Practical Pedal Propulsion

Avoiding the Potholes and Cul-de-Sacs
in considering the (re-) design of a Bike-for-Africa.

Today, as I write this, it is Tuesday 15th February 2005.
This morning I attended a *"Briefing to Experts"*
held at the Design Institute in Pretoria.
In April this year the Institute will host ***Interdesign***,

As I understand it, *Interdesign* is a periodic International Event, where industrial designers and students in industrial design from round the world come together to study a specific problem. They then put their heads together to try to come up with possible – viable and practical - design solutions for these problems.

Perhaps the particular problem studied is relative to conditions pertaining in the host country or even restricted to a specific region. Within a limited timeframe these designers will have the opportunity to observe these conditions first hand and interact with the people who have the problem.

However the design solutions forthcoming from these deliberations could well have wider applications, well beyond narrow regional confines or even national boundaries.

Renewed Energy and Enthusiasm for Pushing ahead on pedal Power.

A few years ago *Interdesign* looked into Water - or rather the lack of it.
The study at that time sought possible new methods of provision.
The specific problem to be studied here and now, again in Africa,
is one of N.M.T. – seeking new design ideas and solutions for
Non-Motorized Transport: Mobility in Rural areas of this country.

The area chosen for the study is the North West Province.
There, during April 2005, designers will ponder on the problem of providing
sustainable, affordable, practical, non-motorised transport solutions.

Although currently specifically a project limited to the N.W.; the outcomes are likely to suit African conditions and, by extension, other similar third world circumstances.

Amongst the vehicles being considered are donkey carts… and bicycles.

Does experience necessarily make one an Expert?

I have been invited to contribute in the capacity of an "Expert"
Now I know very little about donkey carts, but I do know something about bicycles - enough anyhow to know how relatively little I do know about specific aspects - for instance those of a technologically complex nature, requiring more specialized knowledge than I possess.

However my interest for the past six decades has been focused on bicycles – riding, rescuing, restoring, and researching the history and evolution of the bicycle: its design and progress from a technological as well as a sociological and cultural perspective.

Pushing Forward on a Return to the Past :
Pedal Power Potential far from Passé.

For the last decade at least, I have been involved in lobbying, primarily the Government but latterly also Commerce and Industry,
on the logic of a return to the bicycle, primarily as an economical, environmentally friendly means of rural mobility.

I believe that in rural areas particularly, wherever large industries, such as mining, do exist, many employing a sizable labor force, and on farms, no matter the size, employers could facilitate the ownership of bicycles.

This would help alleviate transport problems,
to the benefit of both employers an employees.

This then is part of my interest in the Bicycle aspect of *Interdesign 2005.*
My concern here is that the designers have the correct parameters within which to work - to rethink design in specific terms –
i.e. of a suitable bicycle to meet rural conditions here.

Design Background and The Evolution of the Bicycle

There is a school of design thought which advocates
"Thinking Outside the Box".
Good I say!
But then I advise : first explore "the box".
Know its dimensions.
Explore its limits.
Then go confidently beyond, knowing the answers lie elsewhere!

If the experts (so called, in my case) can contribute anything,
it is in advice based on experience.
It is not at all that:*" We Have Been Down The Road Before"*
We are still ***on*** the Road!

The need to look around but also to look back.

Speaking to the folk "on the ground" will explain some of the problems.
Speaking to and Hearing from people who have the experience of already trying to find solutions, will give an indication of some of the problems already experienced.

Bikes for Africa.

I heartily applaud the Design institute's initiative in bringing together designers to look at the design for an ***Afribike.***

That, in fact, is the current name of the organization
of which I was a founding and board member.
*Afribike w*as set up by ITDP (USA) and Re-cycle (UK)
to do just that - *recycle* discarded bicycles sent here from overseas.
It soon became apparent that this was not the way to go.

This whole rationale was explained to the DOT and influenced the direction of ***Shova Kalula -*** a government initiative within the DOT,
endorsed by Dullah Omar, which *Afribike* helped establish.

There being no bicycle industry in South Africa,
one was forced to look outside for solutions.

Design Criteria and Standards: Operating in Tandem.

Recognising the need to establish criteria for suitable bicycles for rural areas, Cyc-Ous has made some recommendations on what it believes to be essential in its design criteria.

B.E.N - the Bicycle Empowerment Network in the Cape, - in conjunction with the ITDP (the Institute for Transportation and Development Policy) together with design teams in the States and manufacturers in the East, have gone a step further in specifying, importing and distributing the "California Bike" mainly in urban areas, primarily via business and other organizations, for use by the employees of those concerns.

