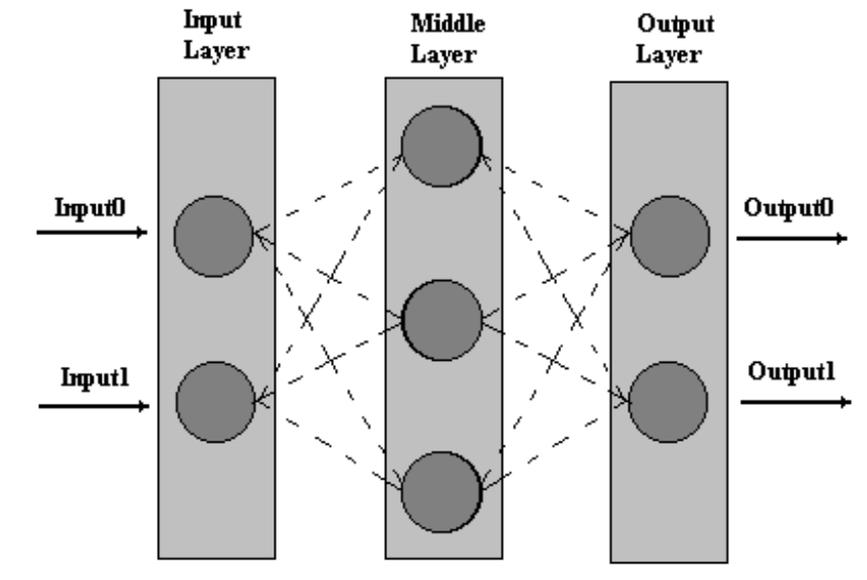
Figure 2.7 Backpropagation Neural Network

Input patterns are identical to the ones used in the ADALINE network except they are usually scaled between 0.0 and 1.0. Since the output layer in a backprop network can have any number of units, a desired output pattern contains a component value for each unit in the output layer. Also, the output layer units are not limited to a binary output like the ADALINE network, theses units (as well as the rest of the units in the backprop network) produce values between 0.0 and 1.0.

After an input pattern has been presented to the backprop network, values propagate forward through the layers until the output layer is reached. The desired output for the input pattern is used to calculate an error value for each unit in the output layer. These error values are propagated backwards through the network as the delta rule is used to adjust the link values to produce a better output. The goal of network training is to reduce the error produced by the patterns in the training set. The training set is presented repeatedly until the overall error is below a given tolerance level. Once training is complete the backprop network is presented with new input patterns and produces an output based on the experience it gained from the learning process.

Unlike the ADALINE network the backprop network is non-linear and produces a more complex surface as shown in figure 2.8. Since the delta rule traverses the error surface downhill, irregularities in the backprop network's error surface may lead to problems (Local Minima).
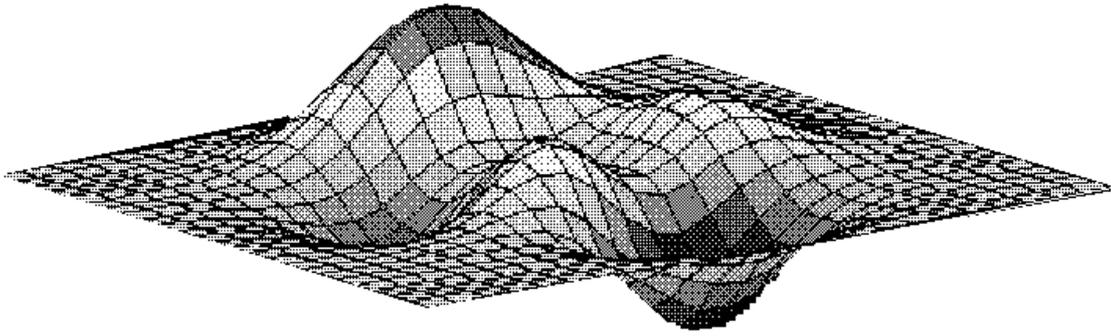
Figure 2.8 Backprop Error surface showing local and global minima

The backprop network holds far greater potential for concurrent processing as it may contain a lot more computational units. Once each unit has received a full set of inputs (stimuli) it can work (sum the weighted inputs and run the result through its threshold function). Because the sequence of processing will depend on the scheduling algorithm used by the operating system that the network is running on, the network will operate in a non-deterministic manner.

3. Multithreaded Neural Networks

One step towards true parallel neural networks is to study how their implementation can be improved by multithreaded/concurrent programming. The approach used here is to treat each network unit as a thread. This means that each unit can operate independently, reading all of its input values, summing them up, and thresholding the result in order to pass it on to all units on the next layer, if any.

As the ADALINE network is simple and is the basis for the more complicated backprop network a simple experiment follows which shows the viability of using multiple threads of execution to represent each unit in the network.

3.1 Defining sequential network operation

The definition of each unit's execution is far easier in sequential implementations of neural networks. In a sequential implementation of the ADALINE network processing would usually begin at the ADALINE unit. This has the effect of summing all of the ADALINE unit's inputs and running them through a threshold function to give some output. This output can be checked against the desired output in order to determine if the network needs to learn. If the network needs to learn the ADALINE unit simply calculates an error using the delta rule and updates all of its incoming weight values. Once the ADALINE unit has finished learning all patterns must be re-presented to the network so the network can finally settle into a stable state (the network is said to have settled once it has successfully learned all patterns). Figure 3.1 shows a typical ADALINE network being run through its paces. The network

is presented with 250 data patterns which it must learn. A complete explanation of the code sample is beyond the scope of this paper but major areas of interest are pointed out.

```
1   while(good < 250)
2   {
3           good = 0;
4           for(i = 0; i < 250; i++)
5           {
6                   Node[0].Set_Value(data[i].In(0));
7                   Node[1].Set_Value(data[i].In(1));
8
9                   Node[3].Run();
10
11                  if (data[i].Out(0) != Node[3].Get_Value())
12                  {
13                          Node[3].Learn();
14                          break;
15                  }
16                  else
17                  {
18                          good++;
19                  }
20          }
21          System.out.println(iteration + ".    " + good + "/250");
22          iteration++;
23
24
25  }
```

Figure 3.1 Typical sequential ADALINE network operation

Line 1 : represents the main loop which will allow the network to continue to run until all patterns are learned, i.e. when the number of good iterations equals 250 (the number of patterns).

Line 2 : initialises a local variable good to zero so that the number of successful iterations can be counted.

Line 4 : starts an inner loop which presents each pattern to the network.

Lines 5 - 6 : load the input units with the next set of patterns.

Line 9 : calls the run method of the ADALINE unit which will begin its computation.

Line 11 : checks to see of the actual output matches the desired output.

Line 13 : invokes the learn method of the ADALINE unit . This calculates the error and updates all the units incoming weight values. Once a pattern has produced an incorrect result all patterns must be re-presented to the network so a break statement forces execution to jump back to the outer loop. Once execution begins again in the outer loop good will be set to zero once more and all patterns will have to be learned again.

Line 18 : simply increment the current value of good as a pattern has given the correct output and there is no need for the network to learn. This keeps execution within the inner loop so that the next pattern will be presented.

Finally when good reaches 250 the outer loop will terminate and the network will have learned all patterns.

The operation of the above network is deterministic, in other words at any given time we can figure out the current point of execution. The operation of the network follows a set of steps, each step depends on the one that went before it. The operation of the network is coded neatly into one main block of code that can be easily followed.

3.2 Defining concurrent network operation

Defining concurrent network operation is far more difficult then one might expect. The best approach is to define the responsibilities of each type of unit within the network and then implement those responsibilities within a thread of execution.

The ADALINE network used as an example here has three input units and one ADALINE unit. Each input unit is connected to the ADALINE unit via a set of weighted links as shown in figure 3.2.
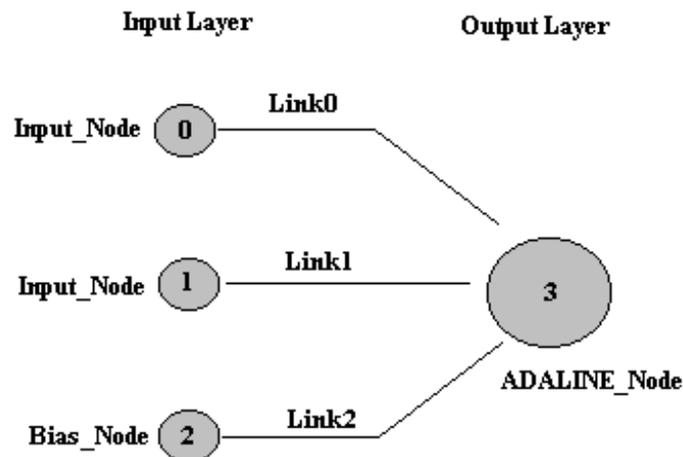
Figure 3.2 Example ADALINE Neural Network

In terms of responsibility within the network the ADALINE unit is the most complex so an obvious place to start is with the input units. Each input unit behaves in the same way, reading values from a pattern file and presenting them to the network. However this time we do not have a main loop with which we can control the presentation of patterns.

3.2.1 Input unit definition

An input unit has a simple set of tasks. Its first task is to take an input pattern and present it to the network. Once it has done this it can lie idle until the next pattern is needed. So when does an input unit know when to get the next pattern? Generally speaking every input unit will have to get its next pattern when the ADALINE unit has finished computing. This means that the input units will have to

wait until the ADALINE unit has received a complete set of input patterns and has finished its responsibilities.

A simplified set of tasks for an input thread is given below:

1. For all 250 data patterns
2. Propagate the input pattern to all units on the next layer, in this case the ADALINE unit.
3. Set the desired result for that particular pattern
4. Update the current pattern number
5. Wait for the single to get the next pattern
6. Check to see of we need to start re-presenting the patterns from the start (an error has occurred on the ADALINE unit).
5. Goto 1

This simplified set of tasks constitutes the run method of the input unit thread. If no errors occur during the presentation of the data patterns then the input units main loop (1) will finally terminate and all patterns will have been presented successfully. Figure 3.3 shows the run method of the input thread.

```
1  public void run ()
2  {
3          for(int j = 0; j < 250; j++)
4          {
5                  notify.setRestart(id, false);
6                  for(int i = 0; i < out_size; i++)
7                  {
8                          outlinks[i].write(
9                          data[current_pattern].In(pattern_component));
10                 }
11                 setExpected(data[current_pattern].Out(0));
12                 current_pattern++;
13
14
15                 try
16                 {
17                         notify.waitToProceed();
18
19                 }
20                 catch(InterruptedException e)
21                 {
22                 }
23
24                 if (notify.getRestart(id))
25                 {
26                         j = 0;
27                         current_pattern = 0;
28                 }
29
30          }
31 }
```

Figure 3.3 Run method of input thread

Line 3 : Represents the main loop for an input unit. When this loop terminates the thread will end its life. The loop is never forced to terminate rather the ADALINE unit notifies the input unit that it should start from the beginning of its input patterns by using a restart notification on line 24.

Line 5 : Once inside the loop restart is set to false for a particular instance of an input unit.

Lines 6- 10: Propagate the input value onto all the units in the next layer.

Lines 11 and 12 : Set the desired output for a particular input pattern and increment the current pattern number so that the next pattern will be read from the file next time around.

Lines 15 – 19 : At this point it is time for the input unit wait until it receives notification from the ADALINE thread. This will stop execution of the input thread until the ADALINE thread is ready for some more input patterns.

Lines 24 – 28 : Once the input thread has been notified by the ADALINE thread it needs to check to see of any errors have occurred. It does this by determining if it needs to restart. If it needs to restart (line 24) then it must set j = 0; and current_pattern = 0;. If this happens the input unit will begin presenting all patterns from the start of the pattern set. If the input unit does not need to start again the j and current_pattern will retain their original values and the next pattern in line will be presented to the network.

NOTE: Once all patterns are learned the loop should terminate of its own accord and the input thread will terminate.

3.2.2 ADALINE unit definition

The ADALINE unit has a much more complicated set of responsibilities for it is the unit that must control the summing of input values, thresholding and learning. An ADALINE unit cannot execute unless it has received a full set of patterns from its input units. This means an ADALINE units does nothing until both input units have propagated their data to the ADALINE unit.

A simplified set of tasks for the ADALINE thread is given below:

1. Continue while the network needs to learn
2. Read and sum all values from the input units
3. Run the summed result through the threshold function
4. Check to see if the actual result matches the desired result
5. If it does then increment good and notify input threads for more input
6. If the outputs do not match then the ADALINE unit must learn by updating all of its input links with the error value. Once the learning has finished good must be set to 0 and the input units must be restarted and notified that they can execute once again.
7. Check to see if all patterns have been learned (good will equal 250)

The set of tasks above constitute the run method of the ADALINE thread. It is important to notice the control the ADALINE thread has over the network operation. It is responsible for waking the input threads up and restarting their pattern presentations from the start if necessary.

Figure 3.4 shows the run method of the ADALINE thread.

```
1  good = 0;
2  while(!stopRequested)
3  {
4          sum = 0;
5          for(int i = 0; i < in_size; i++)
6          {
7                  double r;
8
9                  inlinks[i].setInValue(inlinks[i].read());
10
11                 r = inlinks[i].getInValue() *
12                     inlinks[i].getWeightValue();
13                 sum = sum + r;
14         }
15
16         iterations++;
17
18         sum = transferFunction(sum);
19
20         if (sum != getExpected())
21         {
22                 double error = sum * -2.0;
23                 double delta;
24                 // Must Learn
25                 for(int j = 0; j < in_size; j++)
26                 {
27                         delta = lr * inlinks[j].getInValue() * error;
28
29                         inlinks[j].updateWeightValue(delta);
30                 }
31
32                 good = 0;
33                 notify.restartAll();
34         }
35         else
36         {
37                 good++;
38         }
39
40         if (good == 250)
41                 this.stop();
42
43         System.out.println("Good: " + good +
44         " Iterations : " + iterations);
45
46         notify.proceed();
47 }
```

Figure 3.4 Run method of ADALINE thread

Lines 1-2 : Set the number of good iterations to zero and begin the main thread loop.

Lines 5 – 14 : Loop through all input units and sum their values.

Line 16 : Increment the number of iterations

Line 18: Pass the summed result through the threshold function

Line 20 : Check to see if the actual result matches the desired result

Lines 22 – 33 : An error has occurred on the ADALINE unit so learning must take place. Once all the input links have been updated good = set back to zero and all input threads are notified that they must restart their pattern presentations all over again.

Line 35 – 38 : No error occurred so good is increment and no learning need take place. NOTE: the input threads will continue with the next pattern.

Line 40 : Check to see if good = 250. If this statement evaluates to true then the ADALINE thread is forced to stop. Note the input threads will stop naturally as their main loops will terminate (they will have looped through 250 patterns).

Line 46 : Notify the input threads that they can resume execution.

The above code is a simplified solution to creating a multithreaded neural network. The network has minimum components so as to reduce its complexity. Scaling up to bigger networks would require a lot more code and the addition of new thread responsibilities.

4.0 Conclusion

The multithreaded version of the ADALINE network will not increase the overall speed of the network by much as only one unit is working at any given moment. Execution times for sequential and concurrent networks have not yet been compared so no figures are available to judge speed increases if any. However if the ADALINE thread and input threads are modified to work within a backpropagation network significant increases in speed may be recorded.

4.1 Multithreaded Java Programs and the Java VM

The multithreaded version of the ADALINE network was developed in Java and utilizes Java's input and output pipes as a form of thread communication. One important factor in the next stage of development and testing will be the exploitation of machines that have multiple processors. If the underlying operating systems and the Java VM exploit the use of more than one processor, multithreaded Java programs can achieve true simultaneous thread execution/parallel processing. In theory a Java program would not have to be modified because it already uses threads as if they were running on different processors.

4.2 Extending the Multiprocessor approach

The ADALINE experiment uses Java input and output pipes fro thread communication. This means that threads can only exploit processors within the host machine. By modifying the communication mechanism to use sockets it would be possible for threads to communicate across a network of machines. This greatly increases the number of available processors; it is possible that with a suitable PC network and a suitable neural network that each unit in the network could have its own dedicated

processor which would greatly increase the speed at which the network could learn. There is however other considerations such as the overhead in communications which would have to be addressed but overall the work done so far looks promising.

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Reflexive and Reciprocal Constructions in Modern Irish

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Abstract

This paper examines reflexive (and reciprocal) constructions in modern Irish, a VSOX language for which the generative analysis using c-command is problematic. Reflexive and reciprocal constructions are best reflected in the inherent VSOX word order. The reflexive occurs in transitive constructions with the reflexive marker féin, which can also be used non-reflexively but emphatically. A continuum is observed with a human/animate participant as the subject argument at the reflexive pole and a non-human inanimate at the emphatic end. Motion is an ingredient in reflexivity. Fictive or non-translational motion are both non-reflexive. Translational motion alone allows reflexivity. Reciprocals are complex in virtue of the set of subject members that have the ability to act upon each other, simultaneously or sequentially. Reciprocity distributes over transitive, but also intransitive constructions using a heavy vs. light marking. Light reciprocals occur in intransitive clauses with lexically reciprocal verbs with the light marker le/a chéile. Heavy reciprocals in transitive clauses are specifically signalled by the marker iad féin in linear word order. The role of event structure and associated situation types has a bearing on our understanding of reflexive and reciprocal constructions with some implications for valency.

Introduction

This paper is concerned with reflexive and reciprocal voice, such phenomena being closely related. The major themes examined are: emphatic versus reflexive uses of *féin* "self", the reflexive marker, and reciprocal constructions.

In the literature, reflexive behaviour is generally explicated by binding theory and, in the generative tradition, with c-command. For purposes of our discussion, the binding domain for an anaphor is the minimal S containing the anaphor and where the following three conditions apply:

(1)   a. An anaphor must be A-bound within its binding domain

          b. A pronominal must be A-free within its binding domain.

          c. An R-expression must be A-free

The notion of c-command depends crucially on tree structural requirements for its operation. It is usually defined in terms similar to the following, adapted from Borsley (1999: 96*ff*):

(2)   A node X c-commands a node Y iff neither dominates the other and the first   branching node (i.e. node with more than one daughter) above X dominates Y.

A reflexive must have a c-commanding antecedent

In the generative tradition the use of c-command has been broadly successful, particularly with regard to languages where the word order is SVO (English) or SOV (Japanese). In languages such as these, the tree structures that may be drawn to represent a typical well formed clause follow the usual binary branching with x-bar intermediate categories encapsulating a mix of NP and VP categories. Terminal nodes at the tree endpoints represent the lexical categories of N, V etc. The orientation of the trees reflects a pre- or post-positional bias according to the constituent word order. These essentially deliver a generalised top down tree structural account of the grammatical relations hierarchy of subject > direct object > indirect object > oblique.

In Irish, this grammatical relations hierarchy is reflected more accurately in linear word order and not in a tree structural account because the language always maintains a VSO order in its finite clauses. Not only does this not easily facilitate the use of a notion such as c-command, it also poses a serious question over the nature of, and the use of, a category such as VP in relation to Irish. The notion of a VP may not actually be viable in its usually understood form. Stenson (1981:40) notes that "*because of the basic word order, with the subject intervening between the verb and object, the notion 'verb phrase' as a syntactic category is meaningless for Irish. ... It should be noted that the association between the verb and subject is in fact much tighter than that between verb and object, apart from the closeness inherent in the linear order. Although elements such as adverbs and prepositional phrases can sometimes precede the object nothing can ever intervene between the subject and verb.*" (For alternative discussion, McCloskey 1983).

Irish does not lend itself to a binary tree structural account of grammatical relations without substantial re-arrangement of the constituents to enable the c-command machinery to work. Such transformations operate with a base word order of SVO upon which the transformations are applied in a procedural manner until the desired word order is arrived at. This holds in Principles and Parameters theory and also within the Minimalist program where the subject is internal to the VP, but crucially, within the VP, is left of the V which is in turn left of the O, thereby positing an underlying SVO order (Radford 1997). Bobaljik and Carnie (1996:223*ff*) undertake such an analysis within the Minimalist program of Chomsky (1993) in which "*the overt movement consists of head movement V→ AgrO → T → AgrS, and the NP movement of the object to the specifier of AgrOP with the subject to the specifier position of the Tense phrase (TP)*" [Bobaljik and Carnie 1996:230]. (Within the MP there is an ongoing discussion on the dynamics leading to the achievement of VSO word order from a supposed underlying SVO . See McCloskey (1996:241ff) for alternative discussion to Bobaljik and Carnie of subjects and subject positions in Irish within the Minimalist program).

A number of researchers and authors have commented on the limitations of both tree structural approaches and the notion of c-command and have suggested an alternative based on the notion of obliqueness, that is, of *o-command* (Sag and Wasow 1999; Pollard and Sag 1994; Borsley 1999). In particular, Borsley (1999:102) suggests, in relation to HPSG, the following:

(3)   o-command
        An argument structure list member X is less oblique than another argument structure list
        member Y if X preceded Y.

In our formalism the logical structure of the verbal predicate in the clause is an analogue of the argument structure list. We will therefore appeal to this notion of obliqueness to our analysis, rather than c-command, and refer to it as the *Obliqueness Condition within the Binding Domain*. The use of obliqueness would appear to sit more naturally with the linear word order determination of the grammatical relations' hierarchy of a VSO specific language such as Irish. We will refer to this as the following:

(4)   Obliqueness Condition within the Binding Domain
        a. A logical structure participant X is less oblique than another logical structure participant
            Y is X precedes Y.

        b. An anaphor must be coindexed with a less oblique member of the same logical structure
            argument in the minimal S containing the verb.

        c. The binding domain for a verb is the parameters within the scope of predication of the
            verb in logical structure.

Jackendoff (1990) argues that reflexivisation is sensitive to the thematic hierarchy and that certain thematic roles tend to control the antecedents for reflexives. This suggests that the antecedent of a reflexive has to be higher on the thematic hierarchy that the reflexive particle. Specifically, "*A reflexive may not be higher on the thematic hierarchy than its antecedent*" (Jackendoff 1972:148). In support of this, Wilkins (1988:211*ff*) has determined that the thematic hierarchy must include both patient and affected roles while Kuno (1987:176ff) argues that reflexivisation must be sensitive to a hierarchy that includes undergoer categories such as experiencer and benefactive. We will call this the *Thematic Hierarchy Constraint* and refer to it as such in our analysis.

(5)   Thematic Hierarchy Constraint
        A reflexive may not be higher on the thematic hierarchy than its antecedent.

Role and Reference Grammar (RRG) takes a somewhat different but more coherent approach which subsumes the notion of obliqueness discussed above and the thematic hierarchy constraints of Jackendoff (1972, 1990). In the Role and Reference framework (RRG) of Van Valin (Van Valin 1993, Van Valin & LaPolla 1997) the semantic representation of sentences is based on the lexical representation of the verb or other predicating element. RRG is a decompositional representation based on the theory of Aktionsart of Vendler (1967). This theory has the four basic aktionsart classes of state, activity, accomplishment and achievement to which Van Valin has identified another class, that of active accomplishment. Each of these basic classes has a causative version of it.

The semantic representation of an argument is a function of its position in the logical structure of the predicate and the RRG linking system refers to an elements logical structure position. Thematic relations play no direct role in the theory and where used, the traditional thematic role labels are simply used as a "shorthand" for the logical structure argument positions. RRG posits two generalised semantic roles, or in Van Valin's terminology, "semantic macroroles", which play a central role in the linking system. The macroroles are actor and undergoer. They are the primary arguments of a transitive predication. In an intransitive predicate, the single argument can be either an actor or an undergoer, depending on the semantic properties of the predicate. The relationship between the logical structure argument positions and macroroles is captured by the Actor-Undergoer Hierarchy (AUH). In this, the leftmost argument in terms of the hierarchy will be the actor and the rightmost argument will be the undergoer. Strictly (Van Valin & LaPolla 1997: Chapter 7), the leftmost argument is always the actor but the rightmost argument in logical structure is only the default choice for undergoer.