I myself have tried to interest Importers of bikes to this country in a specific bike for rural purposes. For various reasons too lengthy to discuss here, I have not succeeded. Yet!

I have also lobbied the organizers of Bicycle Design Competitions that often accompany overseas bike shows, suggesting, as a theme for the event, "Designing Bikes for Africa".

The Importance of Exposure.

Even if it did not produce revolutionary ideas, publicity of such a competition would at least help focus world production on the vast potential market in third world countries for the Right Bicycle *(Affordable, reliable, robust, easily serviceable… the characteristics for such a cycle are easily describable. Incorporating them into a product that benefits the producer as well as the user is the trick).*

A Fixed Focus….
is, to mind anyway, preferable to the current no-holds-barred approach where anything goes for entries to such events.
How do you compare and choose "the best design" when judging?
In selecting apples over pineapples, it is surely a matter of taste.
Few, if any, of these concepts submitted are ever taken up commercially, since the novelty value takes precedence over usefulness or marketability.

"I have a Dream"… (Backed by a Practical Philosophy : Service)

Henry Ford, in his 1922 book ***"My life and Works"*** and in the 1926 ***"Today and Tomorrow"*** *(on both of which Samuel Crowther collaborated)* talks of his Philosophy, the one that ***did*** produce the Affordable People's Car.

In both books Ford says his firm profited not *at the expense of* ***service*** (and reliable usage criteria), but precisely because of adherence to those two cardinal principles of good design and business. Interestingly to me, Ford is talking about service in relation to ***manufacturing –*** and already in the '20s!

Volume and Value

Firms such as Raleigh built their empire in sending their machines to the far flung corners of the Empire. The Raleigh name became synonymous with long-lasting reliability and robustness. As with the Ford car, the volume of production and very long life of the product was the assurance of a reliable continuation of affordable spares.

Many subscribers to magazines like Bike Europe, a periodical directed at the bicycle trade, are in India and the East. India and China are today the main world suppliers of bicycles, partly because they are informed and produce to supply what is needed. Their production is market needs driven.

The Price Penalty

At present our South African commuter bicycle imports are virtually all from these regions. Unfortunately, since there are no standards by which to judge quality or value, the criteria of the importers is price driven. Consequently quality and reliability suffer.

The bike for rural requirements needs to meet certain criteria.

The Roots of the Development Issue

It is the needs of the Rural child and the difficulties in getting to school that concerns me.
To me it is an elemental essential that a child receives an education.
The bicycle is the answer to overcome the transport part of this problem.

Technology : Past and Future.

On technological matters there are experts of the caliber of (for instance) Mike Burrows whose second (updated) printing of his book on ***Bicycle Design*** (1) has recently been released.

But even Burrows would be quick to admit that others before him have comprehensively covered many matters from a technological perspective *and* as early as 1896 when Archibald Sharp wrote ***Bicycles and Tricycles: An Elementary Treatise on Their Design and Construction*** (2).

The book has been reprinted many times since the first Massachusetts Institute of Technology Press paperback re-print edition of 1979.
My copy is the 5th printing dated 1993.

The foreword is, significantly, by David Gordon Wilson who together with Frank Rowland Whitt wrote ***Bicycling Science*** (3) in 1982.
Again my copy is again a 5th printing, that of 1989.

Lessons to be learned

There are those people, particularly amongst Historians, who would aver *"That to ignore the lessons of the past, is to risk repeating its mistakes"*
There have been, are and will be others whose imagination and instinct is such that, to them, "History is Bunk!"

That such people have produced, and will in the future produce, innovative work by "thinking outside the box" is true.

Flights of Fancy and Imagination …and Reality.

But let us consider the case of just two instances of innovator/inventor designers. I choose to use, as my examples for comparison,
Leonardo da Vinci and the Wright Brothers.

If asked: "Who, of the two, do you think most influenced the world we live in today?", what would be your reply?
If you chose Leonardo I would contend that you are wrong.

There has recently been a screening on TV (I believe it is a re-screening) of the life of Leonardo. In it the producers tell us that da Vinci is best remembered as a painter, that the Mona Lisa, which he worked on for 10 years, is the masterpiece for which he is renowned.

His other great work, The Last Supper, was ruined because the innovative teqnique he used on the fresco has not stood the test of time.
Instead of following the tried and trusted, proven but slow method of the past masters, he used a system which, though less laborious, has allowed moisture to penetrate through from the back of the work, all but obliterating the image.