Transitivity is defined semantically in RRG in terms of the number of macroroles of a predicate. A major of claim of RRG is that no syntactic subcategorisation information is required in the lexical entries for verbs. For regular verbs, all that is required is the logical structure. For irregular verbs, only the macrorole number needs to be specified. All of the major morphosyntactic properties of verbs and other predicates follow from their logical structure together with the linking system (Van Valin & LaPolla 1997: Chapter 7.3.2).

The linking between semantics and syntax has two phases. The first phase consists of the determination of semantic macroroles based on the logical structure of the verb (or other predicate) in the clause. The second phase is concerned with the mapping of the macroroles and other arguments into the syntactic functions. The traditional grammatical relations have no particular status in RRG in that the theory posits a single construction-specific grammatical relation called the Privileged Syntactic Argument, or PSA, of the construction. The non-PSA syntactic arguments in the clause are referred to as direct or oblique core arguments. The PSA for most constructions is the traditional subject. Individual languages have selection hierarchies to determine the PSA.

For a syntactically accusative language such as Irish, the highest ranking direct core argument in terms of the Actor-Undergoer Hierarchy (AUH) is default, that is, the leftmost argument in the AUH. Case and agreement rules are also formulated with reference to the linking system. The highest ranking core macrorole takes nominative case (in Irish), other core macroroles take accusative case and non-macrorole direct core arguments take dative as their default case. The agreement rules work in a similar manner for Irish with the finite verb agreeing with the highest core macrorole in person and number. For Irish this must take into account the synthetic and analytic forms of the verbs. The default PSA can be overridden and a different argument can be selected to function as PSA.

Syntactic Functions: PSA   Direct Core Arguments   Oblique Core Arguments

  Privileged ranking MR = default (Irish)

Language specific

Semantic Macroroles   Actor   Undergoer

ACTOR   UNDERGOER

Universal

Arg of   1st arg of 1st arg of 2nd arg of   Arg of stare

DO   **do' (x, …**   **pred'(x, y)**   **pred'(x, y)**   **pred'(x)**

['———→ ' Increasing markedness of realisation of argument as macrorole]

Transitivity = No. of Macroroles [MRα]

Transitive = 2

Intransitive = 1

Atransitive = 0

Argument Positions in LOGICAL STRUCTURE

Verb Class	Logical Structure
State	**predicate'**(x) or (x, y)
Activity	**do'**(x. [**predicate'**(x) or (x, y)])
Achievement	INGR **predicate'**(x) or (x, y)
Accomplishment	BECOME **predicate'**(x) or (x, y)
Active Accomplishment	**do'**(x. [**predicate'**(x, (y))] & BECOME **predicate'**(z, x) or (y)
Causative	α CAUSE β, where α, β are logical structures of any type

Figure 1. The System linking semantic and syntactic representations of Irish in RRG

(After Van Valin & LaPolla (1997)

The linking system of RRG is divided into two parts, (See Figure 1) one of which is labelled "universal" with the other "language specific". RRG claims that what it calls the lexical phase of the linking, the determination of the macrorole assignments based on the lexical structure of the verb, is virtually universal and subject to limited cross-linguistic variation. The second phase, the syntactic phase, deals with the mapping of the macroroles and other arguments into the syntax and as such, is

subject to considerable cross language variation. As we have seen in our earlier discussion in this section, many, if not most, linking theories go directly from thematic relations to grammatical relations and posit universal constraints on the linking to the effect that "highest ranking thematic relation maps to the grammatical subject". The RRG linking system has two discrete steps: first, relate logical structure to macroroles and second, relate macroroles to syntactic functions. By achieving the linking in this manner RRG captures a number of generalisations across languages that are not possible with other approaches (Van Valin 1993, Van Valin & LaPolla 1997).

There is a particular and principled reason why the lexical phase of the linking system of RRG is universal. The aktionsarten distinctions underlying the decomposition are universal in that, as far as can be determined, all languages have them. The actor and undergoer notions are also valid across languages and the relationship between macroroles and logical structure is governed by the Actor-Undergoer hierarchy and associated principles.

Figure 2: The structure of the finite clause of Irish in RRG

Most cross-linguistic variation is found in the syntactic phase and the factoring of the RRG linking into two phases, one lexical and the other syntactic, allows the linking system to handle this and universally work. Role and Reference Grammar provides "*a coherent framewo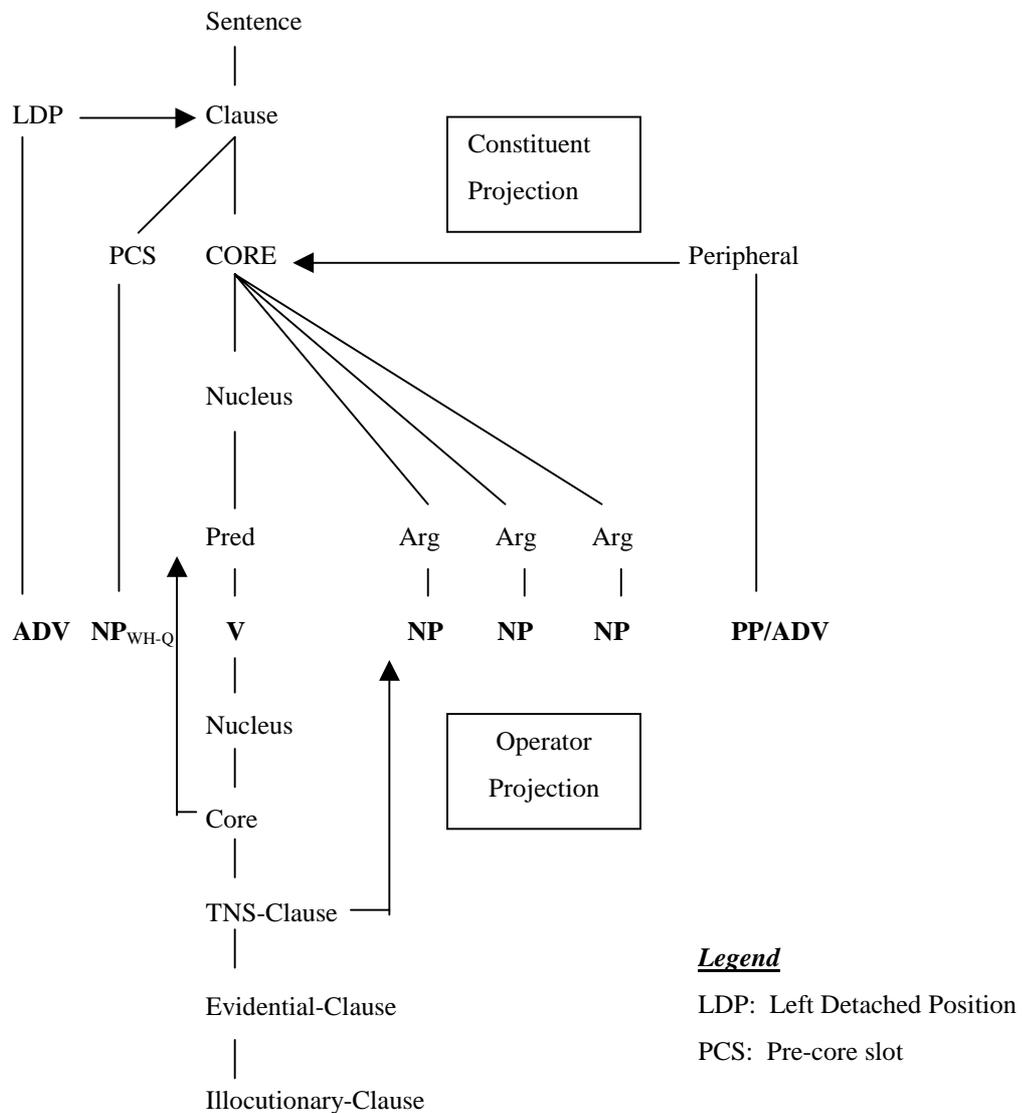rk in which linguistically significant generalisations about the relationship between the semantic argument structure of the verb and the morphosyntactic realisation of the arguments can be readily captured and explained*" (Van Valin 1998). In RRG, the structure of the clause with a finite verb reflecting the VSOX word order is indicated in Figure 2. The scope of predication for the matrix verb of a clause in relation to the binding domain is the logical structure of the core, in RRG terms. We will use the RRG approach to the analysis.

Reflexivity can be found under a number of **conditions**, in particular in constructions that make use of the particle *féin* "self. In the syntax, this particle *féin* has the purpose of acting as a <u>reflexive</u> marker on a grammatical relation in a predicate argument position. The particle *féin* may also be used simply for <u>emphasis</u>, that is, non-reflexively. This same reflexive marker can operate in constructions requiring single or plural number agreement with no overt marking for this on the particle. The reflexive marker can also be used with lexically reflexive verbs, that is, verbs of included or understood object.

Van Hoek (1997:172-174) notes that when the marker is used *emphatically* it tends to exhibit a number of characteristics. These are: 1) <u>proximity,</u> when the reflexive marker occurs directly adjacent to a nominal with which it corresponds, 2) <u>prominence,</u> where the antecedent is the most prominent nominal in relationship to the reflexive, and 3) <u>contrast,</u> where there is some implied contrast between the entity designated by the reflexive and some other (typically unspecified) set of possible entities. In contrast, she finds that when the marker is used in a *reflexive* construction the following characteristics hold: 1) <u>proximity,</u> where the antecedent and reflexive code arguments of the same verb, 2) <u>prominence,</u> where the antecedent is the most prominent nominal in relation to the reflexive, and 3) the recipient of the action is perceived differently than in a non-reflexive event involving two distinct participants.

Reciprocity is closely related to reflexivity and both can be found to exist in the context of the same utterance, as we shall see. In relation to the phenomenon of reciprocals we will find that this can occur in both intransitive and transitive contexts, with the transitive being the more prototypical. We look at how reciprocals are reflected in semantics in logical structure and explore the implications for macrorole assignment, and valency with respect to argument structure at the level of syntax. In the next section we examine the reflexive marker.

The Reflexive Marker

One method by which the expression of reflexivity can be used requires the use of the reflexive marker *féin* "self". This marker *féin* can attach to a nominal, pronoun, verbal noun or prepositional pronoun.

The Position of the Reflexive Marker in the Clause

With respect to word order, the reflexive/emphatic marker *féin* is a free standing word but which adheres to an underlying schema with two template positions within which *féin* can occur reflexively and one in which it can occur emphatically. Used reflexively, the marker *féin* therefore does not have a free word order. The template positions that motivate the word order are generalised as follows:

(6) verb Actor$_1$ *féin$_1$*

  Emphatic

(7) verb Actor$_1$ ((Undergoer$_2$) *féin$_1$*)$_1$

  Reflexive

(8) verb Actor$_1$ Undergoer$_2$ ((prepositional pronoun$_3$) *féin$_1$*)$_1$

  Reflexive

The Use of the RM under Single and Plural Agreement

The use of the reflexive marker supports single and plural agreement without any marking on the reflexive marker itself. That is, the same reflexive marker is utilised and any necessary agreement marking is on core antecedent referent having the same index ("left upstream") in logical structure, that is, in the binding domain of the clause.

We open the discussion by initially highlighting, through some examples, the deployment of the particle *féin* in a number of reflexive and emphatic constructions. Later, in the course of the analysis we will treat in detail the factors at work in these constructions. For now, we simply indicate with a brief comment some salient points relevant to the particular construction.

In this example (9), sentence1 is conjoined with sentence2 and the antecedent of the reflexive marker *féin* is in the 3rd person plural delivering a reciprocal reading.

(9)   *Phós cuid acu agus shocair iad féin ar thalamh na mainistreach.*

Phós   cuid   acu₁   agus
marry:V-PAST some:QTY of:PART+them:DET and:CONJ

shocair   iad₁   féin₁   ar   thalamh   na   mainistreach.
benefit:V-PAST them:DET self:PART on:PP land:N (of) the:DET monastery:N
Some of them married and benefited themselves on the monastery land

The grammatical indirect object of example (10) is reflexive with the subject antecedent via the use of *féin*.

(10)   *Rinne Buck nead **dó féin** istigh go dlúith fá fhoscadh na beinne.*

Rinne   Buck₁   nead₂ dó₁   féin₁   istigh
made:V-PAST Buck:N nest:N for:PP+him self:PART inside:ADV

go   dlúith   fá   fhoscadh   na   beinne.
to:PP snugly:ADV under:ADV shade:N (of) the:DET company:N
Buck made a bed for himself, snug under the shade of the company

The reflexive marker in example (11) is associated with the indirect object of the sentence and has as its antecedent the plural subject of the sentence which delivers a reciprocal reading.

(11)   *Rinne   na   daoine   an   tseirbhís sin uilig dóibh féin*

Rinne   na   daoine₁ an   tseirbhís₂ sin uilig
made:V-PAST the:DET people:N the:DET service:N there:DET

dóibh₁   féin₁
for:PP+them:DET self:PART
The people made the service for themselves

This reflexive marker in (12) is associated with the indirect object of the sentence and has as its reflexive antecedent the grammatical subject of the sentence. However, as the indirect object is already co-referential with the subject by use of the particular prepositional pronoun, *féin* adds emphasis to this.

(12)   *Chuir mé ceisteanna **orm   féin** atá   gan   fhuascladh go   fóill.*

*Chuir   mé₁ ceisteanna **orm₁   féin₁***
put:V-PAST I:PN questions:N to:PN+me:PN self

atá   gan   fhuascladh go   fóill.
that:REL+be:SUBV-PRES without:PP solution:N to:PP yet:PART
I put questions to myself that are without answer yet.

The matrix verb is in the impersonal passive form and the marker *féin* is adjacent to the grammatical object of the sentence giving an emphatic interpretation. Note that even thought the impersonal passive is deployed, the matrix clause has two participants. We discuss why this is so in our analysis later in the chapter.

(13)   *Tréigeadh an seanteampall **é féin** agus   fágadh ina bhallóig é.*

            Tréigeadh   an   seanteampall   é   féin
(someone) deserted:V-IMP-PER-PAST the:DET old:ADJ+church:N it:PN self:PART

agus   fágadh   ina   bhallóig é.
and:CONJ (someone) left: V-IMP-PER-PAST in:PP ruin:N   it:PN

LIT: "(Someone) deserted the old church itself and (someone) left it in ruins"
The old church itself was deserted and left in ruins

The sentence in (14) has the impersonal passive form of the matrix verb with *féin* adjacent to the object, signalling emphatic use.

(14)   *Tugadh **é féin** chun na modh-scoile i mBaile Átha Cliath ina dhiaidh   sin.*

Tugadh   é   féin   chun na   modh-scoile.
came:V-IMP-PERS-PAST he:PN self:PART to:PP the:DET model-school:N

i   mBaile Átha Cliath ina   dhiaidh   sin
in:PP Dublin:N   in:PP after:ADV that:DET
He himself came to the model school in Dublin after that.

This sentence (15) has a transitive verb with subject and object. The reflexive marker is associated with the object signalling reflexive use. The grammatical subject is the antecedent.

(15)   *D'éalaigh Seán é féin go Toraigh le dhaichead fear*

D'éalaigh Seán é féin.
do:PVT+escape:V-PAST Seán:N him:PN self:PART

go Toraigh le dhaichead fear
to:PP Tory:N with:PP forty:QTY men:N
LIT:" Seán escaped himself to Tory with forty men".
Seán himself escaped to Tory with forty men

The use of reflexive *féin* in this sentence (16) serves to denote the conjunction of ownership and possession in relation to the subject of the sentence.

(16) *Bhí   a₁   chuid éadaigh féin₁ leis₁.*
   is:SUBV-PAST his:POSS-ADJ pieces:QTY clothes:N self:PART with:PP+him:PN
   LIT:"His₁ own₁ clothes₂ were with him₁"
   He had his own clothing with him

The example below (17) demonstrates the deployment of an inanimate entity with emphatic use of *féin.*

(17) *Bhí   an gleann féin uaigneach.*
   be:SUBV-PAST the:DET glen:N self:PART lonely:ADJ
   The glen itself was lonely

This sentence below (18) has a subject and a complex direct object that consists of two entities related by conjunction. The first entity of the pair in the complex object carries the emphatic use of *féin.*

(18) *Tá mé bodhruighthe <u>agat féin agus ag Nóra.</u>*

   Tá   mé bodhruighthe agat   féin.
   Be-SUBV-PRES I:PN deadened:VADJ with:PP+you:PN self:PART
   agus   ag   Nóra
   and:CONJ with:PP Nóra:N
   I am bored with yourself and Nóra

This sentence (19) has a grammatical subject, direct object and path and codes actual motion. The plural subject is the antecedent for the direct object against which the reflexive marker is associated. The plural antecedent of the reflexive also delivers a reciprocal reading.

(19) *Chaith siad iad féin thart fá'n teinidh annsin agus thoisigh an ceól.*

Chaith   *siad₁*   *iad₁*   *féin₁*   *thart*   *fá'n*   *teinidh*

throw:V-past they:PN them:PN self:PART around:ADV about:ADV+the:DET crowd:N

annsin   *agus*   *thoisigh*   *an*   *ceól.*

then:ADV and:CONJ started:V-past the:DET music:N

They threw themselves into the crowd then and the music started

The copula verb in this sentence (20) codes a double emphasis by use of two syntactic devices. The first of these is the emphatic form on prepositional pronoun (-*sa*) and the second is the emphatic use of *féin* deployed on the conflated object of the prepositional pronoun in the subject position.

(20)   *Is agam-sa féin atá fhios sin uilig.*

Is   *agam-sa*   *féin*

is-COP at:PP+me:PN+EMPHATIC-PART self:PART

atá   *fhios*   *sin*   *uilig.*

that:REL+be:SUBV-PRES knowledge that:DET of:PP+it:PN

It is only myself that has knowledge of it

The sentence in (21) has a subject which consists of two entities, one is animate and the other inanimate, both of which are related by conjunction in the clause. The particle is adjacent to the animate entity coding for emphatic use. The sentence also codes for fictive motion, as against actual motion, in the sense of Talmy (1996b).

(21)   *D'imthigh an stáisiún agus í féin as a amharc i mbomaite.*

D'imthigh   *an*   *stáisiún*   *agus*   *í*   *féin.*

do:PVP+went:V-PAST the:DET station:N and:CONJ she:PN self:PART

as   *a*   *amharc*   *i*   *mbomaite*

from:PP his:PN_POSS view:N in:PP+a:DET moment:N

The station and she herself went from his view in a second.

The next example (22) has two sentences related by conjunction. Each sentence codes for reflexive use of *féin*, additionally coding for possession, in relation to the subject antecedent of each sentence which has a common identity.

(22)   *Tharraing sé suas **a** bhrístí **air féin** agus theann sé a bheilt **air féin** go gasta.*

        *Tharraing   sé$_1$ suas   **a$_1$**   bhrístí   **air$_1$**   **féin$_1$**.*
        pull:V-PAST he:PN up:ADV his:POSS-ADJ trousers:N on:PP+him:PN self:SELF

        agus   theann   sé$_1$ a$_1$ bheilt air$_1$ féin$_1$
        and:CONJ tightened:V-PAST he:PN his:POSS-ADJ belt:N on:PP+him:PN self:PART

        go   gasta
        to:PP fast:ADV

        He$_1$ pulled his$_1$ trousers up on himself$_1$ and rapidly he$_1$ tightened his$_1$ belt on himself$_1$

The sentence below (23) uses the negative form of the substantive verb and has the incorporated object of the prepositional pronoun reflexive with the subject antecedent in virtue of its use of *féin*.

(23)   *Ní rabh   Mícheál **leis** **féin** ina   smaointe.*

        *Ní   rabh   Mícheál   **leis**   **féin***
        not:NEG be:SUBV-PAST Mícheál:N   with:PP+him:PN self:PART

        ina   smaointe.
        in:PP+his:POSS-ADJ thoughts:N
        Mícheál was not alone with himself in his thoughts

The sentence in (24) codes the substantive verb with a subject, verbal noun and a prepositional phrase indicating possession with ownership by the reflexive use of *féin*.

(24)   *Bhí   Sighle$_1$ ag   tarraingt ar   a$_1$ doras féin$_1$.*
        be-SUBV-PAST Síle:N at:PP pulling:VN on:PP her:POSS-ADJ door:N self:PART
        Síle$_1$ was pulling on her own$_1$ door

Having introduced the **distribution** of the marker *féin* in reflexive and emphatic usages, we now examine representative examples in more detail. We start our analysis by observing in example (25) an instance of double emphatic use of *féin* occurring within the same clause. With constructions such as these, the marker *féin* is found to occur twice in sequence in an utterance. This is a device that allows for increased emphasis on the part of the speaker. Double emphasis can also be found in other constrictions involving the copula verb, the emphatic particle *–sa* and the emphatic use of particle *féin* (see example 20). The construction in (25) is ditransitive with three participants in the semantic logical

structure and three arguments in argument structure in the syntax. It has a situation type of active-accomplishment.

(25)　　*Duirt　　Éamann　sin liom　　féin　　féin*

　　　　Said:V-PAST Eamonn:N that to:PP+me:PN self:PART self:PART

　　　　Eamonn said that to me myself

　　　　[**do'**(Éamann$_1$, [**duirt'**(Éamann$_1$(féin$_1$), (**le'**(**mé$_2$'**(féin$_2$), sin$_3$)))])]

　　　　[**do'**(x$_1$, [**duirt'**(x$_1$(féin$_1$), (**le'**(y$_2$'(féin$_2$), sin$_3$)))])]

Example (26) is reflexive in the sense that two participants are coded but the second participant, the undergoer and object of the sentence, is pointing back reflexively to the first participant, the actor and its antecedent. The reflexive connection between the actor and undergoer is facilitated by use of the reflexive marker *féin*. This captures the insight that the initiator and endpoint participants are distinct while co-referential. The verb *mol* "praise" is not inherently reflexive but is made so in this utterance by the coding by a speaker of *féin* "self" against the participant in the second participant position. That is, the verb *mol* can be either intransitive or transitive. Reflexive use of the marker *féin* requires that the construction, at minimum, be transitive with two arguments in argument structure. If *féin* is used with an intransitive matrix verb then its usage can only be emphatic as there is only one argument.

(26)　　*Mholfainn　　　mé　　féin*

　　　　praise:V-COND+I:PN me:PN self:PART

　　　　I would praise myself

　　　　[**do'**(mé$_1$, [**mol'**(mé$_1$, (mé$_1$'(féin$_1$))])]

　　　　[**do'**(x$_1$, [**mol'**(x$_1$, (y$_1$'(féin$_1$))])]

In relation to the above example, the leftmost participant in logical structure is actor and syntactic subject while the rightmost participant is the undergoer and grammatical object. We can observe that the actor *mé*, the syntactic subject morphologically incorporated in the verb, is antecedent to the reflexive, that is, the grammatical object *mé* (overtly expressed in the syntax) and associated reflexive marker *féin*. As the verb in the conditional tense uses a synthetic form, the personal pronoun is incorporated as a postfix on the verb. The actor and the undergoer, antecedent and reflexive respectively, are both within the binding domain, that is, the scope of predication of the matrix verb. In addition, the obliqueness condition that we adopted predicts that the reflexivity is well formed as the controller of the reflexivity is the grammatical subject and the reflexive is oblique within the binding domain. The thematic hierarchy constraint predicts that the thematic role of the reflexive will be lower on the hierarchy than the antecedent. We can observe that this is so by noting that the actor is leftmost or higher and the undergoer is oblique to the right and therefore lower. Example (26) has two participants in logical structure and two arguments in argument structure. The leftmost participant in

logical structure maps to the first argument, the subject. The rightmost participant in logical structure maps to the second argument, the object. The clause is transitive and, with an achievement situation type is bounded by the second argument. This second argument is marked in the syntax as co-referential with the first argument in virtue of the deployment of *féin* in one of the template positions.

In contradistinction to the previous example, (27) below does not exhibit these characteristics. The marker *féin* is simply adjacent to the subject and not downstream and oblique from the subject within an argument position. That it cannot be reflexive is predicted by obliqueness condition and theta hierarchy constraint. This example therefore is emphatic only, demonstrating the veracity of Van Hoek's proximity principle, as mentioned in the introduction to this chapter. The logical structure has two participants which link into two arguments in argument structure. The clause is transitive and has a situation type of accomplishment. The use of *féin* here does not signal reflexivity, merely emphasis.

(27)   *Mholfainn   féin   é*
         praise:V-COND+I:PN self:PART him:PN-3sg
         I myself would praise him

         [**do'**(mé$_1$, [**mol'**(mé$_1$(féin$_1$), é$_2$)])]
         [**do'**(x$_1$, [**mol'**(x$_1$(féin$_1$), é$_2$)])]

Example (28) is a causative utterance with the reflexive marker associated with the actor and, in word order sequence, occurring immediately following the actor participant. Here the reflexive marker *féin* is used emphatically, that is, simply for emphasis. We can note that while (26) also has a similar word order of nominal followed by *féin*, in that example the nominal plus reflexive marker crucially occupies an argument position while in (28) it does not. The clause is transitive and the underlying logical structure has two participants which map into two arguments in argument structure. As can be seen from the logical structure, the situation type is that of a causative achievement with the second argument providing the boundary. The particle *féin* is proximate to the first argument.

(28)   *Bhris   an   fear   féin   an   gloine*
         break-V-PAST the:DEF man:N self:PART the:DEF glass:N
         The man himself broke the glass

         [**do'**(an fear$_1$,0) CAUSE [INGR **bris'** (an fear'$_1$(féin$_1$), an gloine$_2$)]]
         [**do'**(x$_1$,0) CAUSE [INGR **bris'** (x'$_1$(féin$_1$), y$_2$)]]

We find a similar word order pattern in example (29) with the subject nominal immediately followed by the marker *féin*. Here again, the use is <u>emphatic</u> rather than reflexive. We can additionally note that the subject nominal here is inanimate whereas previously (when reflexive) they were animate. This then is a

clause indicating a situation type of state with one participant in logical structure and a corresponding single participant in argument structure. Reflexivity cannot play a part in this construction as it violates our obliqueness condition within the binding domain.

(29)   *Bhí   an   gleann féin   uaigneach.*
         is:SUBV-PAST the:DET glen:N self:PART lonely:ADJ
         The glen itself was lonely

         [**be'**(an gleann'$_1$(féin$_1$), [**uaigneach'**])]
         [**be'**(x'$_1$(féin$_1$), [**uaigneach'**])]

We can see that the examples of (28) and (29) do not strictly adhere to this reflexive schema outlined in relation to (26). They make use of the element *féin* for simple emphatic effect only. Not all uses of *féin* function, therefore, in the reflexive sense.   The reflexive marker *féin* can refer to entities that are animate or inanimate in emphatic mode. What therefore can the referent of the reflexive marker be? We can hypothesise that, as there are two poles of use of the marker *féin* with <u>reflexivity</u> at one end and <u>emphasis</u> at the other, the ranges of referent attributes (human, animate, animal, inanimate, etc.) maps on to this continuum. We can expect to find the key attribute of human at the reflexive pole and inanimate at the emphatic pole. This indeed is what the examples suggest.

We mentioned earlier that the reflexive marker can operate reflexively over single or plural number agreement and examples (30) and (31) illustrate this. Something very interesting can, however, be observed when the marker *féin* is reflexively used in the context of plural agreement. That is, the participants appear to act on each other. Reflexivity coded with *féin* under plural agreement codes for, and triggers, reciprocity. This means that any of the initiators of the action, the actors, can also be considered as the endpoint of the action, the undergoers. The clause is transitive with an achievement situation type. It has two participants in logical structure, which map into two arguments in argument structure.

 (30)   *Chonaic   na   cailíni iad   féin*
          saw:V-PAST the:DET girls:N them:PN self:PART
          The girls saw themselves.

          [**do'**(na cailíní$_1$, [INGR **conaic'**(na cailíni$_1$,[**iad'**(féin$_1$)])])]
          [**do'**(x$_1$, [INGR **conaic'**(x$_1$,[**iad'**(féin$_1$)])])]

This reciprocity does not exist when the same utterance has single instead of plural agreement as in example (31). In this case, we have simple reflexivity coded by the reflexive marker *féin*. The reflexive marker is adjacent to and immediately following the undergoer participant and indicates that it is co-

referential with the actor. The clause is transitive with a situation type of achievement as with the previous example. It is reflexive but not reciprocal.

(31) *Chonaic   sé   é   féin*
       saw:V-PAST he:PN him:PN self:PART
       He saw himself

       [**do'**(sé$_1$, [INGR **conaic'**(sé$_1$, [é$_2$'(féin$_1$)])])]
       [**do'**(x$_1$, [INGR **conaic'**(x$_1$, [é$_2$' (féin$_1$)])])]

When the speaker refers to the non-reflexive 3rdSG undergoer, as in example (32), the actor and undergoer are not co-referenced. We can see this in (32) which is transitive with an achievement situation type. It is not reflexive, as *féin* is not utilised, and not reciprocal because there is no reciprocal marking and the agreement on the nominals is singular.

(32) *Chonaic   sé   é*
       saw:V-PAST he:PN him:PN
       He saw him

       [**do'**(sé$_1$, [INGR **conaic'**(sé$_1$, é$_2$)])]
       [**do'**(x$_1$, [INGR **conaic'**(x$_1$, y$_2$)])]

That some verbs are optionally reflexive can be observed from the previous examples. The reflexivity is introduced, and its use marked, by use of the reflexive marker *féin*. This is a feature of *féin* when used in reflexive mode. Such optionally reflexive verbs have non-reflexive correlates and can be conjoined with a non-reflexive object, as in example (33). The theta hierarchy constraint applies in this example. Reflexivity is predicted to be well-formed also by the obliqueness condition in the binding domain. This construction is reflexive, transitive, with an achievement situation type having two participants in logical structure and two arguments in argument structure. The second participant is complex in that it is elaborated by two conjoined human animate entities which map as a unit into the second argument position.

(33) *Chonaic   sé   é   féin   agus   a   chara*
       saw:V-PAST he:PN him:PN self:PART and:CONJ his:PN-POSS friend:N
       He saw himself and his friend

       [**do'**(sé$_1$, [INGR **conaic'**(sé$_1$, [[é$_2$'(féin$_1$)] & [a$_2$'(cara$_3$)]])])]
       [**do'**(x$_1$, [INGR **conaic'**(x$_1$, [[é$_2$'(féin$_1$)] & [a$_2$'(y$_3$)]])])]

Reflexive with Motion Constructions

In this section we look at examples of encoding of motion, specifically we look at fictive motion, non-translational and translational motion. We find that reflexive use is to be found with translation motion only. We start by examining non-reflexive constructions involving fictive motion and then move to non-translational motion before identifying the use of the reflexive marker with translation motion.

Fictive motion

Constructions involving fictive motion can be understood to be metaphorical in the sense of Talmy (1996b). Motion appears to be involved but it is not actual motion. The facts are presented as if motion was occurring, hence fictive motion. In example (41), thoughts are moving entities which move to/into the passive thinker. The sentence relates, in particular, to cognition on behalf of the human animate undergoer and that phenomena of cognition is represented as a macrorole participant, that of an inanimate actor. The phenomenon hinges around the actor role in a transitive clause. The actor is cognitively a necessary part of the undergoer. The phenomenon implies a subjective motion on the part of the actor towards the undergoer. This construction has two participants in logical structure and two arguments in argument structure linking one to one. The matrix verb is transitive and the situation type is that of an accomplishment with the second argument serving to bound the activity of the verb. On interest if the fact that the first argument is elaborated by an inanimate non-human participant. The first participant has a theme role and the second participant is that of patient. While *féin* is not deployed here, the conditions do not otherwise exist to facilitate reflexivity. In particular the thematic constraint does not hold.

(34)   *Bhuail   an   smaoineamh mé*
         hit:V-PAST the:DET thought:N   me:PN
         The thought hit me

         [**do'**(0, [**buail'**(an smaoineamh$_1$, mé$_2$)]) & INGR (**be'**(an smaoineamh$_1$, (ag'(mé$_2$))))]
         [**do'**(0, [**buail'**(x_1, y_2)]) & INGR (**be'**(x_1, (ag'(y_2))))]

The actor is inanimate in examples (35) and (36) and construed as having agent-like qualities. Again we see implied or subjective motion towards the undergoer. The actor is cognitively a part of the undergoer as in the previous example.

(35)   *Chuir   smaoineamh isteach orm*
         put:V-past thought:N   in:PP   on:PP+me:PN
         LIT: "A thought put in on me "

A thought intruded on me

[**do'**(0, [**cuir'**(smaoineamh$_1$, [isteach'(ar'(mé$_2$))])])]

[**do'**(0, [**cuir'**(x$_1$, [isteach'(ar'(y$_2$))])])]

(36) *Thainigh   réiteach   i   mo   cheann*

came:V-PAST solution:N in:PP my:POSS-ADJ head:N

A solution came into my head

[**do'**(0, [**thainigh'**(reiteach$_1$, [i'(mo$_2$'(ceann$_3$))])])]

[**do'**(0, [**thainigh'**(x$_1$, [i'(mo$_2$'(y$_3$))])])]

Characteristic of these constructions appears to be that they contain an inanimate non-human actor and an animate human undergoer. The actor is a <u>part</u> of the undergoer with respect to cognition but is viewed as separate. The actor has no independent existence apart from the undergoer. The undergoer may be coded as a destination or location, possibly within a prepositional pronoun, or prepositional phrase with an N or PN. There is a subjective implied motion of the inanimate non-human actor to the animate human undergoer.

The phenomena of fictive motion with resultative meaning has to do with the satisfaction of bodily needs or desires and the explicit recording of the attainment of that condition through fictive motion. We can see this in the first of our examples, (37) below, which is transitive having coded for an accomplishment situation type. The second participant in this construction is the more interesting in that it serves as the device that codes for a resultative endpoint condition. Possession is also a factor and is explicitly encoded. The combination of possession with resultative state codes the "until" condition which denotes the termination of the activity of the verb. The actor is human and animate but the undergoer is not. The undergoer is *a dhótheann* "her fill" which is resultative in the sense that the condition or state recorded has no independent existence apart from the actor. The actor is fictively moving towards possession of the resulting state, which is eventually accomplished in a manner appropriate to the action of the matrix verb.

(37) *Íth   sí   a   dhótheann*

eat:V-PAST she:PN her:POSS-ADJ fill:N

 She ate her fill

[**do'**(sí$_1$, [**ith'**(sí$_1$, [**a$_1$'**(dótheann$_2$)])])]

[**do'**(x$_1$, [**ith'**(x$_1$, [**a$_1$'**(y$_2$)])])]

Similarly, example (38) is transitive. Here the undergoer participant is *codhail sámh* "restful sleep", and codes a resultative state. In line with the previous example, possession is also a factor here in that the state, as an entity, comes into the possession of the human and animate actor, the first participant, following the culmination of the verbal action. The second participant is intrinsically bound to the first by its very nature, that of coding a human activity with resultative meaning. In each of these examples, the actor is in control of the action denoted by the verb.

(38)   *Thóg   sé   codhail sámh*
        take:V-past he:PN sleep:N tranquil:ADJ
        LIT: "He took a tranquil sleep"
        He had a good sleep

        [**do'**(sé$_1$, [**tóg'**(sé$_1$, [**sámh'**(codhail$_2$)])])]
        [**do'**(x$_1$, [**tóg'**(x$_1$, [**sámh'**(y$_2$)])])]

Non-Translational Motion

A non-translational motion construction is intransitive with a single participant, that of actor. The clause has one participant in logical structure and a corresponding argument in argument structure. The actor undergoes the self-initiated, motivated and controlled action. The motion path is expressed via the adverb but the motion is not translational as it not directed, as is the case with translational motion. The actor does not move from one place to another. The scope of the (motion path) adverb is therefore narrower than it is with translational motion and the logical structure underpinning the construction illustrates this by use of embedded, rather than leftmost (and hence wide-scope adverb) position. A characteristic of non-translation motion is that the type of motion involved appears to be implicit in the verbal action denoted. Like the reflexive translational motion examples to be discussed following, the non-translational construction concerns the whole body of the actor.

(39)   *Suí   mé   sios*
        Sit:V-PAST I:PN down:ADV
        I sat down.

        [**do'**(mé$_1$, [**sios'**(**suí'**(mé$_1$))])]
        [**do'**(x$_1$, [**sios'**(**suí'**(x$_1$))])]

This is an active accomplishment with the adverb defining the limit, extent and termination point of the activity. As this clause only has one participant it cannot by definition be reflexive.

Reflexive with Translational Motion

In a reflexive construction with translational motion, we engage the notion of self-movement along a path. This requires that an actor, undergoer, and path be coded in the construction. Use of the reflexive marker is required to signal co-reference between the actor and the undergoer. In this construction actual and not implied subjective motion is coded. These constructions are reflexive because of the necessary shared reference of the undergoer with the actor.

The example in (40) illustrates the required triplet needed i.e. Actor, Undergoer, Path. Constructions of this kind cannot be intransitive and must always be transitive. The translational motion is that used in Talmy (1985, 1996b) and additionally concerns the whole body of the actor. The participants denoting the reflexive translational motion must be contiguous in the clause, as in the example above. The reflexive marker *féin* signals the *é* undergoer and grammatical object as co-referential with the actor and grammatical subject. The transitive construction has two participants in logical structure and two arguments in argument structure. The situation type is that of an accomplishment. Because of the use of *féin*, the transitivity is weakened in the sense that the second argument is co-referential with the first argument. The first argument, the sentence subject, is animate and human. The implication therefore is that the second argument, the grammatical object, must also be animate and human for reflexivity to occur, as indeed it is.

(40)   *Chaith   sé   é   féin   ar   aghaidh*
         throw:V-PAST he:PN him:PN self:PART on:PP forward:ADV
         He threw himself forward

         [**ar'**(agaidh, [**do'**(sé$_1$, [cait'(sé$_1$, é$_2$'(féin$_1$))])])]
         [**ar'**(agaidh, [**do'**(x$_1$, [cait'(x$_1$, é$_2$'(féin$_1$))])])]

While single agreement is coded in (40), both single or plural agreement usage's can be used with the reflexive marker but when plural agreement is introduced then we have an instance where both reflexive and reciprocal hold. The relation changes in that the participants are still co-referential and reflexive but act on each other in a particular reciprocal way. We see this in (41) below. In this example of a transitive clause with a situation type of accomplishment, we again have two participants in logical structure and two arguments in argument structure. The deployment of the marker *féin* on the second argument, the object, signals that this is co-referential with its antecedent, the first argument and sentence subject. There is one important difference between example (41) and the previous example

(40), that of number agreement. In this example we have plural agreement on both the first and second arguments. This triggers the additional reciprocal reading. We have therefore in this example, simultaneous but multiple events where each member of the set of subject participants acted on the others.

(41) *Chaith   siad   iad   féin   ar   agaidh*
throw:V-past they:PN them:PN self:PART on:PP forward:ADV
They threw themselves forward

[**ar'**(agaidh, [**do'**(siad$_1$, [**cait'**(siad$_1$, (iad$_2$'(féin$_1$)))])])]
[**ar'**(agaidh, [**do'**(x$_1$, [**cait'**(x$_1$, (iad$_2$'(féin$_1$)))])])]

The Non-Sanction of Reflexives in impersonal passives

Impersonal passive constructions utilising lexically reflexive verbs are sanctioned but not, apparently, impersonal passive constructions with the marker *féin* "self" in reflexive use. The marker *féin* cannot be co-referential with the unspecified or impersonal initiator of the action. The use of the reflexive marker *féin* with the impersonal form of a verb is therefore not possible. The simple and unsurprising reason for this is the reflexive has no upstream antecedent argument in the syntax to which it can be bound, as predicted by the thematic hierarchy constraint and the obliqueness condition within the binding domain. This is also not available at the level of semantics as we can see with example (42) illustrates the use of an impersonal passive matrix verb with an accomplishment situation type. This clause has two participants in logical structure but a single argument in argument structure. The first participant in logical structure, the actor, is recorded as indefinite and unspecified. This is visible to the syntax as it causes the impersonal marking on the verb, but is not sufficiently specific or elaborated at the level of logical structure to allow the participant to be recorded in argument structure as the grammatical subject. The (impersonal) argument is semantically present but syntactically unexpressed as subject and it is this fact that delivers the impersonal passive marking on the verb. The second participant in logical structure is elaborated and is mapped into argument structure as the second argument and the grammatical object of the sentence.

(42) ***Dírítear***   ***a***   *shuile ar*   *an pictiúir*
Focus:V-IMPERS-PASS-PAST **his**:POSS-ADJ on:PP the:DET picture:N
LIT: "(Someone) focused his eyes on the picture"
His eyes were focused on the picture

[**ar'**(an pictiúir$_3$), **do'**(x$_1$, (**dírigh'**(x$_1$, [**a$_1$**'(suile$_2$)])))]
[**ar'**(z$_3$), **do'**(x$_1$, (**dírigh'**(x$_1$, [**a$_1$**'(y$_2$)])))]

Where : x_1 is an unspecified individual of animate and human type, and interpreted as "someone"

Impersonal passives are *"functionally equivalent to indefinite personal constructions"* (Geniusiené 1987:275), with a *"human agent"* (Geniusiené 1987:278) but the reflexive marker requires a <u>specific</u> and <u>not indefinite</u> antecedent in the binding domain. The personal passive *"serving to transpose focus on the referent of the promoted direct object and the impersonal passive serving to focus on the verbal action. Both however, serve to defocus the subject referent by deleting it or demoting it to a minor syntactic position."* In addition, the *"impersonal, which is always agentless, and the personal passive with a deleted agent can be used, to a varying degree, to imply a generalised, or indefinite (unspecified, non-individuated), or specific agent"*. (Geniusiené 1987:279).

Emphatic use of *féin* with grammatical object is sanctioned, as simple proximity to the object entity is all that is required. The example in (43) illustrates the use of *féin* with impersonal passive constructions but deployed in <u>emphatic</u> mode only and not reflexively.

(43)   *Tugadh é féin chun na modh-scoile i mBaile Átha Cliath ina dhiaidh sin.*

Tugadh   *é*   *féin*   chun   na   *modh-scoile.*
came:V- IMPERS-PASS-PAST he:PN self:PART to:PP the:DET model-school:N

i   mBaile Átha Cliath ina   dhiaidh   sin
in:PP Dublin:N   in:PP after:ADV that:DET
LIT: (Someone) brought him (self) to the model school in Dublin after that
He himself came to the model school in Dublin after that.

[**cun'**(na modh-scoile$_3$, [**i'**(BAC$_4$, [**ina'**(diadh sin, [**do'**[x_1, [**tugadh'**(x_1, [$é_2$'(féin$_2$)])]])])])])]
[**cun'**(w$_3$, [**i'**(z$_4$, [**ina'**(diadh sin, [**do'**[x_1, [**tugadh'**(x_1, [$é_2$'(féin$_2$)])]])])])])]

Where : x_1 is an animate and human entity.

The sentence in example (44) at first glance appears unusual in that it contains two conjoined clauses, both with the impersonal passive form of their respective verbs. In addition, the first clause has apparently has two arguments and the marker *féin* associated with the second of these in post adjacent position. The second clause has only one argument, the clausal object. This is a complex sentence and the cause of the complexity is these two arguments in the first clause which look like subject and object. This cannot be as the clause verb is in the impersonal passive and cannot therefore promote the object to subject position. The verb has two participants in logical structure, the first of which is indefinite and

unspecific but human and animate. The second participant in logical structure is specific but non-human and inanimate. The problem lies with a potential ambiguity in the clause, which is only removed by the insertion of *é féin*. A speaker uttering *Tréigeadh an seanteampall féin ...* would be ambiguous between these two readings 1) "The old church <u>itself</u> was abandoned … " and 2) "<u>Even</u> the old church was abandoned … ". To disambiguate the meaning to the intended first reading it is necessary to replace *féin* with *é féin* in the clause, hence the strangeness of the clause. The treatment of the first participant in logical structure is identical to that of the previous example and results in the marking of impersonal passive on the verb. The second participant is linked to the available argument position as the clause object. The additional "argument" is a dummy and does not take an argument position or increase the valency in any way. The marker *féin* is used emphatically in both of the clauses in this sentence and not reflexively. In the first clause, there is no visible human subject to act as antecedent, thereby breaching both the obliqueness condition within the binding domain and the thematic hierarchy constraint.

(44) *Tréigeadh an   seanteampall é féin agus   fágadh ina bhallóig é.*

  Tréigeadh   *an*   *seanteampall*   *é*   *féin*

(someone) deserted:V- IMPERS-PASS-PAST the:DET old:ADJ+church:N it:PN self:PART

  agus   *fágadh*   *ina*   *bhallóig é.*

and:CONJ (someone) left: V-IMP-PER-PAST in:PP ruin:N   it:PN

LIT: "(Someone) deserted the old church itself and (someone) left it in ruins"

The old church itself was deserted and left in ruins

$[\textbf{do'}(x_1, [\textbf{tréig'}(x_1, [\textbf{an seanteampall}_2\textbf{'}(\textbf{é}_2\text{'}(\text{féin}_2))])])] \&$

$\qquad [\textbf{do'}(x_1, \textbf{fág'}(x_1, [\text{é}_2, [\textbf{in'}[\textbf{a'}_2(\text{ballóig})\,]]]))]$

$[\textbf{do'}(x_1, [\textbf{tréig'}(x_1, [\textbf{y}_2\textbf{'}(\textbf{é}_2\text{'}(\text{féin}_2))])])] \&$

$\qquad [\textbf{do'}(x_1, \textbf{fág'}(x_1, [\text{é}_2, [\textbf{in'}[\textbf{a'}_2(\text{ballóig})\,]]]))]$

  Where **x** is an animate and human entity, but unknown or irrelevant to the context

All Irish verbs, whether inherently reflexive or not, have an impersonal passive form. Use of *féin* in emphatic mode with the impersonal passive form of a verb is sanctioned, and exhibits simple proximity to its argument in the syntax.

With the impersonal passive form of a verb, no specific and definite actor is elaborated in logical structure and hence there is no subject available in argument structure to act as the reflexive antecedent in the binding domain.

Some additional comments on the reflexive marker

At the semantic level, two participant roles may exist for a verb and in many instances this is reflected in syntax as two argument in a transitive clause. The reflexive marker *féin* preserves the two participant roles at the semantic level but also encodes the fact that both roles share the same reference, that of the antecedent. In the syntax, the leftmost role is reflected as the grammatical subject and the rightmost role that is co-referenced with it attracts the reflexive marker *féin*. The clause is still transitive but the transitivity is weakened, not reduced. This is because two participants are found in logical structure and two arguments are found in argument structure with the reflexive marker immediately after the second argument in the syntax. What is important is that the second argument is still recorded in the syntax, it is not deleted or replaced by *féin* but flagged as co-referential by the deployment of *féin* with it. Reflexivity weakens the transitivity and hence the valency, it does not reduce it. Semantically and syntactically the valency is still two (in a transitive clause) but the identification of the human and animate participant in the second argument is reflexively linked to the human and animate participant in the first argument. In a ditransitive construction, the same holds for the third and first arguments.