"Been there Before…"

As far as the concepts and designs for such things as a flying machine, the parachute, the chain and the bicycle (reputedly, but wrongly attributed to Leonardo), they were before their time and technology.

Furthermore the inventions and thoughts were hidden for so many centuries that others had arrived subsequently to re-conceive the concepts and produce practical, workable solutions to the problems and flights of imagination.

Only with the benefit of hindsight and the rediscovery of the preserved notes and drawings are we able to recognize and appreciate the true stature of his genius. He was before his time.

Getting it Wright…

The Wright brothers success in being credited with the first powered flight just over a century ago is often – and wrongly – attributed to their having been involved in the construction of bicycles.

This had little to do with their getting Air travel off the ground - as a plethora of centenary anniversary books produced to mark the occasion have noted.

Following the Wright Procedure...

It is however also to be noted that, once the Wrights got it right, those who followed, in France and elsewhere, advanced in such leaps and bounds that, in a scant six decades, man reached the moon.

The Wright brothers studied everything they could find on flight,
and having done so decided to begin again.

But…they only threw the book away once they had learned everything there was to know from their predecessors.

In the opinion of many Bicycle Historians, let alone modern-day bicycle designers*, anyone purporting to, or considering embarking on, a re-look at the design of a bicycle for a specific purpose should, at least, be familiar with the contents of those three books.
*(*Yes, there are such people and, on a practical workable level, you can count Graeme Obree and his fastest-bike-in-the-World-yet-made-from-fridge-parts amongst these)*

To do otherwise is, at best, to risk wasting time going through processes only to end up with conclusions others have reached before.
Having done so, designers may yet feel that they have other answers.
But not to do so, beforehand, smacks of hubris.

Been there Before : Part II

Since pedals were first affixed to cranks around 1865, inventors, designers and engineers have been ‘around the block” a few times.

So it is perhaps significant, and certainly remarkable,
that the ***Basic Bicycle***, as we know it even today,
used as a personal commuter vehicle and for transport purposes,
has remained in production, virtually unaltered, for over a hundred years.

This was, and still is, the major mode of independent mobility, the self - propelled personal transport - and oft-times beast of burden - of the majority of poorer people in Africa and large parts of Asia, China and India.

Back Then…

The Bicycle is the vehicle that gave mobility to the masses in Europe in the1900s and even after the Second World War.

Called *the Draad-Esel; Cheval d'Afrique; Dikwiel*, whatever –
on this Continent and elsewhere, wherever colonialism made inroads,
it is the vehicle on which the peoples of (what is now referred to as) the third world, were first able to experience and gain a wider view of options for advancement.

In the bad old days of apartheid, the then government decided to try to confine the transport industry to a standardized diesel engine.

This was merely taking a leaf out of the Allied book of WWII
and of the solution then to the problems of incompatibility.

The Advantages of Designs for, and Standards of, Quality and Uniformity

The advantages of ***uniformity of production*** enabled volume production, making cost economies possible and thus also giving assurances of more affordable and better supply availability.

These are important criteria affecting not only availability but simplicity of operation, service and repair.

Here we face the age old problem of reconciling opposites.
Quality, Simplicity and Reliability at Affordable Cost.

The Cost Factor : Transport Comparisons

It is necessary to understand ***affordable cost*** in this context.

The yardstick I have chosen to use here is Taxi Fare.
Obviously this varies according to route length, traffic congestion and carrying capacity etc, but let us assume a journey to and from work of 15 kilometers each way.

This could cost R6 one way, making it R12 per day .
In a 5 day week that is R60.

It is estimated that, in the Urban Labor Force,
25% of monthly income goes on transport costs.

A multi-speed (Overly-complex and inferior quality “Supermarket”) bike can currently be had for R400 – R600.
On this basis, at most, it would take 10 weeks to be in a position to have the cash to buy the more costly machine.

But…Thereafter you are free from fares forever and,
except for replacing tyres occasionally and chains periodically,
little other expenditure is needed on upkeep.

A further But…

Herein lies the “Catch 22” situation.
You need the money for taxi fare.

This is of course an urban comparison situation which assumes taxis, jobs, income. In many rural areas there are no local roads, jobs, taxis –
each being dependant on the other.

So with ***Acquisition Affordability*** the problem
the answers lie in subsidization, by Government or industry or both.

If it were a Three Part Endeavor, then it would be R200 from each of the parties.