Reflexivity and possession

Givon (1990:639) has noticed that a variant of reflexivity occurs within a specific semantic context where "*the subject is the possessor of the object*". In this type of construction, the subject and object are not co-referential. They are "*semantically more transitive that true reflexives*" and, as no argument is lost from argument structure, they are not valence decreasing and therefore "*syntactically more transitive that true reflexives*".

The verb in example (45) is a member of that verbal class that codes for an understood object. In this example, the actor and undergoer are both explicit in logical structure. The clause, however, is ambiguous and lends itself to two different interpretations, that is, a reading with an understood object which is additionally possessed by the actor or, a reading with an explicit syntactically realised object not possessed by the actor. The two glosses and logical structures below differentiate the two possible readings of this example. The reflexive marker *féin* can be used to disambiguate between the two readings.

(45)   *Coirigh   Mairéad   a   gruaige*
       brush:V-past Mairéad:N her:POSS-ADJ hair:N
       Mairéad$_1$ brushed her$_2$ hair

       (a) Object which is possessed by the clausal subject
       [**do'**(Mairéad$_1$, [**cóirigh'**(Mairéad$_1$, [**a'**$_1$(gruaigh$_2$)])]) & BECOME [**cóirigh'**(**a'**$_1$(gruaigh$_2$)]]

[**do'**(x$_1$, [**cóirigh'**(x$_1$, [**a'$_1$**(y$_2$)])]) & BECOME [**cóirigh'**(**a'$_1$**(y$_2$)]

(b) Object explicit and syntactically realised but not possessed by the clausal subject

[**do'**(Mairéad$_1$, [**cóirigh'**(Mairéad$_1$, [**a'$_2$**(gruaigh$_3$)])]) & BECOME[**cóirigh'** (**a'$_2$**(gruaigh$_3$)]]

[**do'**(x$_1$, [**cóirigh'**(x$_1$, [**a'$_2$**(y$_3$)])]) & BECOME [**cóirigh'**(**a'$_2$**(y$_3$)]]

We have seen that the marker *féin* may be used and associated with the undergoer participant in order to indicate to reflexivity with the actor as antecedent. We then understand that the undergoer as marked by *féin* is co-referential with the actor. This is precisely what occurs in example (46). The actor and undergoer are explicit and the reflexive marker is deployed following the undergoer *í* "her". This is a transitive clause in which two roles are coded for but which only has one reference. While a specific undergoer is indicated in the clause, an implicit undergoer is understood, that is, the *gruaigh* "hair" affected and owned by the syntactically realised object of the clause and which is possessed by the actor/subject. The activity denoted by the verb is bounded and the situation type is therefore an accomplishment.

(46)   *Cóirigh   Mairéad í   féin*
         brush:V-past Mairéad:N her:PN self:PART
         Mairéad brushed her self

[**do'**(Mairéad$_1$, [**cóirigh'**(Mairéad$_1$, [**í'$_1$**(féin$_1$)])])] & BECOME [**cóirigh'**[**í'$_1$**(féin$_1$)]]

[**do'**(x$_1$, [**cóirigh'**(x$_1$, [**í'$_1$**(féin$_1$)])])] & BECOME [**cóirigh'**([**í'$_1$**(féin$_1$)]]

The example in (47) is also transitive with an explicit actor and undergoer coded. Here however, the actual patient is explicit, rather than the possessor as in the previous example. The reflexive marker is used appropriately signalling that the undergoer is co-referential with the actor. Again, the entity that elaborates the undergoer is a component body part of the actor and therefore necessarily possessed by the actor. This example is therefore reflexive in virtue of the deployment of the marker *féin* immediately post adjacent to the undergoer NP and the clause has an accomplishment aktionsart.

(47)   *Coirigh   Mairéad a   gruaige féin*
         brush:V-past Mairéad:N her:PN-POSS hair:N   self:PART
         Mairéad brushed her own hair

[**do'**(Mairéad$_1$, [**cóirigh'**(Mairéad$_1$, [**a'$_1$**(**gruaigh'$_2$**(féin$_1$))])])
         & BECOME [**cóirigh'**(**a'$_1$**(**gruaigh'$_2$**(féin$_1$)]]

[**do'**(x$_1$, [**cóirigh'**(x$_1$, [**a'$_1$**(**y'$_2$**(féin$_1$))])]) & BECOME [**cóirigh'**(**a'$_1$**(**y'$_2$**(féin$_1$)]]

When reflexivity is coded, the reflexive relationship is one of necessary possession of the undergoer by the actor and that undergoer partakes of the action expressed by the verb.

The possessed entity in example (48) is not a part of the undergoer but an external entity in the world. As such, this possessed external entity may be worn by, or carried on, the actor. Body parts can consist of ones hand, hair and such like. Wearable possessed entities can be clothes, coins or rings. Use of the marker *féin* relates the possessed inanimate entity back to the actor under this relationship.

(48)　　*d'Oscail　　sé$_1$　　a$_2$　　　　chota　　féin$_1$*
　　　　　open:V-past he:PN his:PN-POSS coat:N   self:PART
　　　　　LIT: "He opened his own coat"
　　　　　He opened his coat

　　　　　[**do'**(sé$_1$, [**oscail'**(sé$_1$, [**a$_2$**'(cota$_2$(féin$_1$))])])] & CAUSE [BECOME [**oscail'**(**a$_2$**'(cota$_2$(féin$_1$)))]]
　　　　　[**do'**(x$_1$, [**oscail'**(x$_1$, [**a$_2$**'(y$_2$(féin$_1$))])])] & CAUSE [BECOME [**oscail'**(**a$_2$**'(y$_2$(féin$_1$)))]]

This example is transitive with a specific actor/subject and a specific undergoer/object and has a situation type of achievement. Without use of the reflexive marker *féin*, ambiguity with respect to reference of the possessed undergoer/object would exist, for which see example (49), but this is immediately disambiguated when the reflexive marker is deployed. Example (49) can be interpreted in a possessive-reflexive or possessive non-reflexive manner, depending on whether one interprets the possessed entity as owned by the actor or owned by some other non-referenced individual. Both interpretations are shown in logical structure below, with the differences denoted by the indices.

(49)　　*d'Oscail　　sé　　a　　　　　chota*
　　　　　open:V-past he:PN his:PN-POSS coat:N
　　　　　He opened his coat

　　　　　Possessive-Reflexive interpretation
　　　　　[**do'**(sé$_1$, [**oscail'**(sé$_1$, [**a$_1$**'(cota$_2$)])])] & CAUSE [BECOME [**oscail'**(**a$_1$**' (cota$_2$))]]
　　　　　[**do'**(x$_1$, [**oscail'**(x$_1$, [**a$_1$**'(y$_2$)])])] & CAUSE [BECOME [**oscail'**(**a$_1$**' (y$_2$))]]

　　　　　Possessive Non-reflexive interpretation
　　　　　[**do'**(sé$_1$, [**oscail'**(sé$_1$, [**a$_2$**'(cota$_3$)])])] & CAUSE [BECOME [**oscail'**(**a$_2$**'(cota$_3$))]]
　　　　　[**do'**(x$_1$, [**oscail'**(x$_1$, [**a$_2$**'(y$_3$)])])] & CAUSE [BECOME [**oscail'**(**a$_2$**'(y$_3$))]]

Reciprocal

In a way somewhat analogous to the distribution of the reflexive, the reciprocal can manifest itself in a number of different constructions, intransitive and transitive, and with several different reciprocal markers. Following Givon (1990:628*ff* volume 2), we will use the terms light and heavy reciprocals to describe these constructions.

Light reciprocals are constructions which appear to be inherently reciprocal under the normal or prototypical reading. These constructions utilise verbs such as *póg* "kiss" or *pós* "marry" where the common understanding is that at least two human animate entities are involved in the action of the verb and that the entities act upon each other in some way. Givon (1990:628 volume 2) defines the reciprocal in this way: "*two like events are at issue, with the subject of the first being the object of the second, and vice versa. The two participants thus act upon each other (reciprocally)*". In a light reciprocal construction we find that the actor/undergoer of the clause, the sentence subject, is plural. The subjects are conjoined and there is no reciprocal marking. Similar to the class of reflexive verbs with an understood object, here we find that the plural subject is the (plural) understood object of the sentence.

Verbs that are lexically reciprocal are used in intransitive clauses with a plural subject nominal. A typical example (50) of such a verb is *póg* "kiss". In this example, the normal reading is reciprocal and the understood object is *iad féin* "each other", represented as underlined in the logical structure. The understood object is *visible to the semantics* but <u>not</u> manifest in the syntax. Under this reading the action is simultaneous and constitutes a single event.

(50)   *Phóg   siad*
         kiss:V-past they:PN
         They kissed

         [**do'**(siad$_1$, [**póg'**(siad$_1$, (<u>**iad$_2$'**(féin$_1$</u>)))])]
         [**do'**(x$_1$, [**póg'**(x$_1$, (<u>**iad$_2$'**(féin$_1$</u>)))])]

The interpretation of this construction, assuming that *siad* "them" contains two human entities, m and n, would be as follows:

(51)   **póg'**(m$_1$ ∧ n$_2$, n$_2$ ∧ m$_1$) & [not **póg'**(m$_1$, m$_1$)] & [not **póg'**(n$_2$, n$_2$)] & m$_1$ ≠ n$_2$

Simply, this can be read as **m** and **n** kissed each other, **m** did not kiss **m**, **n** did not kiss **n** and **m** is not **n**.

The heavy reciprocals are more marked in the syntax and can be intransitive or intransitive. We will examine the intransitive form of these constructions first followed by the transitive variant. The intransitive heavy reciprocals, like the light intransitive reciprocals, code for a single event with

simultaneous action. They have a plural subject that is human and animate. They differ specifically from the light reciprocal in that they use the reciprocal marking *le chéile/a chéile* "together".

An example of this is (52) where the participants equally act upon each other and each can be equally considered as actor and undergoer. This construction is stative in nature in virtue of its use of the substantive verb *tá* "be".   One participant role is involved which is elaborated by a prepositional pronoun *orainn* "on+us" with plural number agreement. Reciprocity in invoked by use of the reciprocal marker *le chéile*. The prepositional pronoun *orainn* with the marker *le chéile* denotes a reciprocal relationship between the referents. The verbal noun form of the verb *obair* "work" is used. In its finite form, this intransitive verb would take a subject in the normal manner and could be used with the heavy reciprocal marker *le chéile*. In this construction (52), the subject is adjacent in template position to the substantive verb.

(52)   *Tá   orainn   obair   le   chéile*
         is:SUBV-pres on:PP+us:PN work:VN with:PP self:PART
         We must work with each other

         [**be' (ar'**(muid$_1$), [**obair'(le'**(céile$_1$))])]
         [**be' (ar'**(x$_1$), [**obair'(le'**(céile$_1$))])]

In example (53) and (54) we have a similar example where a variation on the heavy reciprocal marker, *lena chéile*, is used in an intransitive construction. The construction is intransitive, expressing an activity with a plural subject. No object is expressed in the syntax. The action is simultaneous and denotes a single event. Each of the members of the plural subject act on each other. The context to the utterance in (53) is provided by (54)

(53)   *Níor   réitigh   siad   lena   chéile*
         Not:Neg agree:V-past they:PN with:PP+in:PP+to:PP together:PART
         They did not get on together

         [not [**do'**(siad$_1$, [**réitigh'**(siad$_1$, [**lena'**(céile$_1$)])])]]

(54)   *Bean chéile gan aon tuiscint aici dó. Níor réitigh siad lena chéile, agus ní théadh sé abhaile ach go déanach agus é ólta.*

         "A wife without any understanding of him. They did not agree with each other and he never went home until late and drunk."

Not all deployments of the phrase *le chéile* denote a reciprocal construction. In example (55) and (56), we have such a deployment in a <u>transitive</u> construction with a situation type of accomplishment. The subject is human, animate and plural. The object of the sentence is complex and specified in the syntax as plural but crucially, non-human and inanimate. The phrase *le chéile* qualifies the complex object and cannot signal reciprocity between the subject and object because the subject and object have completely different references. This construction is not reciprocal and the simple use of *le chéile* alone cannot be considered a sufficient diagnostic, on its own, as a marker of a reciprocal construction.

(55)   *Chuir siad cnámha an divan **le chéile**, déanta mar bhéadh trí thaobh cearnóige ann,*

         "They put three supports of the divan together, made as if there were three squares there"

(56)   *Chuir   siad   cnámha   an   divan   le   chéile,*
         put:V-past they:PN bones:N   of:GEN+the:DET divan:N with:PP each+other:PART
         "They put three supports of the divan together"

         [**do'**($siad_1$, (**cuir'**($siad_1$, (**le'**(**céile'**(cnámha an $divan_2$)))))))]
         [**do'**(x_1, (**cuir'**(x_1, (**le'**(**céile'**(y_2))))))]

We have considered the intransitive variant of the heavy reciprocal. At this point we can proceed to an examination of the transitive heavy reciprocal. This construction is always transitive and its use is marked by the phrase *iad féin* "them self". These constructions tend to code multiple events where the action can either be simultaneous or sequenced in some way. The subject of the clause must be human, animate and plural.

The construction in (57) is transitive, having human and animate actor participants with plural number agreement. The undergoer participants necessarily agree with the attributes of the actor in virtue of the reflexive coreference signalled by use of the reflexive marker *féin.* The action is additionally reciprocal in virtue of the coreference of plural subject and object, and the overt coding of the fact of the unfolding of the action generated by the subject onto the objects, that is, onto themselves. The subject pronoun *siad* "they" has nominate case and the object pronoun *iad* "them" has accusative case. The object is not understood and covert in this example but overt and explicitly represented in logical structure and in argument structure within the syntax. This use of *iad* and *féin* together constitutes the heavy reciprocal marker for transitive constructions.

(57)   *Phóg   siad   iad   féin*
         kiss:V-past   they:PN them:PN self:PART
         LIT: "They kissed themselves"
         They kissed each other

[**do'**(siad$_1$, [**póg'**(siad$_1$, (**iad$_2$'**(féin$_1$)))])]

[**do'**(x$_1$, [**póg'**(x$_1$, (**iad$_2$'**(féin$_1$)))])]

The example in (58) is transitive, codes for translational motion and deploys the reciprocal marker *iad féin*. The coding of translational motion in the clause requires that the clause have a path along which the motion of the object undergoing the verbal is directed. This means that the triplet of actor, undergoer and path must be expressed in the syntax. While reflexive, the construction is also reciprocal by virtue of the plural number agreement of the participants. Specifically, the construction is transitive accomplishment coding for actual translation motion with a plural subject, an object that is coreferential with the subject in all respects, and a path. The subject codes for two or more people. The construction is reciprocal. The multiple reciprocal events of the action of the verb over the participants may encompass simultaneous or serial actions. For a quantity of two people we may assume that the actions are simultaneous, but for more than two people this need not be so and remains unspecified.

(58)   *Chaith siad iad féin thart fá'n teinidh annsin agus thoisigh an ceól.*

Chaith	*siad*	*iad*	*féin*	*thart*	*fá'n*	*teinidh*
Throw:V-past	they:PN	them:PN	self:PART	around:ADV	about:ADV+the:DET	crowd:N

annsin	*agus*	*thoisigh*	*an*	*ceól.*
then:ADV	and:CONJ	started:V-past	the:DET	music:N

They threw themselves into the crowd then and the music started

[**ansin'**(**faoi'**(an teinidh$_3$, [**do'**(siad$_1$, [**caith'**(siad$_1$, (**iad$_2$'**(féin$_1$))])])]))

     & [**do'**(0, [**thoisigh'**(an ceól$_4$)])]

[**ansin'**(**faoi'**(w$_3$, [**do'**(x$_1$, [**caith'**(x$_1$, (**y$_2$'**(féin$_1$))])])])) & [**do'**(0, [**thoisigh'**(z$_4$)])]

Example (59) is transitive, an accomplishment and reciprocal. The plural object is coreferential with the plural human animate subject. The subject set has two or more participant members. The construction codes for multiple events with simultaneous action.

(59)   *Ansin shocair siad iad féin go seascair ina ngabháltas.*

Ansin	*shocair*	*siad*	***iad***	***féin***.
then:Adv	settle:V-past	they:PN	them:PN	self:PART

go	*seascair*	*ina*	*ngabháltas*
to:PP	comfortably:ADV	in:pp+their:POSS	holdings:N

[**ansin'**[**do'**(siad$_1$, (**socair'**(siad$_1$, (**go seascair ina ngabhaltas'**(**iad'**$_2$(féin$_1$))))))]]

[**ansin'**[**do'**(x$_1$, (**socair'**(x$_1$, (**go seascair ina ngabhaltas'**(**iad'**$_2$(féin$_1$))))))]]

The example in (60) is a complex sentence having two conjoined clauses. The first of these clauses has the matrix verb *pós* "marry" which we discussed earlier as inherently reflexive with an understood plural object coreferential with, and identical to, the overt plural human animate subject. The first clause is intransitive, signalling an activity at the level of the syntax but is inherently reciprocal with a semantically present understood object that is not expressed in the syntax. The subject of the first clause has two or more members. The action is simultaneous with a single event if the set of members of the subject is two, but this codes multiple events with simultaneous action when the number under consideration is say, four or more. The subjects in the first clause are conjoined with respect to the action of the verb *pós*. The verb in the second clause is *socair* "settle". The subject of this second clause is in fact the subject of the first clause, that is *cuid acu*. The subject of the first clause is therefore the controller of the action of the second clause. The subject of this clause is present in the semantics in logical structure but not expressed in the syntax. It is however visible to the syntax. Evidence for this is to be found in the accusative marking on the plural pronoun *iad* "them". This demonstrates that the subject, and controller, is in the matrix verb inn the first of the conjoined clauses and the undergoer of the second clause, the object, takes the appropriate marking in the syntax. In the second clause we have multiple events and the action is simultaneous.

(60)   *Phós cuid acu agus shocair iad féin ar thalamh na mainistreach.*

         Phós   cuid   acu   agus.
         Marry:V-past some:qty of:PP+them:PN and:CONJ

         *shocair   (**pro**) iad   féin   ar   thalamh   na   mainistreach*
         settle:V-past   them:PN self:PART on:PP ground:N of:GEN+the:DET monastry:N

         [**do'**(cuid acu$_1$, **pós'**(cuid acu$_1$, (**iad'**$_2$(féin$_1$)))) & **do'**(*x*$_1$, (**socair'**(x$_1$, (**iad'**$_2$(féin$_1$))))))]

         [**do'**(x$_1$, **pós'**(x$_1$, (**iad'**$_2$(féin$_1$)))) & **do'**(*x*$_1$, (**socair'**(x$_1$, (**iad'**$_2$(féin$_1$))))))]

The example in (61) and (62) is stative in nature in virtue of the use of the substantive verb. It codes an activity that is ongoing and, as such, deploys a verbal noun form of the action verb *tóg*. The action verb in finite form is transactional in nature and therefore ditransitive with three participants' i.e., it has a subject, an object and theme. These same participants are to be found in the construction of (61) albeit with the participants in different template positions. The subject of (61), *na siopadóirí*, is now found in this construction immediately to the right of the substantive verb in linear word order and to the

immediate left of the *ag tógáil* verbal noun phrase. The sentence is reciprocal in virtue of the use of *iad féin* and denotes an ongoing activity that is still progressing in the state described in the construction.

(61)   *Bhí   na   siopadóirí   iad   féin*
          be:SUBJ-past the:DET-pl shopkeepers:N   them:PN self:PART

         ag   tógáil   earraidh ar   cáirde
         at:PP taking:VN goods:N from:PP+their:PN friends:N

         [**be'**(na siopadóirí₁, [**ag'**(**tóg'**(**ar'**(**cairde'**(earraidh**3**)), (**iad'₂**(féin₁))))])]

(62)   *Bhí na siopadóirí **iad féin** ag tógáil earraidh ar cáirde agus ag díol bisigh air leis na margaitheoirí.*

         "The shopkeepers were themselves each taking goods from their friends and increasingly selling them to the marketgoers"

Similar examples of the use of the reciprocal marker *iad féin* are to be found in the complex sentence (63). The relevant component clauses within this are in (64) and (65). The underlying behaviour of these examples is as with the other *iad féin* constructions. The clause in example (64) is transitive and an accomplishment, reciprocal in virtue of the prototypical deployment of *iad féin*. Multiple simultaneous events take place. A difference with (64) is that, as well as utilising the *iad féin* marker, the phrase *a chéile* is also used. We previously found the phrase *a chéile* as the heavy reciprocal marker in intransitive clauses; here we find it used in a transitive clause in addition to the heavy reciprocal marker *iad féin*. The phrase *a chéile* in this clause serves to denote the manner in this already reciprocal action took place, in the sense of delivering a spatial configuration to the reciprocity. We also find the phrase *a chéile* in the second clause, shown in example (65), and used with the inherently reflexive *póg* "kiss". Even thought the verb is inherently reflexive, the use in this context is that of a heavy reciprocal marker on a syntactically intransitive construction.

(63)   *Shnaidhm siad iad féin ina chéile; phóg siad a chéile agus na deóra leo; acht focal agus ní rabh siad ábalta a labhairt ar feadh chupla bomaite.*

         "They embraced each other together; they kissed each other together and their tears with them; but a word and they were not able to talk for several moments"

(64)   *Shnaidhm   siad   iad   féin   ina   chéile*
         embrace:V-past they:PN them:PN self:PART in:PP+their:POSS together:PART

They embraced each other together

(65)   *phóg   siad   a   chéile*
kiss:V-past they:PN to:PP together:PART

They kissed each other together

It is not uncommon to fine this type of usage of reciprocal constructions in complex sentences consisting of multiple clauses. Additional examples of this usage is to be found in the passage in (66) where the heavy reciprocal marker, *iad féin,* is demonstrated in transitive constructions and reflects the prototypical utilisation of this marker.

(66)   "*Och, chuala tú faoin bheirt leads óga a **mharaigh iad féin** toisc nach raibh siad in ann obair a fháil. Bhuel . . . tá Cóilín agus cara leis i ndiaidh an cleas céanna d'imirt. **Mharaigh siad iad féin** - **phlúch siad iad féin** istigh i ngaráiste agus gás ag teacht ó inneall gluaisteáin. Maidin inniu.*"

"… have you heard about the two young lads <u>that killed themselves</u> because they could not find any work. Well … Cóilín and a friend have played the same trick. <u>They killed themselves</u> – <u>they suffocated each other</u> inside a garage with the fumes coming from a car engine. This morning."

In example (67) a causative verb *rinne* "make" is deployed with the reflexive marker *féin*. The utterance is transactional in nature and codes for three participants. The roles denoted are generalised as actor, undergoer and beneficiary. The actor participant role is elaborated by a plural nominal and the utterance is otherwise similar to the *indirect reflexive with reflexive marker* construction discussed in the previous section. The major difference is that the referent has plural number agreement. This plural number agreement, when used with the reflexive marker, sanctions both a reflexive and reciprocal interpretation, as illustrated in this example.

(67)   *Rinne   na   daoine   an   tseirbhís sin uilig dóibh   féin.*
made:V-past the:DET people:N the:DET service:N there:DET for:PP+them:PN self:PART
The people made the service for themselves

[**do'**(na daoine $_1$, [**rinne'**(na daoine $_1$, an tseirbhís sin uilig$_2$))
        & CAUSE **be'**(an tseirbhís sin uilig$_2$, [<u>**do'**</u>(**siad$_1$'**(féin$_1$))])]
[**do'**(x_1, [**rinne'**(x_1, y_2)) & CAUSE **be'**(y_2, [<u>**do'**</u>(**siad$_1$'**(féin$_1$))])]

In this example, the actors that initiate the action cause the beneficial effects of the action to unfold on themselves as undergoers. The plural subject of the sentence causes the action to beneficially effect the coreferential objects.

Summary and Discussion

We introduced this paper with a necessarily brief discussion on the traditional approaches to the analysis of reflexivity and found that this was problematic for languages with a VSOX word order. We discussed some alternative approaches from the literature, including approaches by Jackendoff and Van Valin that have more coherent applicability to VSOX languages such as Irish and a greater explanatory power. We posited that the behaviours of reflexive and reciprocal constructions are reflected in the inherent word order of VSOX. We proceeded to examine the distribution of reflexive constructions and found that these occur in transitive constructions signalled by the reflexive marker *féin*. This marker can also be used non-reflexively in emphatic constructions.

We examined the distributional facts of the reflexive constructions and found that, of necessity, they bind the subject. Givon (1990:628 volume 2) defines the reflexive construction as applying where "*the subject is co-referent with the object, and this acts upon itself (reflexively)*". Reflexives cannot occur in personal passive or impersonal passive constructions. Reflexives take part in control constructions where the actor/agent control reflexives at the semantic level and subjects control reflexivity at the syntactic level. The reflexive construction was found to maintain the valency count at the semantic and syntactic levels. Reflexives require local antecedents and, as such, are amenable to a clause/sentence internal analysis where the domain of applicability, the binding domain, is constrained accordingly.

In relation to subject properties and control of reflexivity, Givon (1990:628) notes that "*The closer the clausal subject is to the prototypical syntactic subject, the more it is likely to retain control of co-reference of reflexivation*". In the situation with two clauses in a sentence, control is likely to be vested in the subject of the main clause. We found that reflexives cannot occur in subject position. We explained this by use of the obliqueness condition within the binding domain, the thematic hierarchy constraint and the constraints implicit in the RRG approach that we applied to the analysis.

The prototypical transitive verb has an agentive subject and a patient direct object. Reflexives (and reciprocals) are restricted to those that take (ideally) human subjects, but at minimum animate subjects. This dictates that the object of the clause must be also ideally human and animate but at least animate if it is to be co-referenced with the subject. A continuum may be observed to exist with a possibly human, but necessarily animate, participant in the subject argument at the reflexive end of the scale, and non-human and inanimate at the absolute other pole, the emphatic end of the continuum.

Human/animate <u>reflexive</u> use------------------------ non-human/inanimate <u>emphatic</u> use

The prototypical transitive clause with patient/object is not human but inanimate. Therefore it is more natural for dative/benefactive (i.e. human) objects to occur with reflexive or reciprocals. In relation to subject properties and the control of reflexivity, it appears that in sentences with two clauses, control is more likely to occur in the main clause subject. We considered the reasons why reflexivity cannot apply in constructions involving impersonal passives due to the visibility of the antecedent to the reflexive marker in the syntax. A diagnostic of reflexives is therefore that that they cannot be expressed in passive constructions. The issue of motion as an ingredient with reflexivity led us to consider fictive, non-translational and translational motion. Translational motion alone allows reflexivity.

We completed this analysis with an examination of reciprocal constructions and the different conditions that apply to their use. We discovered that reciprocal constructions have a restricted distribution over a number of different construction types and specific constraints apply. One of these constraints is that the relevant subject nominal must have plural number agreement. The attributes that reflect the distribution of the reciprocal are summarised in (68) in relation to transitive and intransitive constructions.

(68)

Reciprocal	
Transitive	*Intransitive*
Not inherently reciprocal	May be inherently reciprocal
Multiple events	Single event, simultaneous action
Markings	May or may not have markings
Makes use of *iad féin*	May make use of *le/a chéile*
Plural subject	Plural subject

With reflexives, the object is co-referential with the subject and the subject therefore acts upon itself reflexively. With reciprocals, this is somewhat complex in virtue of the plurality of the set of subject members, with the subject of the first action being the object of the second, and vice versa such that the participants act upon each other. Reciprocity can be introduced when a reflexive construction has nominal with plural number in argument structure positions. Givon (1990:628 volume 2) defines the reciprocal as "*two like events are at issue, with the subject of the first being the object of the second, and vice versa. The two participants thus act upon each other (reciprocally)*". We found in this analysis that reciprocity distributes over transitive, but also intransitive, constructions and reflects what Givon (1990:628ff) calls light vs. heavy marking. Light reciprocal constructions occur in intransitive clauses with either lexically reciprocal verbs, or in constructions that employs any of the variants of the light reciprocal marker, *le/a chéile*. The use of the phrase *le/a chéile* must occur with an intransitive clause with plural subject for reciprocity to occur. Heavy reciprocal constructions in syntactically

transitive clauses are restricted to, and specifically signalled by, the marker *iad féin* in template position in linear word order.

The role of event structure and the underpinning situation types has a direct bearing on understanding the distribution of, and the behaviours of, the reflexive and reciprocal constructions. The relationship between semantic and syntactic valency and aktionsarten is very strong. Interestingly, in some situations the semantic valency is visible to the syntax but in other cases it is not, thereby directly influencing the transitivity of the clause.

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The Treatment of Rape in Theology

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When I first began to research the treatment of rape in theology some five years ago I was frequently asked what rape had to do with theology. That is not a question I hear today. Largely due to scandals in both church and state a theological response has been demanded to the serious question of sexual abuse. That response is underway. This article presents a brief summary of central theological issues that arise from an analysis of the experience of rape victims.[1] It presents an overview of the treatment of rape in traditional and mainstream theology and finally it examines the contribution of certain feminist theologians who address the issue of sexual violence. Its focus is primarily that of the rape of women.[2]

Theological Issues Arising From the Experience of Rape

Women's stories of rape reveal that the perceived reality and the experienced reality of rape differ considerably Because of the tremendous difficulty women often have in voicing their experience of rape the perceived reality, unfortunately, tends to hold sway. Personal accounts of rape show immense differences but certain recurring themes emerge; a virtually universal fear of rape on the part of women and a personal sense of trauma, shame, guilt, denial and anger are commonly reported. Repeatedly such women insist that the physical rape is but one aspect of the total rape experience; the physiological, psychological, emotional and spiritual repercussions are equally significant and in some cases even more so. Clearly then, an exclusively physical approach to the question of rape is considered to be theologically inadequate.

Rape is not merely a personal phenomenon. In research on rape medical, legal, justice and religious systems come under close scrutiny in their ability to effectively silence rape victims. This silencing is achieved largely through a bolstering of time-old rape myths. One author, McColgan,[3] outlines the role of embarrassment, humiliation, shame, manipulation and fear in this silencing. She insists that "the penalties for complaining are high". Media portrayal of rape equally proves disturbing. Analysis of the

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[1] The term 'victim' is used hesitantly here since k is often called into question. It is viewed by some as a stereotypical label with a disempowering effect. The alternative term 'survivor' is often preferred. Many women who have been raped do, however, choose to describe themselves in this way.

[2] One disturbing aspect of this research is that the theological treatment of the rape of men is minimal even though both psychological and sociological studies of male rape are available and are on the increase.

[3] A. Mc Colgan, *The Case For Taking The Date Out of Rape,* (London: Pandora 1996) 21

newsprint headlines and the general media message conveyed to readers is generally that victims of rape are beautiful women with sex appeal and that rapists are either mentally disturbed or are depraved monsters.[4] Such coverage is clearly stereotypical.

One institutional form of rape is that of rape in war. As an effective and calculated weapon it serves to demoralise the enemy and features as a symbolic sign of victory. Rape in war is generally viewed as 'inevitable'. Researcher Aruan Gnanadason[5] writes that anew war-rape terminology is evident. The use of adjectives such as 'front-line' and 'third-party' are used to normalise rape in war, despite the fact that the Fourth Geneva Council on The Protection of Civilian Persons in Times of War (1994) classifies wartime rape as a serious human rights violation.[6] What is notable from a theological perspective is that, despite global awareness of the most horrific examples of mass rape in the World Wars, Mylai, Rwanda, the former Yugoslavia and more recently in Albania,[7] most theological explorations of 'Just War' theory fail to address the horror of rape in war at all.

So what then are the significant issues regarding rape from a theological perspective? A reading and re-reading of personal accounts of rape points to a number of theological issues, which are only referred to here. One fundamental issue is that of belief in God. For victims who previously have had a belief in a loving and protecting God, faith is often shattered. One victim exclaims: "The more I remembered, the more I realised that God did not care for me at all. If he didn't care for me, He wasn't who I thought He was. And who was He? It's been an incredible loss... I haven't been able to find a God I can believe in."[8] Another common difficulty is that of imaging God as male and the dilemma of continued participation in the sacramental life of the Church where both language and images point predominantly to a male God. As one woman said, she could only feel at ease with a faith in an angel's presence. For her the notion of 'God' and especially 'God the Father' was much too threatening after the experience of prolonged incest.

Women's stories suggest to the theologian that re-examinations of anthropology, Natural Law theory and traditional theologies of suffering, sacrifice, redemption and reconciliation are a priority. Stories also indicate that deeper explorations of both the meaning of embodiment and of the theological significance of the violation of the human body are important. Victims also clearly challenge theologies of power asking that these theologies include a serious critique of the negative use of power in rape and furthermore they demand a dispelling of rape myths through a facilitation of truth-telling and justice. Finally, since many rape victims speak of a death or loss of self, theological and philosophical

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[4] Research indicates that both of these descriptions of the rapist account for a very small percentage of convicted rapes.

[5] A.Gnanadason, *No Longer a Secret: The Church and Violence Against Wonie₄* Risk Book Series (Geneva: WCC Publ., 1993)14-17.

[6] Art. 27, Para. 2.

[7] The mass systematic rape of Albanian women k graphically described by Christine Toomey in an article "Speak No Evil, See No Shame"', The *Sunday Times Magazine,* 28/11/99, 32-40.

[8] Cited in E. Bass and L. Davis, *The Courage to Heal* (London: Cedar, 1990) 156.

explorations of selfhood, identity and person-hood may be enriched by a closer listening to the identity issues arising in the case of rape.

Rape in Traditional Theology

In traditional and indeed contemporary mainstream theology, rape is examined predominantly from the perspective of Scripture and Natural Law. References to rape in Scripture are relatively few and the primary concern here is that of male property rights. In the Old Testament, for example, rape by an outsider is largely viewed as an act of aggression against male property, hence an act of hostility towards the males in a community. The rape of Dinah (Gn 34:1-31) and the rape of the concubine (Jgs 19:22-30) are classic examples. What is notable in these and other cases is that the violation of the woman *in itself* is not treated as an offense. Rape is also viewed as a crime against the community and a source of communal conflict.[9] Further references to rape in the Old Testament include legal references. Take Ex 22:15-16. Here it is stated that in the case of the rape of a virgin the rapist is required to pay the 'bride-price' *(mohar)* and must also marry the virgin Dt 22:23-29 similarly describes how the rape of a virgin leads to a forcible marriage with no divorce and the payment of 50 sheckles.

New Testament sources, on the surface, offer limited insight; rape is generally regarded to be subsumed under the general categories of adultery, vice or impurity. Theologian L. William Countryman[10], however, creatively explores the links between New Testament views of morality and the wider discussion of rape. He re-visits the notion of property rights from the perspective of the Kingdom, speaking of the 'metaphorical space' which surrounds the human person which is the essence of being human. This space is that aspect of the self which we freely open out to others in relationship. When this is broken by violence such as rape the very possibility of being human is denied, at least temporarily. On this basis he insists that there is no sexual sin more serious than rape.

An analysis of rape in the Tradition proves interesting. Historian Sylvana Tomaselli[11] argues that Augustine's contribution is important in that he challenges the Roman practice of self-inflicted suicide after rape, by the victim, for the sake of honour; he insists that the sin is that of the rapist and that the victim remains chaste in the eyes of God. The single most significant theoretical influence however is that of Natural Law as developed by Aquinas and subsequent neo-scholastics[12]. Natural Law theory when applied to the area of sexuality (the area in which rape is addressed traditionally) is clearly

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[9] J.R Halstead, "Sexuality" in C. Stuhlmueller, ed, *The Collegeville Pastoral Dictionary of Biblical Theology,* (Collegeville, Mn.: The Liturgical Press, 1996)900-903 at 902

[10] L. William Countryman, Dirt Greed and Sex: Sexual Ethics in The New Testament and Their Implication For Today (London: SCM Press Ltd.,) 1988, 36-38.

[11] S. Tomaselli, "Rape", in P. Barry Clarke & A. Linzey, eds., *Dictionary of Ethics, Theology* and *Society,* (London/New York: Routledge, 1996)714-718 at 715.

[12] Aquinas *Summa Theologiae, 11-Il. Q. 154. aa 11.12.;* See also R. Gula, *Reason Informed By Faith: Foundations of Catholic Morality (New* York/ Mahwah: Paulist Press 989) 222-223.

'physicalist'. In other words, it looks to physical arid biological structures when it identifies the end goal of sexual activity as procreation. Under this schema, sexual activities which may result in procreation are not considered to be ''contrary to nature' nor 'intrinsically evil'.

Rape, however unacceptable, technically fits this category since procreation is possible in its case. The logical fall-out of such a theory is that rape is somehow less grave morally than sexual acts which, by their physical nature, fail to allow for possible procreation, e.g. auto-eroticism, homogenital sexual activity, sodomy etc., which fall into the category of 'grave moral matter'.

Since historically Moral Theology tended to focus on 'grave' matters of morality, rape as a theological issue was largely ignored for many centuries. Indeed the treatment of rape throughout the tradition was narrowly confirmed to moral discussions related to contraceptive intercourse and abortion. These concerns remained consistent in the manuals of moral theology (1600-1960) and are still strongly reflected in treatments of rape in official teaching and mainstream theology. One most valuable contribution is that of E. J. Bayer[13] who thoroughly traces the development of the theological treatment of rape in the manuals of moral theology. His concern is primarily the question of pregnancy prevention in the case of marital rape but his analysis provides much information that is of significance in a more general discussion.

Bayer points out that the theologian Sanchez, in his work *Disputationes de Sancto Matrimonio* (1606) was most likely the first theologian to seriously raise the question of rape in marriage. Two issues were at stake according to Sanchez. The first was the question of the moral right of the woman to expel the rapist's semen, through flushing or otherwise. If we remember that the ovum had not yet been discovered it is clear that the primary concern was that of abortion. The second moral concern was the violation of what was termed the *bimestre* period. This was a period of two months, instituted by Gregory IX when a newly married woman was not obliged to consummate the marriage since she had the right, during that period, to leave marriage and enter religious life. Sanchez sought to argue some defense of the right of a wife to expel semen if intercourse was forced upon her during this *bimesfre* period. He was, however, more clearly convinced of this right to defense in the case of a raped, non-married, virgin woman and uses arguments regarding social shame in this argumentation.

By raising this as a theological question and by seeking a creative response, his theology might be regarded as quite innovative. Subsequent theologians, however, were to have a more restrictive position. Eventually the issue of rape went underground and remained so for a number of centuries until significant events, such as the discovery of the ovum and the mass rape of Belgian Congo missionaries m the 60's, brought it once more to the fore as a serious theological issue. In the last few decades the theological discussion in official teaching and mainstream theology has focused primarily on the examination of rape in Scripture, rape and Natural Law theory and ethics regarding contraception and abortion in rape cases. Questions of internal consent to rape and of the woman's right to self-defense

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[13] E. Bayer, *Rape Within Marriage* (London /New York: University of America Press, 1985)

are often raised. More recently, however, the social implications of rape, the sexual objectification of women and the violation of human dignity through the act of rape have featured as theological concerns in both official teaching and mainstream works.

Feminist Theology and Rape

Having its roots in liberation theology the feminist contribution[14] begins, not with abstracts and principles, but with concrete experience, hence it more closely mirrors women S actual experience of rape than traditional examinations of the subject. The feminist examination of rape is clearly situated in a critique of society as a whole. Hence, patriarchal socialisation processes and the intimate relationship between religion and patriarchy form the background to most feminist discussions on rape. Significantly rape is not examined in the context of sexuality. It is morally viewed as a sin of *power* as opposed to a sin of sexuality and is explored from the perspective of truth-telling arid just relationships.

Feminist authors take a more comprehensive approach.[15] They too examine the Scriptural treatment of rape but highlight in their analysis the question of male property rights and the subordination of women. The story of Eve, the violent gang rape of the woman in Judges 19 and a selection of Pauline texts are frequently quoted, among others, to this end. Feminist theologians go on to challenge exclusively male images of God, which are viewed as restrictive arid potentially harmful spiritually. Misogynistic texts in the tradition, particularly from the Church Fathers are highlighted (though sometimes in a selective manner). Formative religious stories are thoroughly critiqued (that of Maria Goretti in particular) arid theological definitions of rape are scrutinised from the perspective of patriarchal intentions.

Most significantly, however, traditional theologies of forgiveness, suffering, ownership, and sacrifice are profoundly challenged as abusive to women and as positive supports for a rape culture. Feminist writers argue that traditional interpretations of suffering, sacrifice and atonement have led to the acculturation of women to accept abuse.

Authors such as Carlson Brown and Parker[16], for example, describe Christian theology as an abusive theology that glorifies suffering. Rape it is insisted is not redemptive. In itself, it is a dealer of death. In feminist works theologies of ownership are strongly challenged also. Here case studies are referred to where rapists justify their acts of rape arid abuse by reference to ownership of the victim. This is commonplace in marital and partner rape but evidenced also in cases of incest. One man arrested for

[14] Its theology is praxis-reflection based. It uses women's experience as a primary category and serves women's liberation from oppression, in whatever form.

[15] For an overview of feminist approaches to the question of rape and sexual violence against women see
Schussler Fiorenza and M. Shawn Copeland, eds., "Violence Against Women", *Concilium,* 1994/ 1.

molesting his daughter insisted: "She is mine. I produced her. I have a right to her before anyone else".[17] For this reason feminist theology includes research on the psychological effects of ownership and the relationship between being owned arid having no identity.

The key question of forgiveness is explored in some depth. Feminist theologians point out that victims' stories indicate that Jesus' mandate that we forgive those who wrong us, while true in itself, has been used manipulatively for the purpose of silencing. Such theologians seek then to articulate the complex relationship between forgiveness, truth-telling, mercy and justice and challenge strongly the pathology of a 'forgive-and-forget' theology or practice viewing it as both simplistic and dangerous. They insist that theologies of forgiveness or reconciliation require treatments that acknowledge their enormous complexities and that pastoral practices need to be founded on more developed and enlightened theologies

The importance of authentic human relationships is frequently stressed in feminist works. Theologian Carter Heyward,[18] for example, insists that 'evil' is not some metaphysical reality but something profoundly personal, done from person to person, and that at its heart is a struggle for power. Her view is that victims of evil are rendered ineffective until they reclaim an authentic power. This power, she suggests, can only be recovered in genuine relationships. Insights such as these highlight the necessity of a supportive and loving community and this is very often shown to be significant in women's stories of post-rape healing. For this reason the importance of communal rituals of healing are regarded as central to any discussion on rape and reconciliation.

Concluding Comment

What is perhaps most striking of all in researching the treatment of rape in theology is the sore lack of dialogue between mainstream and feminist theologies. Cross-references are rare and serve very specific purposes and the overall sense is that both worlds are battling ahead in parallel rather than engaging in any real and helpful theological conversation. My hope is that a more in-depth, integral and comprehensive theology be pursued and that theological research on the experience of male rape, so minimally explored theologically to date, will be a priority in the future.

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[16] J Carlson Brown and R. Parker, "For God So Loved The World" in J. Carlson Brown and C.R. Bohn, eds. *Christianity, Patriarchy and Abuse: a feminist critique,* Cleveland, Ohio: The Pilgrim Press, 1989, 1-3o at 26
[17] Cited in *Concilium,* op.cit. 47.
[18] Carter Heyward. *The Redemption of God,* (London: University Press of America Inc., 1982) 162.

Ethics and Business

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To many, the old adage that business and ethics never mix, has been reinforced by the constant revelations of the various tribunals set up since the early 1990's. Laura Nash, Associate Professor at Boston University Graduate School of Management has stated "*Many an executive today voices cynicism at the relevance of moral inquiry to managerial practice. For many reasons from the external fact of greed to the very different ways in which we tend to think about managing and morality, ethics and business have often seemed if not downright contradictory, at least several worlds apart*" Commentators on Irish business practice might tend to agree with Nash as Irish company law has been characterised, by a culture of non compliance with only 13% of companies filing returns on time in 1997 to the Companies Office. Persistent breaches of the Companies Act, banking scandals, alleged payments to politicians, and company non compliance with many regulatory bodies, would lead most observers to believe that the question of business ethics has never been high on the agenda of certain Irish companies and entrepreneurs.

Business practice Irish style is best reflected in Howard Kilroy's, Outgoing Governor of Bank of Ireland, answer to a shareholder's question regarding the banks activities vis a vis DIRT tax at the Annual general meeting in early July. He stated "*It is difficult to imagine what the climate was 15 years ago. It happened in all the banks. We could spend all day talking about it. It was a time characterised by winks and nods in government and perhaps in other places too.*" Whether this analysis of business practice and ongoing revelations has long term societal consequences is debatable, it certainly has awakened the interest of media and the Irish public at large in corporate malpractice.

The question of business ethics, the art of applying one's personal moral norms to the activities and goals of a business, has been top of the agenda of American business since the 1980s. Companies have witnessed the high costs of corporate scandals that have hit America, which included heavy fines, bad public relations, high employee turnover, and in many cases loss of market share and revenue. Major corporations such as Johnson & Johnson, Boeing, Xerox, Hewlett Packard and others have introduced ethics codes, social responsibility audits and ethics training to emphasise that high standards of personal conduct is an invaluable asset. A survey by Fortune 500 American companies in the manufacturing sector, and a further 500 in the services sector, revealed that;

- 91% had a written code of ethics;

- 49% had ethics training in place for all employees, and;
- 87% surveyed believed that the public is more aware of ethical issues in business than in the past.

While many cynics will still argue that the high moral ground of many major multinational corporations is motivated solely by profit, nevertheless the philosophy of the corporation's role in society has changed over the years. Milton Friedman's notion that the only responsibility business has is "*to use its resources and engage in activities designed to increase its profits so long as it stays within the rules of the game, which is to say, engages in free and open competition, without deception or fraud*" is now outdated. Friedman's argument could be seen as somewhat flawed when "the rules of the game" in many less developed countries would allow such things as the exploitation of child labour or environmental pollution. Current thinking would suggest that while the business of business is to maximise return for its shareholders, every business and its employees are major stakeholders in wider society. The business enterprise as a social and economic stakeholder in society is obliged to act in a morally responsible way towards any person or group it interacts with. Issues such as false/misleading advertising, creative accounting, genetically modified foodstuffs, dangerous products, recycling and destruction of the ozone layer have forced companies to balance their social responsibilities to the consumer with the return-on-investment demands of shareholders. Many American corporations balance their moral, social, economic, legal and societal responsibilities as part of normal business practice.

While the question of managing business ethics has become a major corporate issue in America, it will be most interesting if ethics becomes a major agenda item for Irish business in the light of the countless revelations of corporate ethical behaviour 'Irish style'. Many debate whether it is possible to manage ethical behaviour, given the complexities of the business environment, and the people who operate within it. To understand the activities of people in the marketplace, one must understand the essentials of human behaviour. Human behaviour and personal ethics are explained by both individual and situational factors. Behavioural research has revealed three personality measures that could influence ethical behaviour: ego strength, Machiavellianism, and locus of control. Ego strength is defined as a person's ability to engage in self directed activity and to manage pressurised situations while Machiavellianism is a measure of deceitfulness and duplicity. Locus of control is a measure of whether an individual believes that life's outcomes are determined by one's own actions or by actions outside one's control.