Promoting Pedal Power

Today, whilst the Energy-saving advantages and the Ecologically preferable potential of the Bicycle is recognized in the first world, it is, for the most part, seen and valued as a recreational vehicle – especially by manufacturers.

The Prophet in his Own Country…

The Economic viability of Pedal Power as alternative to motorized mobility ***- particularly in rural areas and specifically for children -*** has so far been given only token support by authorities in this country.

The North West Province fits the Prospect Profile in this respect;-
It is rural and underdeveloped. The road infrastructure is sparse.
People are unemployed. To develop the area and build roads will take time and money. Even if it were viable to consider large scale development, to create employment is not a priority here and there is no money.
But what happens to the people in the meantime?

Prioritizing Prospects and Potential

Consider this:-

Where there are no roads there are no cars.
Where there are no cars, riding a bicycle is safer.
A bicycle needs no Road. A footpath will do.

When the Japanese overran Burma in WWII
the very lack of roads and the use of The Bicycle
on footpaths led to victory.

To a child a bicycle is a Freedom Machine.
To be able to own one would mean
going anywhere, anytime, cost free.

It would also mean being able to get to School
faster, fresher and so better able to take in the lessons
necessary to get a better job.

To an adult, a bicycle provides the means to get to work
The bicycle or tricycle could BE the workhorse.
(In Malawi they have bicycle taxis)

The Bicycle can break the Poverty Cycle.

Where, When, Why, Who, Which and How? What's Missing?

All the foregoing is obvious to those of us
who have, for the last two decades
been promoting the two wheeled solution
as ***the answer to Rural transport issues.***

I think the question ***which bicycle?***
is only ***one*** of the questions that need answering
before pen is put to paper to design.
and energy is expended, effort is wasted
and enthusiasm dampened through misdirection.

Here is an example of just one of those questions.

Supposing practical proposals result in a realistic concept
for a Bike for Africa. Where will it be made?
Here? In Europe? In the East?

Does it matter you say?
Yes it does!
For it to be produced in this country,
labor intensive methods should be employed**.
Why ?
So we can provide more jobs for people.

***The Government now insists in labor intensive road building, wherever feasible, for precisely this reason.*

The question also arises of production.
A bicycle is, primarily, made up of frame and components,
the two most important of which are the wheels.

In truth we have never, in this country, produced the ***whole*** bicycle.
Frames, wheel rims, even bicycle tyres, yes.
Parts were, for the main, imported and the whole assembled here.

It may be surprising for some to learn that the conventional bicycle is a complex construction consisting of over 1000 individual parts.

The bike one designs to be produced by hand
either in this country or elsewhere,
is totally different to what is possible using
an automated injection molding process.

Admittedly, though, we have however produced the fastest bike in the world in this country. There is a firm in Somerset West in the Cape who has the technology and skill to produce the ***Lotus*** *bicycle of the type designed by Burroughs and raced by Boardman to achieve a World One Hour Record*

Already it can be seen that there are:-

(1) …Children's cycles
(2) …Adults cycles
(3) …Transport cycles (or Tricycles)

There is a gender question (boys/girls: crossbar/ loop-frame)

There is terrain to consider (gearing for hills or load carrying)

But apart from the considerations of the machine itself,
there are other considerations which MUST be taken into account.
Amongst these are:

- Affordability
- Servicing (simplicity)
- Spares and repairs
- Availability

To sum up…

I believe there are a number of other issues raised here - beyond usage, technology and production factors which are the main concerns of Industrial Designers, which are important to take into consideration.

Perhaps it is not too presumptuous to suggest that the leaders of the Bicycle Group at ***Interdesign*** need also to consider Cultural, Social, Economic, and other such "Outside Issues" - all of which could have a bearing on the Design Thinking Process and to which end the utilisation of the knowledge and experience of "Experts" was surely aimed .

My concern is that "Time is Few". There is precious little enough time for the Design Process once the designers have had a closer look at the situation here.

"Be Prepared" is a Scout Motto worth considering.

Perhaps it should be suggested that the people who are coming here to consider the design for Bicycles should do some work ***before*** they get here to see where the bicycle has come from in order to be better prepared to decide where the design for rural conditions needs to go.

I will be proposing some other reading that could be done in the meantime and will put forward a list of people willing to be consulted once they have been contacted and their conditions for agreeing to participate are known.

To this end I also suggest that a meeting of such people as are willing and able to contribute to the bicycle aspect of *Interdesign* take place ASAP so as to ensure optimum success to this admirable initiative on the part of the Design Institute.