Another major source of ethical influence is socialisation. Gender differences, religious beliefs, age, nationality, work/life experience, marital status have all been identified as factors, which may influence the ethical decisions of individuals. A major socialisation factor for those in the workplace is the influence of others in the same environment. Social learning theory supports the idea that we learn appropriate behaviour by modelling the behaviour of people that we see as important - parents, relatives, friends, members of religious orders, teachers, mentors and public officials. Added to this list for many would be one's managers and colleagues, who are often seen as key influencers. In many

organisations the ethical behaviour of this group will influence the ethical behaviour of colleagues. Often different organisational factors/variables supersede personality and socialisation in making ethical choices. The philosophy, culture and managerial behaviour in an organisation will have major impact on ethical behaviour of all employees. Ethical philosophies will have little impact on employees' ethical behaviour unless they are supported by managerial behaviours that are consistent with the philosophy. If an organisation is serious about ethical issues, theory would suggest that areas such as reward systems, goals, systems of appraisal must be structured to account for ethical behaviour. It is a fruitless exercise establishing an ethics' policy when employees are pressurised to act unethically in their interaction with external stakeholders.

While internal variables can influence ethical behaviour, these same variables are always influenced by the external realities of the marketplace. Economic conditions, market share, pressure from managers and shareholders may also serve to undermine ethical behaviour in organisations. In the accountancy profession, an important influence was the changing nature of equity markets. The development of a vast array of creative accounting techniques was as a direct result of pressure from company investors to improve profits and strengthen the balance sheet. A healthy balance sheet ensured that there was a demand for shares, creating scope for rights issues, reducing the need for bank borrowing systems, justifying acquisitions or defending against takeover. Honesty, fairness and respect, attributes of most people's upbringing, are not left outside the office door when one goes to work, yet pressure from internal and external sources makes people compromise these attributes on a daily basis.

While conscience will sometimes stop unethical behaviour, fear of detection and punishment is also recognised as an inhibitor of illegal, immoral and unethical behaviour. In many instances regulatory bodies who police the marketplace, are seen by free marketeers as barriers to economic growth and development. However, the law does have an important role to play in shaping ethical behaviour. Business's pursuit of individualistic values is often at odds with government's collectivist public value goals. Yet most societies recognise the need for governmental regulation, in order to balance the pursuit of profit maximisation with the social and moral obligations of business. It is also important that regulatory bodies ensure that companies who obey the rules are not put at a competitive disadvantage by those unscrupulous enough to flout the law. Commenting at the publication of the Company Law Enforcement Bill in June 2000, Tanaiste Mary Harney stated "*a compliant corporate sector has the potential to yield substantial returns in business efficiency, business solvency, revenue yield and social solidarity but compliance with the disciplines laid down in company law both in relation to governance and accounting is beneficial to the enterprise itself. Any enterprise which takes compliance seriously is also likely to identify and avoid problems in good time which might otherwise threaten it's viability*". This warning comes in the light of the conclusions and recommendations of the Working Group on Company Law Compliance and Enforcement, established by Ms. Harney. These recommendations and the information coming through the various Tribunals of Inquiry and the investigations undertaken by Department of Enterprise and Employment showed (not surprisingly) that many people in business had a complete disregard for the law. It is debatable whether Irish business will follow their U.S.

counterparts and undergo a corporate cleansing programme, nevertheless Irish law and regulatory bodies will have to ensure that white collar law breakers are detected and punished like any other citizen of the state.

Despite current ethical theory, it is very difficult to have generic codes of ethical behaviour while competing in a multicultural global marketplace, with different value systems. While we learn appropriate behaviour by modelling the behaviour of persons we see as important, it is still difficult to manage a complex issue such as business ethics. Many instances of business malpractice are committed by people who never deliberately set out to commit unethical acts. Psychology and world history has shown us that members of almost any group can sink to depths of such immoral barbarity they would never do as individuals. In certain arenas of the business environment, ethical discussions are seen as not being 'macho', a threat to efficiency or contrary to the image of power and efficiency of the enterprise. In the international and indeed national marketplace, many people encounter each other with completely different value systems. How should a manager react to a difficult sales target in a declining market full of unethical competitors with shareholders pressurising the company? How does being reared in the right way, provide an automatic solution to a possible ethical dilemma and the choices that must be made about one's obligation to the customer, the shareholder or society in general? When it comes to business ethics there are no hard and fast answers to these questions. While national and international law has a very important role to play in punishing unethical behaviour, the efficient operation of a free market economy will depend on the deliberate maintenance of a complex set of ethical values in the face of ever increasing and often conflicting pressures.

Who Wants To Be An Entrepreneur?

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So you want to be an Entrepreneur? What does it take? Are you suited to entrepreneurial life? Have you got the required personality characteristics and what social factors influence whether or not you become an entrepreneur? While many studies have tried to answer these questions the results are somewhat mixed.

Just looking at some of our own indigenous entrepreneurs we can see they are a motley crew. Entrepreneurs come in all shapes and sizes, from different social backgrounds and with different motivations e.g. Michael Smurfit, Denis O Brien, Chris Horn. It would appear that there is no such thing as a typical entrepreneur. However studies have found that entrepreneur's share a common type of personality (McClelland, Brockhaus, Morris, O Connor and Rogers). Personality characteristics often identified with entrepreneurs include:

- **Need for achievement -** a need to prove oneself or seek personal accomplishment
- **Risk taking propensity and ability to identify opportunities -** entrepreneurs have the ability to recognise emerging patterns early, enabling them to get a head start on competitors. New opportunities are rarely revolutionary, but are often simply new ways of looking at old ideas e.g. Amazon.com. Entrepreneurs capitalise on change by chasing the opportunity in a short timeframe. While lots of us see opportunities it is the entrepreneur who takes the risk and marshalls the resources to pursue the opportunity.
- **Strong need for independence and control**
- **Internal locus of control -** this refers to the belief that one is responsible for one's own fate, that one has control over one's own life. This has been found to be a key characteristic of successful entrepreneurs.
- **Drive and energy**
- **Self confidence**
- **Tolerance of ambiguity and uncertainty**

These last traits are very important as the entrepreneur sets his/her own agenda and works in a constantly changing environment, where the 'Buck' generally stops with them alone.

Entrepreneurs have also been found to be good at problem solving, setting and attaining self imposed goals, dealing with failure and learning from mistakes. Learning from mistakes is very important because the entrepreneur rarely has the luxury of a mentor from whom to learn. Not many entrepreneurs can lay claim to all these traits and skills and it is therefore necessary to do a little honest soul searching and identify where your strengths and weaknesses lie prior to embarking on a business venture. This is an important exercise because in order to be successful the Entrepreneur will have to acquire resources he /she does not have. Ignoring your weaknesses e.g. lack of financial skills is not an option as it will lead to problems later on.

What really sets successful entrepreneurs apart from others however is their ability to fill the resources gap i.e. their ability to acquire resources in a practical, creative and cost effective manner. An example of this would be managing your limited financial resources tightly in the early days by hiring/leasing equipment instead of buying, working from home/garage until you can afford a premises, attracting investors, getting suppliers to give you credit, persuading marketing and finance professionals to offer up some of their valuable time to give expert advice, hiring multi-skilled, flexible staff who can grow with the business. Filling the resource gap requires highly developed networking and negotiating skills.

To complicate the matter the skills required to start a business are very different from those required to manage a growing enterprise. The Entrepreneur will have to adapt continuously as the business grows. Initially financial, marketing, technical and administrative skills are all important but as the business develops the traditional management skills of planning, leading and organising become crucial. Entrepreneurs need to be equipped with the business and technical skills not only to start a business but also to manage a growing venture. Many of these latter skills fortunately can be learned through training and experience.

Not all people who have entrepreneurial skills start businesses. The true entrepreneur is motivated to do so. Motivations vary and can start very early in life. Our social upbringing can strongly influence our entrepreneurial tendencies i.e. an entrepreneurial parent often creates an environment where entrepreneurial development is encouraged. Many studies support this e.g. Shapero and Sokal found that over fifty percent of company founders in the US had parents who were company owners, free professionals, independent artisans or farmers. A similar study in Ireland (O' Farrell 1986) found that a high percentage of new firm founders had fathers who were self-employed. Growing up in such an environment means self-employment is seen as a very acceptable career option. In Ireland we can see this tendency in our leading entrepreneurial families e.g. the O'Reilly's, Ryan's and Smurfit's.

The motivations for starting a business are manifold. Some people become self -employed because they do not comfortably fit in with the restrictions of the modern organisation (Kets De Vries). They resent and are uncomfortable with the rules and regulations and prefer the freedom of working for themselves. Shapero found that 65% of the entrepreneurs in his study had started a business for negative reasons,

such as involuntary redundancy or job dissatisfaction. Another study found that 60% of entrepreneurs had decided to start a business long before they knew what type of business they wished to establish. Many entrepreneurs use the experiences they have gained in employment as a stimulus to 'try it' themselves. Ireland is full of company owners who learned their skills in Irish based Multinationals, before venturing out on their own.

Because entrepreneurs need to gain experience in their chosen market, many work for a number of years in formal employment prior to starting a business venture. Hence the typical entrepreneur is between thirty and forty years of age (Cooper) and until recently was predominantly male. However there is encouraging news for budding female entrepreneurs as women in the US are starting businesses at twice the rate of men and 50% of all US businesses are expected to be owned by women by the end of this year. Hirsich and Brush found that the female entrepreneur is typically first born, middleclass, starts her business venture in the services sector at the age of 35 having first obtained a degree and raised her children.

Being a successful entrepreneur requires a mix of skills and resources, but above all it requires dedication, commitment, hard work, drive and energy. As such it is wise to start a business only when the timing is right, not just for the business opportunity but for you. Getting a business off the ground does not leave room for any distractions and requires strong family support. So if there are distractions in your life such as on-going studies, getting married or starting a family, then you should seriously consider the appropriateness of your timing, regardless of market conditions. If you are determined to be an entrepreneur there will always be another opportunity around the corner.

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Human Resources Management, a dynamic process of supporting an organisation's development.

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Human Resources Management is a situation specific process focused on a strategic corporate approach to people. Given the diversity of people in the work context and the particular time bound events/issues that define an organisation, human resources management provides customised management responses. Every organisation, be it public, private, a service organisation or a manufacturing organisation is at a unique stage in its own development at any point in time. Such uniqueness merits/evokes customised human resources management approaches. A start-up company is very different from a mature organisation, while the profit-making organisation is very different from the voluntary, not-for-profit organisation. All these characteristics are intrinsic to an organisation. Accordingly, it is across such a wide ranging and diverse spectrum of working environments that the Human Resources practitioner contributes to optimising the contributions of people (or human resources) to achieve an organisation's goals/mission.

While the spectrum of peoples' endeavours in the work place is diverse, there are common factors that prevail in all organisations, many of which are now assuming an un-precedented momentum as organisational change increases. People's working lives/environments are now being shaped by such issues as; family friendly practices, equality policies, working time directives (particular to the European economy) as well as flexible work arrangements such as teleworking and job sharing.

The context in which organisations evolve and develop also impacts on the way organisations, made up of people, develop and survive. Michael Porter, a renowned strategist refers to the forces/barriers that help an organisation to maintain its competitive advantages. A leading organisation can defend its position in the market place by virtue of its **reputation**, **the economies of scale** it has attained and the **cumulative learning** within an organisation. So, in practice, how do such insights inform human resources management?

In terms of **reputation**, every organisation has a particular appeal. For example, The Body Shop, established by Anita Roddice in 1976, acquired a reputation synonymous with environmentally friendly issues, social responsibility and accountability. The growth of The Body Shop brought particular challenges. Sales increased through the 1980's at c. 50% per annum. When it floated on the stock exchange in 1984, the shares opened on the first day at 95 pence and closed at 165 pence that afternoon. The unique characteristics of this organisation elicited particular human resources responses.

Intel, for example, as a company has achieved a global advantage in the market place with its microprocessors. That advantage has been attained by its unrelenting focus on innovative product development and its capacity to then deliver its products to the market in large volumes on time. The **economies of scale** that make up Intel's manufacturing capacity permits such an advantage to be maintained. Though such an advantage is not absolute as was noted when Intel was obliged to withdraw a flawed Pentium product in the mid 1990's and risked its reputation until such time as it agreed to offer a no questions asked exchange of a flawed Pentium product. Every organisation is susceptible to the environment it finds itself operating within – an environment shaped by market forces.

In relation to **cumulative learning**, if an organisation is new it will not have acquired a store of cumulative learning/expertise among its employees/human resources. That may trigger a particular human resources management strategy such as the recruitment of people with specific expertise/experience or alternatively developing internal learning/development plans for existing employees so that the competencies required for the organisation to succeed will become available to it. Depending on how quick an organisation needs to develop its competencies, it may chose to recruit external to the organisation -a fast track option - or to pursue the development of existing employees to achieve long-term competencies. The latter option will potentially be more successful as there is a greater possibility of internal employees forging a strong emotional link with the organisation. This in turn may lead to a situation where people are inspired to deliver consistently higher levels of performance in the work place.

The organisational challenges of any organisation in the new millennium are legion. The challenges include; a need for organisations to realise that the availability of sufficient resources will no longer guarantee its competitiveness in the long term. Today every employee's contribution to an organisation has to be optimised - a value adding contribution.

Labour turn over rates in Ireland have increased as people are less inclined to develop a long-term affinity with an organisation and often that reticence is prompted by less than positive employee relations or the way people are managed within an organisation. Low levels of un-employment and greater labour mobility among people now contribute to ever increasing levels of turnover among people. In many instances people are becoming more discerning about the organisations they join.

Such challenges are now prompting a new frame of mind or vision within organisations as the necessity of leveraging every person's skills and knowledge becomes critical to the present and future success of an organisation. People, in the new millennium, are becoming the only remaining source of competitive advantage, as technological advantages become readily available on a global scale to all organisations. The proverbial playing pitch is becoming more level as the global village becomes smaller, though the

players – the human resources - are becoming the unique factors that will ensure an organisation's success going in to the future.

The need to leverage human resources is now prompting fundamental questions on the part of organisations. For example, if a retail supermarket chain is employing people to run its employee canteens, there is a question to be asked within such an organisation; Are we in the business of retail food sales *or* are we in the food preparation and sales business? This question prompts a fundamental questioning of what the core business of such an organisation is in practice. The answer to the question will have human resource management implications – it will be either a matter of developing the internal knowledge/skills necessary for operating an employee canteen or sub-contracting that activity to a specialist provider of such a service. In a manufacturing organisation a similar question may be asked; do we outsource the manufacture of particular components with a view to then assembling those components and testing them within the organisation? Alternatively do we continue to make all the components we require to build a particular product? Implicit within such questions is another question; what are we good at doing best?

The time between expenditure on resources, such as training people in particular skill areas and the return on such an investment, as/when those skills are available and applied within the organisation, is now critically important. In addition, organisations are now recognising that particular employees cannot be allowed to retain/personify the core competencies of the organisation. Ideally the competencies that define an organisation's success ought to be prevalent among a large number of people within the organisation, such that the organisation's reputation is sustainable in the long term even if particular employees leave the organisation.

In the absence of customised people development strategies the prospect of particular employees leaving an organisation is a daunting one for any organisation's continued success. Short term human resource management practices tend to create such vulnerabilities, where an organisation fails to maintain/develop key-people and a downward spiral is started when people see an organisation becoming less attractive and people leave to work in other organisations. Succession management, an instrument of human resources management, has a part to play in reducing labour turnover in an organisation, where key employees are identified, developed and retained. Ultimately the social dynamics that shape an organisation need to be known and interpreted by the Human resources management practitioner if succession planning and employee retention is to happen successfully.

Every employee will essentially require a customised working context in which his or her respective skills and knowledge may be recognised, developed, applied and rewarded. The customising of an organisation's responsiveness to every employee's particular set of development needs, skills and career ambitions is one of the on-going challenges of the human resources management practitioner.

In the final analysis such responsiveness within an organisation can only be articulated if, in the first analysis, every organisation defines itself as a collectivity of individual people in pursuit of a shared goal/mission.

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Project Management in a Commercial Environment

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Abstract

Projects are proposed as a result of creative ideas and as responses to problems and planning. While relatively small projects can be managed on an informal basis, complex projects require formal project management in order to achieve specific objectives, obtain and allocate resources in an efficient and effective manner, meet allocated budgets, and ensure that critical time schedules are met. This paper examines the principal elements of project management by analysing the key roles which Project Managers play, the roles with which the Project Manager must interact, the methods available for the definition, monitoring, control and closure of the project activities. Risk management is examined in terms of risk identification, evaluation and management. Mechanisms for project monitoring, control and quality assurance are discussed. Finally, current project management methodologies are outlined.

Introduction

Projects exists to provide defined benefits to the organisation and a significant aspect of the project management task is to generate realistic goals, adequately estimate the time and cost required to achieve these goals, and to manage the project in a way which produces the desired outcome while expending as little resource as is practicable within the constraint of realising the overall goals (TPi 1999).

This paper introduces project management in terms of what tasks need to be done and how they should be organised to ensure successful project completion. Section 2 gives an overview of a project and outlines the need for project management. The main project participants and their roles are identified. These are project champions, sponsors, stakeholders, customers/suppliers, the steering group and the project manager. Section 3 looks at project development in terms of the project scope, goals, objectives and the project plan which outlines the who, what, how and when questions that must be answered when a company is undergoing change of any kind. Section 4 considers risk identification, evaluation and management. Section 5 evaluates project control and monitoring mechanisms. Finally, Section 6 reviews the main project management methodologies currently used in commercial projects.

Project Management

Need for Project Management

A **Project** has been defined as a '*temporary endeavour undertaken to create a unique product or service*' (PMBOK 1983). This definition was further refined by Wysocki as '*A project is a sequence of unique, complex and connected activities having one goal or purpose and that must be completed by a specific time, within budget and according to specification*' (Wysocki *et al* 1995) . In general, projects have seven characteristics (i) a one time focus, (ii) a specific purpose and desired results, (iii) a start and a finish, (iv) a time frame for completion, (v) the involvement of a cross-functional group of people, (vi) a limited set of resources and (vii) a logical sequence of interdependent activities (Randolph and Posner 1992).

No project can run efficiently without some sort of management. In any project, someone has to plan what has to be done and keep track of how things are going in relation to the plan (Britton 1997). The definition of **Project Management** by the PMBOK is '*the application of knowledge, skills, tools and techniques to project activities in order to meet or exceed stakeholder needs and expectations from a project*' (PMBOK 1996). More recently, this definition has been expanded as '*project management is the process of defining, planning, directing, monitoring and controlling the development of an acceptable system at minimum cost within a specified timeframe*' (Whitten & Bentley 1998).

In order to decide which projects should be pursued, an organisation must evaluate the costs, benefits and risks associated with each one. Overall an organisation should give highest priority to projects that promise significant benefits and a manageable level of risk (Donaldson Dewitz 1996). Effective Project Management works under the triple constraints of 'getting work done, within budget, to specification' (Davidson Frame,2000).

The Project Management Book of Knowledge (PMBOK) Guide describes the progression of activities that occur within a project as initiating, planning, executing, controling and closing. Movement from one phase of the project to another is based on established milestones that must be accomplished (PMI 1996).

A successful project is one where the product is delivered, customers perceived requirements are met, the supplier is able to continue further production and the customer is willing to use the supplier again (Norris *et al* 1993). More importantly, the project has been completed on time, within budget and to performance requirements (Markland *et al* 1995).

Project Participants

Champions, Sponsor, Stakeholders. Customers/Suppliers

Project Champions are individuals who take an idea for a new product or service and do all they can within their power to ensure its success (Schön 1963, Afuah & Tucci 2000). By actively promoting the idea and communicating and inspiring others they can help the organisation reach its potential (Howell & Higgins 1990). The project champion is the person who sells the project to management (Whitten & Bentley 1998).

Sponsors A project originates in the sponsors belief in it's need (Davis 1994). A sponsor is usually a senior level manager , whose protection sends a signal to political foes that they are dealing with a senior executive and who's support reassures the Champion and other key individuals involved in the project (Roberts & Fusfeld 1980). The sponsor is usually the person / department that underwrites the cost of the project (Whitten & Bentley 1998). Sponsors facilitate the initiating of the project by communicating the vision, providing resources and establishing project boundaries (Grauf 1995).

Stakeholders are the people and groups with an interest in the project and who can affect its outcome even if they are neither its participants or its customers (Alter 1999). Key issues for project management include the identification of any stakeholders, pressure groups and interested parties (Boddy & Buchanan 1992) and the evaluation of their impact on the project (Laudon & Laudon 2000).

Customers and **Suppliers** might be the same corporate body or may be independent of one another. The customer specifies the desired outcome of the project, makes use of the outcome and probably pays for the project, while suppliers provide the resources and skills to create that outcome (CCTA 1999).

Steering Group

A link between the project group and the sponsor/ owners is made by means of the steering group which meet regularly and provide guidance on the directions and priorities of the work, monitor progress and discuss difficulties particularly where external relationships are concerned. This group will generally bring together representatives of different organisations or departments involved in sponsorship of the project (Friend & Hickling 1997).

The Project Manager

Managers in any organisation formulate action plans to solve organisational problems, allocate the human and financial resources to achieve strategy and co-ordinate the work (Laudon & Laudon 2000). Projects are seen as separate and distinct from the normal organisational activities and the project managers role is seen as that of managing change, often facing the triple constraints of time, money and the specification (Boddy & Buchanan 1992).

The project manager has to collect information about what exactly needs to be done and how it is to be organised, how much it will cost and how long it will take and then look at the interdependencies of various tasks, skills and other resources (Morris 1994).

Project managers typically need to get things done with the co-operation of groups or functions over whom they have no formal authority. They have to engage in structured communication processes in order to ensure that all project members understand the goal and objectives of the project, each persons role within the project, reporting requirements and the quality standards to be met (Boddy & Buchanan 1992).

Once the project has begun the project manager directs the project activities and evaluates progress (Whitten & Bentley 1998). Boddy & Buchanan (1992) have proposed that project managers need to manage in four directions :

1. *Managing Up*

    Project Managers have to influence the attitudes and actions of senior managers in the processes of shaping goals, negotiating for adequate resources or seeking other forms of commitment and support. Senior managers, in turn, need help from project managers to articulate their vision of what the project can do and what realistic expectations might be ((Boddy & Buchanan 1992).

2. *Managing Across*

    Most projects depend on co-operation of other departments or external organisations to provide expert support, to advise on functional operations, to provide members of the project team or to change the way they operate as changes are brought in. Conflicts and disagreements among the key stakeholders may need negotiation to a solution and continuing effort is generally needed to maintain a sense of commitment to the project (Boddy & Buchanan 1992).

3. *Managing the Team*

    The temporary nature of project teams, the varying knowledge and interest of the members and the competing demands on each individuals loyalty makes this task difficult for the project manager (Boddy & Buchanan 1992). Project teams need to meet regularly to discuss and monitor progress (Whitten & Bentley 1998). Management of Project Teams is increasingly a specialised field of knowledge with a defined and growing set of principles, tools, metrics and procedures (Adler 2000). Members of the project team need to understand their own individual roles and responsibilities as well as their reporting relationship to the project manager (Whitten & Bentley 1998). Randolph and Posner (1992) have put forward a set of rules for successfully leading a project team summarised by the acronym DRIVER which stands for

    Develop the people individually and as a team

    Reinforce the commitment and excitement of people

    Inform everyone connected with the project

    Vitalise people by building agreements

Empower yourself and others

Risk approaching problems creatively.

Developing people is essential to a successful project, project managers must be just as concerned with team members' emotions and attitudes as they with budgets and deadlines (Markland *et al* 1995).

4. *Managing the Staff*

Project managers need to ensure the commitment of a wide range of staff, on whom the success of the project ultimately depends. Some need to change their way of working or cope with additional work, others may be called on to help the project team design solutions (Boddy & Buchanan 1992). Boehm (1981) found that capabilities of personnel were more than twice as important as any other factor in the management of successful software projects.

The project managers most difficult and important function is managing the project, monitoring tasks, schedules, costs and expectations in order to control those elements (Whitten & Bentley 1998).

Project Development

Scope

Project scope specifies what is or is not included in the study, it limits the functions and business areas addressed by the project and ensures that the project is focused (Donaldson Dewitz 1996). When describing what is to be achieved, it is sensible to state explicitly anything excluded from the project that some parties might have otherwise have expected to be included (Field 1995).

Project assumptions and constraints define those factors that cannot change, these might include absolute deadlines, available resources, current and expected technological advances (Whitten & Bentley 1998). Project constraints limit the resources allocated which include time, money and personnel, all of which are limited for any organisation. Other constraints may impose user requirements that the system must satisfy, for example, the system must be easy to learn and use. Any incompatibilities between objectives and constraints need to be recognised as early in the project as possible (Donaldson Dewitz 1996).

The scope statement is a narrative document which provides a basis for (i) a contract between the project team and the customer, (ii) confirming a common understanding of the project scope, (ii)) change control and (iv) making future project decisions (Thomas 2000).

Goals

Effective project management requires clear, measurable goals and a definition of the benefits which the business will obtain by developing the system (Donaldson Dewitz 1996). Every project should have

one overriding goal (Whitten & Bentley 1998). Clearly defined goals are necessary to make the proper trade-offs in time, schedule and performance during the project (Markland *et al* 1995).

Objectives

Objectives are dated and measurable actions, results or conditions that are directed toward achievement of the project goal. They can be considered as a yardstick which ultimately measures the success or failure of the project (Whitten & Bentley 1998). The completion of the projects objectives will achieve the project goals (Markland *et al* 1995). Deliverables are tangible work products whose specification at each project step is a way of ensuring that the work is progressing - they provide a running history of what was done, when it was done and why it was done (Alter 1999).

The Project Plan

A project plan outlines initial answers to the *who, what, how* and *when* questions that must be answered when a company is undergoing change of any kind. The project plan is a summary of a project that divides it into sub-projects with start and completion times and identifies staffing, resource requirements and dependencies between project steps (Alter 1999). Having a plan helps in identifying unanticipated and organisational problems as they arise and in evaluating their impact (Alter 1999). Delivering a high quality information system is not sufficient, the system must be delivered on time, within budget and with a high level of user commitment. Hence, how the development process is managed is as important as the quality of the product delivered (Donaldson Dewitz   1996). Randolph and Posner (1992) have developed an acronym for successfully reaching the finish line of a project known as GO-CARTS which stands for :

> Set a clear **G**oal
>
> Determine the **O**bjectives
>
> Establish **C**heckpoints, **A**ctivities, **R**elationships and **T**ime estimates
>
> Create a **S**chedule.

Task Definition

An estimate is a document setting out a proposed budget for the project. You cannot estimate accurately how much a project, or part of a project will cost to implement until you know what it involves. Estimating a project involves determining what tasks have to be done in terms of the time and resources each task will take and the order in which the tasks must be carried out in order to optimise the effective use of the available resources (Keller 1995).

Work Breakdown Structures

The work breakdown structure (WBS) is a hierarchical decomposition of the project into phases, activities and tasks (Whitten & Bentley 1998). The National Aeronautics and Space Administration's *Handbook for Preparation of Work Breakdown Structures (1975)* defines the WBS as '..*a family tree subdivision of effort required to achieve an objective. The WBS is developed by starting with the end*

objective required and successfully subdividing it into manageable components in terms of size and complexity. It should be task or product orientated and should include all the necessary effort which must be undertaken to achieve the end objective'.

The work is specified in ever finer detail until a task list emerges, equivalent to the statement of work that describes in detail the work one individual or a very small team will carry out (Rook 1991). It should be possible to test whether a package of work is complete and the work elements should be well-defined tasks that can be completed in a reasonable period of time (Keller 1995).

A method for depicting the WBS includes an outline format as shown in Figure 1

```
1.      Phase 1 of the Project
    1.1 Activity 1 of Phase 1
        1.1.1   Task 1 of Activity 1.1
            1.1.1.1             Step 1 of 1.1.1
            1.1.1.2             Step 2 of Task 1.1.1
            1.1.1.3             . . . .
        1.1.2   Task 2 of Activity 1
        1.1.3   . . . .
    1.2 Activity 2 of Phase 1
2.      Phase 2 of the project
```
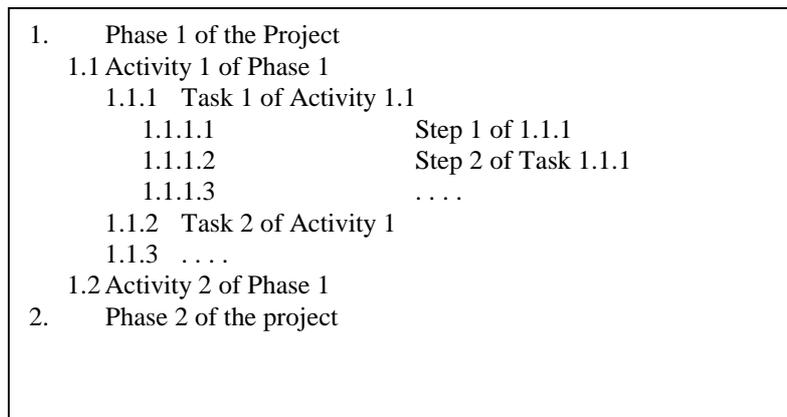
Figure 1 : Outline WBS for a project (Whitten & Bentley 1998).

The WBS is not concerned with the order in which the tasks are done, how long they might take or how many people are needed (Markland *et al 1995)*. At the lowest level of the structure, each task list item becomes a specific statement of the task to be done known as a Work Package (Keller 1995). Work Packages (WPs) are defined in BS 6046 Part 1 (1992) as '.. *related products and functions brought together ... [to form] parcels of work which can be individually planned, resourced and costed which can be used to produce a project budget and to monitor performance against this. They are not restricted by date boundaries or by project phases* '.

A WP Document specifies a statement of work (SOW) for the work to be done for each package described in the WBS and determines what is to be done, who is responsible, start and completion dates, deliverables and milestones for the package. The SOW will include details of the supplies, materials, components and parts that will be required for each WP (Keller 1995). A milestone is an event that signifies major accomplishments or events during a project such as the completion of a phase or the production of a deliverable (Whitten & Bentley 1998). Inadequate development of the work breakdown structures (WBS) will likely cause a future effect of an incorrectly developed schedule (Bailey 2000).

Product Breakdown Structures

In some projects, it may be necessary to use a product breakdown structure (PBS) which deals with machinery, equipment and software which consists of components that need to be estimated separately. This will allow comparisons to be made between elements from different suppliers in order to determine optimum choice and to estimate costs (Keller 1995).

Figure 2 : An example of part of a PBS diagram for designing a mountain bike.
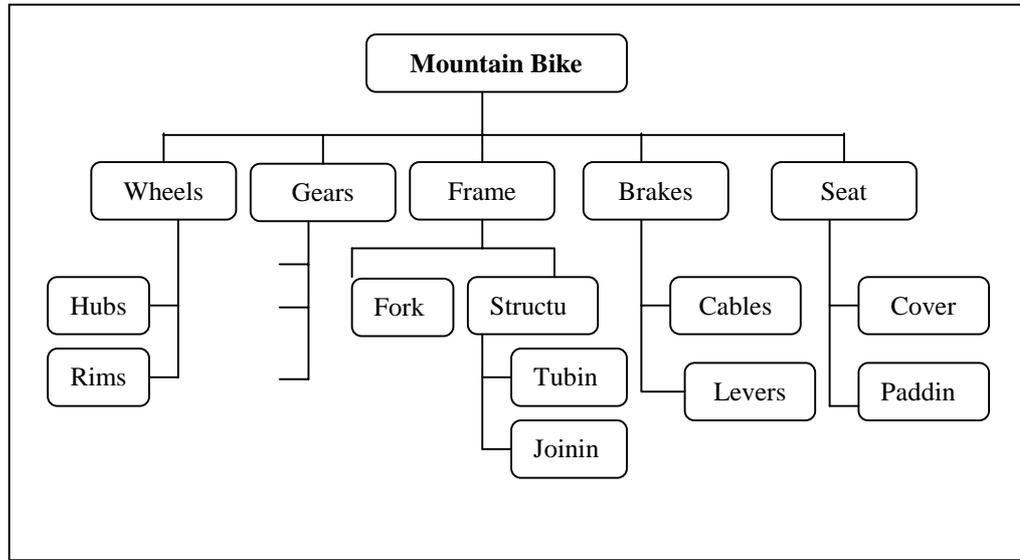
(Markland *et al 1995)*

Cost Breakdown Structures

The cost breakdown structure (CBS) shows details of all the cost categories for a project and will include information garnered from the WBS, WP definitions and SOWs, PBSs if they have been required. Other cost items, including labour costs, expenses and overheads will also be included (Keller 1995).

The Project Schedule

The essence of project management is controlling tasks that occur in a particular sequence and have an expected duration. Dividing the project into steps clarifies what need to be done and helps the people doing the project understand what they have to do and where it fits into the overall project (Alter 1999). Many projects must be completed within a deadline around which the project schedule must be built (Whitten & Bentley 1998). The project schedule is a terse project description identifying the timing of major steps and who will do the work (Alter 1999). The project schedule should be developed with an understanding of task time requirements, personnel assignments and inter-task dependencies.

Milestones

The first step in drawing up a schedule is to divide the work into main phases. A baseline is used to represent the status of the project at the end of significant phases of work (Field 1995). Milestones are events that signify major accomplishments or events during a project phase (Whitten & Bentley 1998). The characteristic of a good milestone is that there should be no room for doubt about whether it has been passed or not (Field 1995). Managers can put a date to a milestone and use it to monitor development of the project (Britton, 1997).

Project Timing

The work breakdown structure (WBS) discussed in Section 3.5.1 does not address the timing of individual work elements (Markland *et al* 1995). A **Gantt chart** is a simple horizontal bar that depicts project tasks against a calendar.

Each bar represents a named project task, the tasks are listed vertically using a horizontal time scale (Whitten & Bentley 1998). Each activity in the Gantt chart is an element in the WBS structure, so a cross reference can be made to the WBS to show information about that activity. Figure 3 shows a typical Gantt chart.
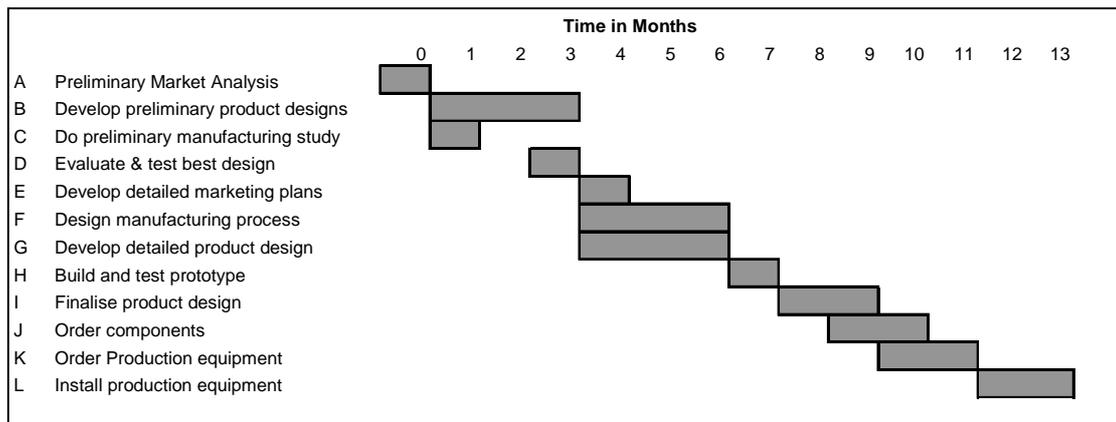
Figure 3 : Gantt Chart for Mountain Bike Development Project (Markland 1995)

There are a number of variations on the simple Gantt chart which convey more information, colour may be used to show activities that are the responsibility of a particular department or to indicate progress on a particular activity (Field 1995).

However, Gantt charts do not explicitly express the precedence relationships of activities (Markland *et al* 1995) except by inference (Field 1995).
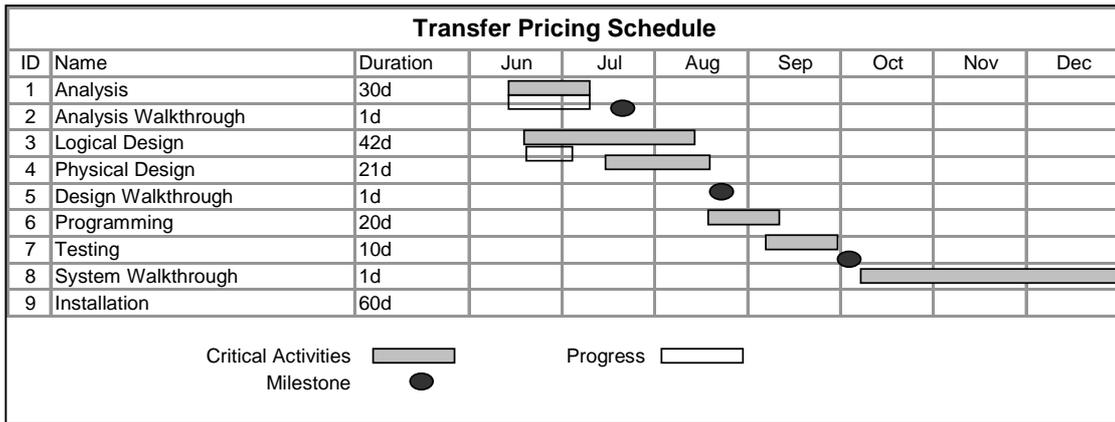
Transfer Pricing Schedule											
ID	Name	Duration	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1	Analysis	30d									
2	Analysis Walkthrough	1d									
3	Logical Design	42d									
4	Physical Design	21d									
5	Design Walkthrough	1d									
6	Programming	20d									
7	Testing	10d									
8	System Walkthrough	1d									
9	Installation	60d									

Critical Activities   Progress

Milestone

Figure 4 :   Gantt Chart for Planned Sequence and Timing of the Different Steps in an Information System Project (Alter 1999)

Network Techniques

These are used to portray graphically the interrelationships of the elements of a project and to show the order in which the activities must be performed (Markland *et al* 1995). To develop a network, the planner has to be able to answer two questions for each activity (i) what must be done before this activity can start? and (ii) what can be done once this activity finishes? Activities that can overlap in time can then be ascertained (Field 1995). One of two methods - *activity-on-arrow* or *activity-on-node* is used to construct project networks (Markland *et al* 1995).

Activity-on-Arrow

An activity-on-arrow diagram is shown in Figure 5. Each activity is represented by an arrow which starts and finishes at a node which represents an event, a point of zero time duration, which signifies the completion of *all* the activities leading to that node.
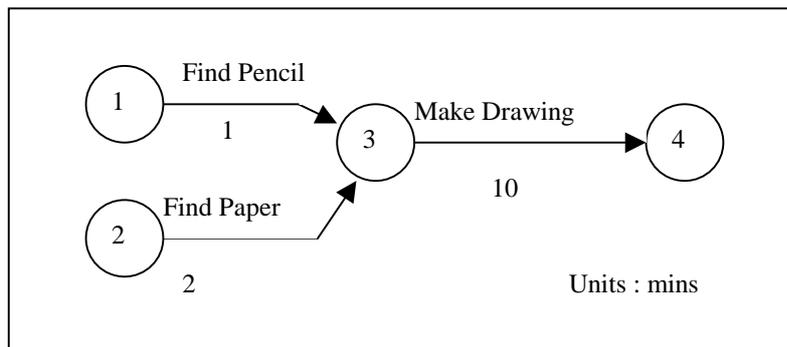

Figure 5 : Activity-on-arrow Network (Field 1995)

In Figure 5, the activity *Find Pencil* is independent of *Find Paper* but only when both have been completed is Event 3 reached and the activity *Make Drawing* be started.

Critical Path

Given the estimated duration of each activity, the minimum time necessary for the whole project can be calculated - the time taken from the longest path from the beginning to end which is known as the Critical Path (Whitten & Bentley 1998). There may be more than one critical path in a network if there are several paths of the same length and the activities are usually referenced back to the WBS references (Field 1995). Given the activity durations from the project network, the minimum completion time for the project can be determined by adding the critical path activity time-spans (Makeland *et al* 1995). Therefore, it is possible to determine whether the project will fit into the time allowed for it (Fields 1995).

Analysing the Network

Since each activity in the Network diagram has been given an estimated duration, the earliest time at which each node can be reached can be found (in Figure 5, the earliest time node 3 could be reached is 2 minutes). Most projects will have a required completion date, so the latest time by which each node must be reached can be calculated backwards in order to meet this requirement. Figure 6 shows how the activity-on-arrow diagram would be drawn if the completion time for the project in Figure 5 was 15 minutes.
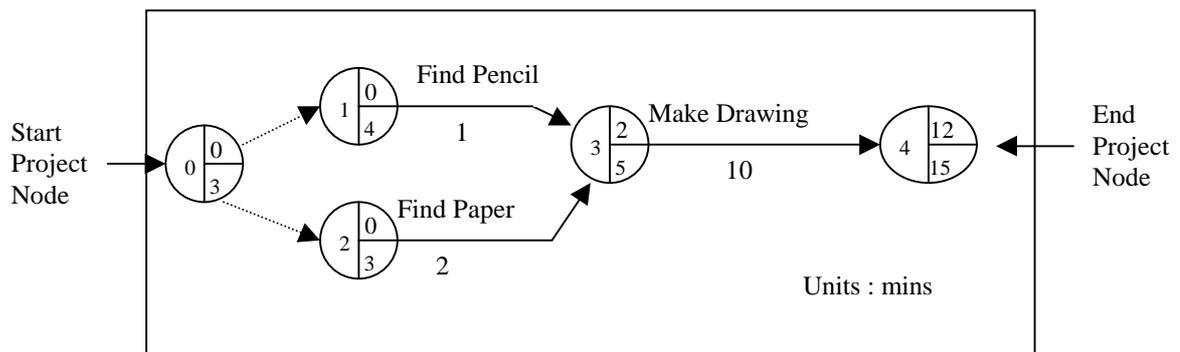

Figure 6 : The Drawing Project Analysed (Field 1995)

The convention shown in Figure 6 is the British Standard System where 3 is the Node Identifier, 2 is the earliest event time and 5 is the latest event time (BS6046 1992).

Some activities could increase in duration while still enabling the project to be completed by the required date, such activities exhibit **Float**, which is the excess time available for an activity in addition to its estimated duration without delaying the project (Markland *et al* 1995).

## Program Evaluation and Review Technique *(PERT)*

In the Activity-on-node network,

EST	Duration	EFT
Activity Identifier		
LST	Float	LFT

the roles of the node and arrow are reversed. The large compartment in the middle can be used to contain the event description, the top corners show the earliest start (EST) and finishing times (EFT) as calculated for the activity-on-arrow network. The bottom row shows the latest start (LST) and finishing (LFT) times and the total float (BS 6046). The redundant information given in the nodes has the advantage of displaying all the data on an activity without requiring further calculation (Field 1995).

Figure 7 : The activity-on-node Network Diagram for the Drawing Project (Field 1995)
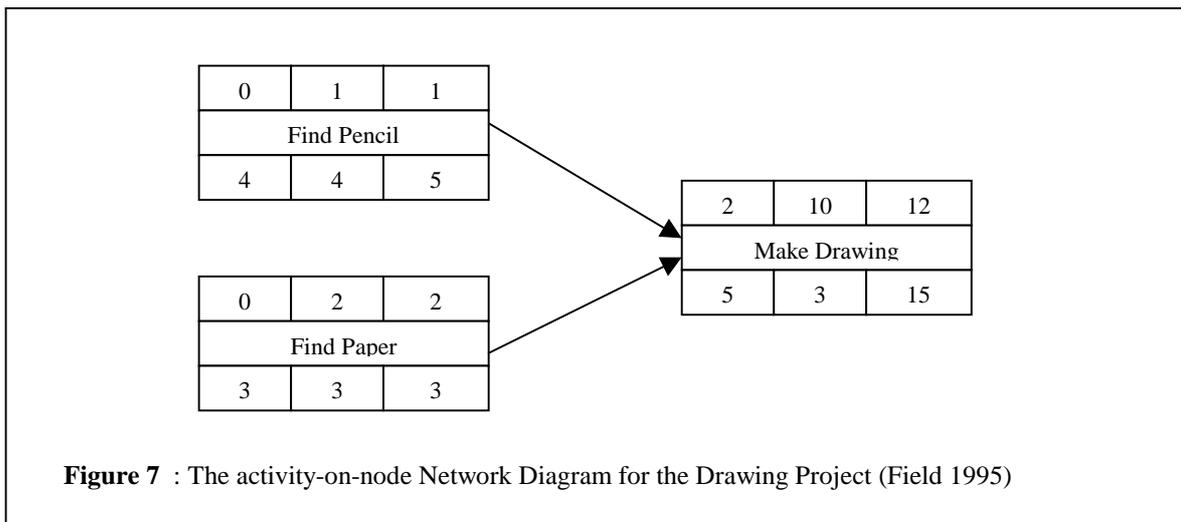
PERT diagrams can be easily used to represent relationships between activities other than the normal finish-to-start relationships, these relationships might also include a lapse of time - **lag** - between two activities. Figure 8 shows and example of a situation where there is four week lag between starting the design and beginning the manufacture of a component regardless of the duration of the design activity (Field 1995)

Figure 8 : Start -to Start Lag (Field 1995)
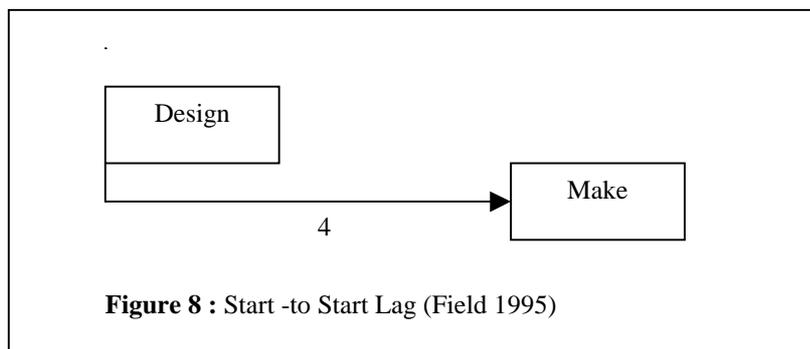
The network diagram of the activities and their dependence on each other need not change significantly even when the estimated duration for activities is altered (Field 1995).

Project Management software allows the best feature of PERT - the critical path analysis - to be incorporated into Gantt Charts. As activities, their duration and dependencies are entered, Gantt Charts are scheduled to take into consideration the dependencies with the critical path highlighted in bold facing or colour (Whitten & Bentley 1998). As the project proceeds, the chart can be updated with actual progress allowing a clear view of whether the project is on schedule be easily seen (TPi 1999). There are a number of computer based software packages available including MS Project, SuperProject which carry out these functions.

Resources and Scheduling

The task of managing a project involves deploying resources to achieve a specific result. Resources are usually limited and they can have a significant effect on the ability to complete a project on time and within budget (Markland *et al* 1995). There are two extreme situations, the first the case of unlimited resources within a fixed time project and the case of limited resources within a flexible project time. When unlimited resources are available, the objective of time scheduling is to profile the resource usage as economically as possible (Field 1995). When resources are limited, the project manager must utilise available resources to optimise the smooth running of the project, by prioritising the tasks according to the critical path through the project (Field 1995).

Estimation

As a project moves forward, there is a planning wave that rolls ahead of activity execution and elaborates the detail of the work about to be done (Harrison 1992). Similarly, organising and staffing are continuing activities (Field 1995). Project estimation can be described as the process of assembling and predicting costs of a project over its life cycle, forecasting is the process of developing future trends along with the assessment of future probabilities, uncertainties, and inflation that could occur in the project (Thomas 2000). Estimating a project will require several iterations, as more is known about tasks, materials and human resources the estimate must be refined (Field 1995). Cost budgeting is the process of establishing budgets, standards and a monitoring system by which the investment cost of the project can be measured and managed (PMI 1996). There are a number of distinct tasks to be undertaken in the process of estimating. These include:

1. A task list from the WBS
2. A list of materials, components, supplies
3. A PBS if required
4. A cost breakdown structure and cross references
5. Applying a rate to the cost of staff time
6. Any data not included above, for example extra temporary project staff

(Keller 1995)

Anticipated cost escalation as a result of inflation during the project must be also be included (Harrison 1992). In addition to this, the project estimate will need to include contingency allowances to cover minor changes and omissions and to provide some insurance against risk (Keller 1995).

Contract

Contract terms normally encompass price, delivery criteria, completion time, payment guarantees, penalties and exclusion clauses. Both the client and contractor need to check that the contract contains a complete specification of what is to be done, states any constraints on how it is to be done, includes any standards or intellectual property rights that need to be adhered to by the contractor, sets out key delivery dates and milestones including interim stages and deliverables and ascertain whether any allowance for controlled change is included (TPi 1999).

Risk

Risk is a major factor to be considered during the management of a project. Risk has been defined as '*The chance of exposure to the adverse consequences of future events*' (CCTA 1999). Project risk is the likelihood that a proposed system will not satisfy the project goals (Donaldson Dewitz 1996). The sooner a problem is discovered, the sooner corrective action can be taken and the possible side effects of the problem curtailed (Britton 1997). In order to contain the risks during a project, they must be managed in a disciplined manner, this involved risk analysis and risk management (CCTA 1999).

Risk assessment involves obtaining a clear definition of risk, including the sensitivity of the project to the risk and the likelihood of the risk occurring (Keller 1995). Highly structured projects whose requirements are straightforward and clearly defined, where the users know what they want, what the project out come should be and where their needs are unlikely to change run a much lower risk that projects whose requirements are relatively undefined, fluid and constantly changing, where outputs cannot easily be fixed because they are subject to users changing ideas or where the users cannot agree on what they want (Laudon & Laudon 2000).

Risk Identification

The process of risk assessment is more than simply identifying the risks, it includes a clear definition of risks, analyses the risks in terms of their impact on performance, cost, schedule and quality and estimated projects exposure (the probability of the risk occurring during the execution of the project) and prioritises the risks according to that exposure (Keller 1995). Figure 9 shows how assessments of risk fit into the planning of a project.
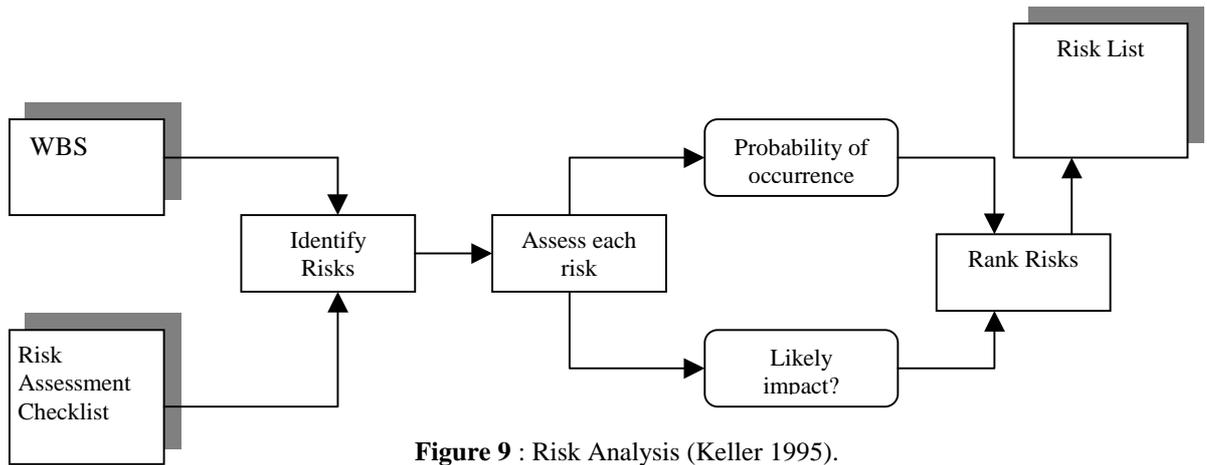
Figure 9 : Risk Analysis (Keller 1995).

Risk Evaluation

Researchers have identified three key dimensions that influence the level of project risk, these include project size, project structure and the level of technical experience of the staff and team (McFarlan 1981). These are summarised in Table 1.

Size of Project	Structure	Technology Level	Degree Of Risk
Large	High	Low	Low
Small	High	Low	Very Low
Large	High	High	Medium
Small	High	High	Medium-Low
Large	Low	Low	Low
Small	Low	Low	Very Low
Large	Low	High	Very High
Small	Low	High	High

Table 1 : Evaluation of Project Risk (Laudon & Laudon 2000)

A project that is economically feasible may be infeasible for organisational, technical or operational reasons. A high-quality system that is delivered on time, within budget, and with high user commitment, and that helps the organisation meet its strategic objectives, will usually be one which considered the level of risk and the likelihood of the identified risks actually occurring (Donaldson Dewitz 1996). A typical Risk evaluation form is shown in Figure 10.

The higher the total score achieved in the evaluation, the lower the risk associated with the project. However, individual factors would also need to be taken into consideration because a negative rating on a few key factors can increase risk substantially. For example, negative ratings on 3c and 4c and positive ratings on all other factors would yield a total score of 10, indicating low risk. However, a

project requiring developers to use new technologies and lacking user support is actually high risk so the project managers judgement will usually be required to fully evaluate the risk involved (Donaldson Dewitz 1996). It is important to prioritise risks in terms of project exposure, effect and what problems will be associated with compounding risks (Keller 1995).

PROJECT RISK EVALUATION FORM		
Project: **Completed By:**		**Date:**
Factors affecting project risk	**Rating***	**Comments**
1. **Characteristics of the organisation**		
a. Has stable, well-defined objectives?		
b. Is guided by an information systems plan?		
c. Proposed system fits plan and addresses organisational objectives?		
2. **Characteristics of the information system**		
a. Model available/clear requirements		
b. Automates routine, structured procedures ?		
c. Affects only one business area? (No cross functional or inter-organisational links)		
d. Can be completed in less than one year		
e. Uses stable, proven technology		
3. **Characteristics of the developers**		
a. Are experienced in chosen development methodology?		
b. Are skilled at developing functional requirements?		
c. Are familiar with technology and information architecture?		
4. **Characteristics of the users**		
a. Have business-area experience		
b. Have development experience?		
c. Are committed to the project?		
Total Points		
* +1=yes; 0=maybe; -1=no		

Figure 10 : Project Risk Evaluation Form (Jordan & Machesky 1990)

Contingency Planning

Contingency Planning involves '*identifying the range of alternative options for providing acceptable recovery strategies in the event of loss*' (PRINCE 1993). General contingency strategies are :

- **Prevention** where countermeasures are put into place which either stop the threat or problem from occurring, or prevent it having any impact on the project.

- **Reduction** where the actions either reduce the likelihood of the risk developing or limit the impact on the project to acceptable levels.

- **Transference** which is a specialist form of risk reduction where the impact of the risk is passed onto a third party.

- **Alternatives** procedures previously identified and described in detail which will come into force if and when the risk occurs or selecting alternative ways to proceed from the point at which the hazard occurs.

- **Acceptance** where it is decided to go ahead with the project and do nothing (this option should be a positive choice) (CCTA 1999).

Risk Management

Risk Management is the '*identification of counter measures necessary to meet the requirements identified in risk analysis*' (Prince 1993). Risk management consists of four major activities.

Planning consists of identifying the quantity and type of resources required to carry out the actions and obtaining management approval for the provision of these resources.

Resourcing which will identify and assign the resources to be used to carry out risk avoidance. The resources required for the prevention, transfer or reduction actions will have to be funded from the project budget.

Monitoring - watching for early signs warning signs that a risk is developing and checking that the execution of the planned actions is having the desired effect.

Controlling which is taking action to ensure that the events of the plan really happen.
(CCTA 1999).

During the course of the project execution, it will be necessary to review the list of risks and risk factors to determine whether any risk has become or is likely to become critical at any time soon and whether

any new risks have arisen which require assessment and possible planning or immediate action (Keller 1995).

Control

Changes are inevitable if a project is to take advantage of new opportunities, adapt to changing circumstances or to avoid problems. However, any change usually increases both the cost and duration of the project (Field 1995). Each project should have sufficient control mechanisms to allow project progress to be monitored. The controls selected for the particular project will depend upon the size of the project (TPi 1999).

Monitoring and Control

Monitoring and control are the project manager's predominant activities during the execution of a project (Field 1995). The elements of control of any task are knowing what should happen, monitoring progress, comparing actual progress with planned progress and doing something if actual and planned progress differ (Carter *et al* 1988). Meredith and Mantel (1989) have defined control as '*the act of reducing the difference between plan and reality*'.

Controlling the Project

Projects plans have little value if they are not executed in a controlled way that hold performance to plan (Morris 2000). The project manager needs to continually gather information about the status of the project , compare all current measurements with their desired values (as set out in the project plan) and initiate action to bring the project back under control where discrepancies occur (Field 1995). The resources expended on the project in terms of people, time and how money is spent (e.g. travel) also need to be monitored and controlled (TPi 1999).

Controlling the Cost

The ultimate objective of project management is to monitor and control costs while keeping the project on schedule. Cost control is the process of gathering, accumulating, analysing, monitoring, reporting and managing the costs on an on-going basis (Thomas 2000). Reviewing the actual project costs for all completed and partially completed activities and comparing these costs with the planned costs can identify cost overruns for which corrective action may be taken (Markland *et al* 1995).

Maintaining the Schedule

The method for estimating the date at which a project will be completed is to update the project network to reflect the current position. A less detailed method involves milestone tracking that concentrates on recording the rate of progress past the milestones. Deviations from the project schedule are known as slippage, which must be controlled to put the project back on track (Field 1995).

F. Brooks (1974) summarised the difficulties of getting projects back on schedule by coining the term the *mythical man-month*, which implied people are inter-changeable and can be added to a project at any time. In fact people are interchangeable only in project that require little knowledge, communication or learning and adding many new workers to an ongoing project may temporarily halt progress (Alter 1999).

Developing a course of action to quickly restore project control is critical to preserving project value, maintaining stakeholder support and improving team morale (Bailey, 2000).

Quality

Quality is defined as part of ISO 8402 (1986) as '..*the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implicit needs*'. Quality is monitored by reviewing and testing what has been produced, a quality review is an examination of some part of the work which could vary from simply asking someone to check over work, to formal assessment of the product in which all problems are documented (TPi 1999).

Quality planning is an essential part of developing a project, to capture the quality assurance activities necessary for successful delivery. A key factor concerns acceptance criteria which provide decision rules by which a particular product can be accepted or rejected - this may include benchmarks where a deliverable may not be amenable to acceptance criteria (TPi 1999).

Validation is the process of checking that a product is what the client wants and verification checks that the product produced at one stage conforms to the specification that was supplied to it (Boehm 1981). A product of an acceptable quality will conform to all of the requirements, a product of unacceptable quality will conform to only some or none of those requirements (CCTA 1999).

A quality audit is carried out for the specific purpose of checking that quality standards are being applied, it involves establishing a review of the present state of the project against the project baseline - what was expected at this point. (Field 1995).

Change Management

All users and managers have expectations of the project, over time these expectations can change (Whitten & Bentley 1998). The consequences of changes made during the project lifetime may be out of proportion to the actual change made, the effects of which may not be immediately apparent (Field 1995). The manager of a project can shorten the duration of an activity by assigning more resources to it. This will increase the cost of the activity and project managers need to consider such time/cost trade-offs (Markland *et al* 1995).

Changes are considered external if they directly affect the contract with the client. Despite efforts to keep fixed what the project is to achieve, new facets requiring development may be uncovered during its execution, a new technique or component may become available or the client may request changes. *Feature creep* is the uncontrolled addition of technical features to a system under development without regard to schedule and budget (Whitten & Bentley 1998). Internal changes are confined to the internal work of the project, which do not affect the agreed deliverables (Field 1995).

There is usually a standard form for the purpose of requesting and approving changes to a project, this identifies and gives the reason for the change, the requestor, the segments of the project affected and an estimate of the costs involved (Harrison 1992).

Configuration Management

Configuration management has been defined as '..*the discipline of identifying the configuration of a system at discrete points in time for purposes of systematically controlling changes to this configuration and maintaining the integrity and traceability of this configuration throughout the system life cycle*' (Bersoff *et al* 1980). The basic idea is that the components produced during the development of a project form a configuration of identifiable items which may be changed only in an approved and recorded manner (Field 1995). An example of a configuration item could be the agreed interface between two designers of individual components of a finished item such as how a handle might fit on a door where the handle is being designed by one and the door by the other.

Configuration management has four main elements, (i) configuration identification which uniquely identifies all items, (ii) configuration control system through which changes may be made, (iii) configuration status accounting which records and reports the current status and the history of all changes made, thereby providing traceability and (iv) configuration auditing which confirms conformity between the items in the configuration and their specifications and through all project documentation (Field 1995).

For simple projects version control, component tracking and document revision can be achieved using manual methods. For larger projects there are a number of computer based tools available including MKS Source Integrity and Star Team Server (TPi 1999).

Project Closure

Most projects have an end date, when the original objectives have been satisfied, the essence of a project closure is to inform all interested parties that the project is no longer operational (TPi 1999). A number of factors need to be taken into consideration including (i) handover and maintenance, (ii) documentation, (iii) contract completion, (iv) financial accounting and (v) the future of project staff (Field 1995).

Finally, the project should be reviewed and documented. The achievements should be compared with the plan in terms of quality, time and cost targets incorporating any follow-up actions that the project team would recommend to the client (Merdeith & Mantel 1989).

Methodologies

The advantage of using a project management methodology is that some of the uncertainty of managing a project is reduced by using the framework of a defined set of techniques and procedures (Field 1995)It had been found that companies that adopt project management methodologies are more likely to meet their delivery schedules (Hart 1994). Examples of current methodologies are outlined below.

Project Management Body of Knowledge (PMBOK)

In 1983, the Project Management Institute (PMI) published the a 'Project Management Body of Knowledge' which attempted to define what knowledge and skills the good project manager should have whose competence and skills will stem partly from their innate ability, their use of past experience and formal learning (Duncan 1994). The guide has been extensively revised and expanded and was released as the 'Guide to the Project Management Body of Knowledge' in 1996 (PMI 1996). It is possible to download the guide free from the PMI Web site at http://www.pmi.org .

The objectives of the PMI in producing the PMBOK have been to (i) identify generally accepted project management practice, produce a basic reference document, identify a common set of terms and act as a basis for project management training and accreditation (pmi.org 2000). The PMBOK is organised into nine key knowledge areas :

1.	Project Integration Management
2.	Project Scope
3.	Project Time Management
4.	Project Cost Management
5.	Project Quality Management
6.	Project Human Resource Management
7.	Project Communications Management
8.	Project Risk Management
9.	Project Procurement Management

Each area is prefixed by the word Project to make clear that each area covers only those topics specific to project management (PMI 1996). The PMBOK identifies a set of processes for each phase of the project. A process is defined as '*a set of actions bringing about a result*' (PMI 1996). Five groups of processes have been have been identified : initiating, planning, executing, controlling and closing. Within each group there are *core* processes which are often interconnected so that the output of one process is input for others and *facilitating* processes such as quality planning and risk identification(Hughes & Cotterell 1999). For each process, PMBOK defines inputs, techniques that may be used and outputs (PMI 1996). One of the most useful sources to the PMBOK is the 'Project Managers Desk Reference' (Thomas 2000) which is also available on line at http://www.4pm.com.htm .

PRINCE

Large organisations can have a number of projects being executed at the same time, each project making differing demands on management which in turn means that the degree of control will vary from project to project (Hughes & Cotterell 1999). The UK Government, through the Central Computer and Telecommunications Agency (CCTA) has sponsored a set of standardised procedures called PRINCE which stands for **P**rojects **IN C**ontrolled **E**nvironments which has become the *de facto* standard for government projects and is widely used in the private sector (CCTA 1999).

Although PRINCE was originally developed for the needs of information technology (IT) projects, the method as been used on many non-IT projects ((Hughes & Cotterell 1999). The method describes how a project is divided into manageable stages enabling efficient control of resource and regular progress monitoring throughout the project (TPi 1999). PRINCE is a process-based approach to project management, where the processes define the activities to be carried out. In addition, a number of components are described which are applied within the appropriate activities (CCTA 1999).
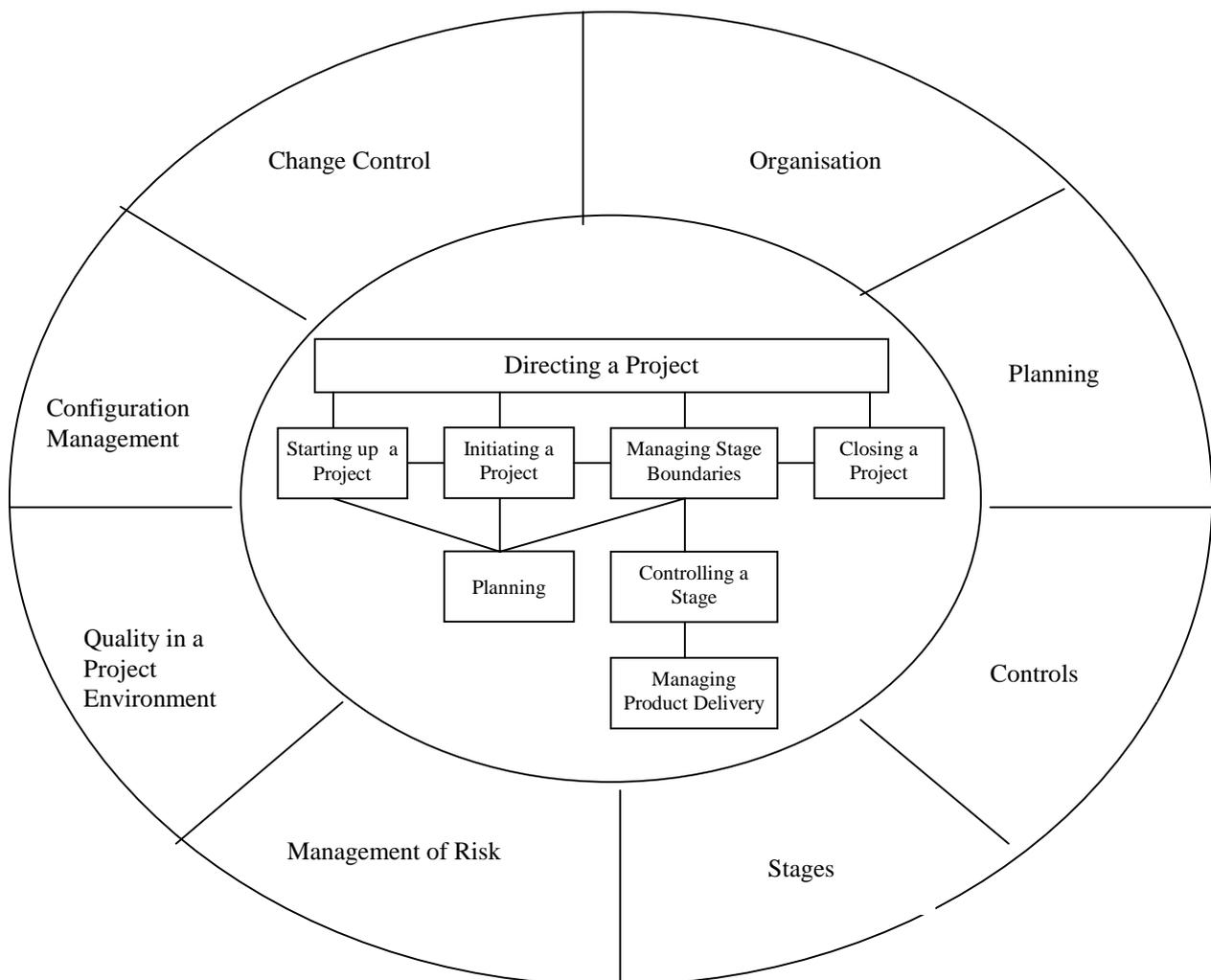

Figure 11 : PRINCE Processes and Components (CCTA 1999).

The PRINCE process model shown in Figure 11, consists of eight distinctive management processes covering the activities from starting the project, through controlling and managing the projects progress to the completion of the project (CCTA). Each process is defined with its key inputs and outputs together with the specific objectives to be achieved and activities to be carried out (PRINCE2 2000).

The process model provides the flexibility to establish a number of stages, each forming a distinct unit for management purposes (CCTA 1999). A key PRINCE 2 principle is to avoid too detailed planning at too early a stage, but to map out the detailed plan for the next stage as each stage is completed. Any inadequacies in the overall Project Plan can then be identified and updated (Hughes & Cotterell 1999). Project planning is product based and is focused on delivering results and are not simply about planning when the various activities on the project will be done (PRINCE2 2000). Throughout a PRINCE project, the projects business case which describes the organisation's justification, commitment and rationale for the deliverables or outcome is reviewed to ensure the business objectives, which often change during the lifecycle of the project are still being met (PRINCE2 2000).

Controlling changes is linked to configuration management which is focused on controlling the products being delivered knowing where they are at any point in time, what their status is, who is working on them and which is the latest version (CCTA 1999). While the PRINCE process approach is similar to the PMBOK, the PMBOK describes the components of processes at a much higher and more abstract level (Hughes & Cotterell 1999).) One of the most important benefits of PRINCE2 is the involvement of management and stakeholders at the right time and place during the project and good communication channels between the project, project management and the rest of the organisation (PRINCE2 2000)

Standards

National Standards Organisations were formed to promote credibility in the commercial world, ensuring that there could be basic trust and common expectations about the nature and quality of products and the processes by which those products have been created (Jardins 1984).

BS6079

The British Standards Institution published BS6079 : Guide to Project Management (1992) which is a set of guidelines which reflect current best practice. BS6079   provides credibility to the business community of broad project management principles. (Dooley 1997). BS6079 focuses on the project as a set of activities and encompasses detailed descriptions of techniques that cut across the normal functional structures of most organisations ((Hughes & Cotterell 1999).

It has been emphasised by the promoters of both PRINCE and BS6079 that the two standards are not in competition with each other, but rather that 'one of the major roles of PRINCE2 is to provide a means by which the British Standards can be implemented' (Newman 1997).

ISO 12207

Both PRINCE2 and BS 6079 are British Standards, international standards are covered by ISO 12207 which relates specifically to software development and focuses on documentation as its primary area of concern.

Conclusion

This paper has examined the essential principles of project management and the techniques used at all stages throughout the lifecycle of any project. Key aspects of a project and project management have been defined. The principal roles involved have been identified and their impact on the project discussed, including the interpersonal skills required of the project manager in terms of their interactions with all levels within the organisation. Project planning has been discussed in terms of the factors to be considered when setting up the project. Techniques for scheduling a project, including milestones, Gantt charts and networks have been described. The identification, evaluation and management of risks which could affect the attainment of project goals has been outlined. The application of quality auditing to ensure verification and validation of the project deliverables against the project baseline has been briefly outlined. Control mechanisms to ensure that projects can be monitored effectively have been discussed in terms of maintaining the project schedule and preventing cost over-runs. Finally, two of the most widely used project management methodologies, PMBOK and PRINCE II, and the standards to which they conform have been discussed.

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