

## **A called place MANABUS**

By Maria Cristina Sierraalta (Goldratt Venezuela and UK)

I think that in life nothing happens by chance, behind everything there is a reason and with it some kind of logic. In my experience of more than 10 years working and living in the world of TOC, each case is a story and provides some learning. The perfect case does not exist; always they are things that remain unsolved and others that could have been different. One learns that in some of the great corporations sometimes there is nothing really tangible underneath, that there are some leaders who can make a difference and others that want to just buy a change. There is, nevertheless, a special ingredient of success that encourages me to relate the case of a called place MANABUS —Manufactura Nacional de Autobuses, C.A.

### **Chronology**

In 2003, I do not remember the exact date; I visited this company founded in 1960, dedicated to the manufacture of buses that circulate in Venezuela and other markets (Colombia, Ecuador, Peru and Caribbean Islands). By an initiative of Auto Paint (one of my most successful implementations in TOC), Gabriela Gresi and Danilo de Lima, who are responsible for the MANABUS account, took me there for a first interview.

MANABUS paints its white buses with Auto Paint paint, and there was an interest to switch to a “pay per produced unit” payment scheme, as used in the automotive supply chain. Auto Paint was worried about this..., the situation in the paint cabin was a difficult one, and they thought that basic things needed to be solved first. Such as the first time that I arrived in Auto Paint - where a pile of

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open orders were waiting with undefined lead time. In MANABUS there were incomplete buses everywhere and for the first 10 or more days of production in a month the company was not able to make the first sale.

I was received by Ernesto Marcano, one of the owners of the company. I believe that what we discussed sounded interesting to him. He knew about the book *The Goal*, and gave me a personal tour around all the facilities. I left the place really surprised about the creativity levels of the company, which his father initiated from his house 45 years ago. The buses were practically built by hand, to their own design. The engine, transmission and chassis are imported, but everything from metallic structure to chairs and fiber glass was made on site. The parts are manufactured and assembled in facilities of 110,000 square meters by around 1000 people, organized in different areas. The visit did not progress to the next step, although I suggested an introductory workshop on TOC and offered to bring a copy of *The Goal* in Spanish for the next time.

In May 2003, I wrote to the Goldratt UK office where Martin Powell and Oded Cohen gave me the opportunity to come to work in Europe. A year and half later, María Elena Acedo from INPROVA (Institute of Productivity and Quality of the State of Carabobo in Venezuela), with an extraordinary vision of the future invited me back to Venezuela. This time I brought the book I had promised for MANABUS and I gave it to Danilo de Lima from Auto Paint to pass on.

In 2005 I returned to Venezuela again, this time on an assignment for Graciela Torres, logistic manager from the Tana group (American corporation for auto-parts). Gabriela is another one of those special people – an Alex Rogo type -

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who was trying to take the common sense message to a very heavy corporate environment.

It was working with Tana that I first met a young engineering student, Alexandra Rivas, who will have an important part in this story.

In my contract, I was coming every three months per periods of an intense month inside the plant. I needed somebody to become my eyes and ears, while I was doing follow up from England. Alexandra graduated as Industrial Engineer making her thesis on TOC. The TOC work done by Alexandra became so important, that every day Tana would pay for a taxi to get her from her house at 5:30 a.m. so that at 7:30 a.m. the director had the updated information of the day on his desk.

During 2006, still working with Tana group, I visited MANABUS twice. This time I met the plant vice-president, Fernando Contreras. Danilo de Lima from Auto Paint was ashamed that there was no progress and he had asked him to at least listen to me. Gabriela was willing to obtain support from Auto Paint to finance the TOC introductory workshop that we had suggested but the complicated thing was going to be to organize the groups and find the time.

Two weeks before my return to Europe, I said to Contreras that I was in a difficult position with the insistence of Auto Paint and if he was not really interested I did not want to lose my time or his. It was then on impulse he said “Yes, but it has to be on a weekend”. Everything was organized in a rush. Celia, his assistant, came immediately and we arranged the basic details. Normally, I always have the opportunity to make a visit and talk with the heads of the different areas, “to

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smell” a little the atmosphere, and to be able to make a good connection between the theory and their day to day world. Martin Powell and Oded Cohen might say that this is not totally necessary, at the end the concepts are universal.... and everything is part of a process.

### **July 2006**

Finally we organized a first basic workshop for two groups. I will never forget that Saturday morning, in the so called “little school” (like in the 1970’s), everybody sitting at small wooden desks watching me as the stranger responsible for them being there on a weekend. Danilo de Lima and Gabriela Gresi came on behalf of Auto Paint to try to explain why we were there. I started the workshop with my truck simulation factory made out of colored cardboard. I was making an effort to make a connection with these people. They were the heads of the different departments, without official positions or university titles; people with many years in the company. I could not imagine the impact that the first run of my truck game was to have on these people.

The first one to jump was Nicolas, the head of the metallic part section. He produces parts for chassis, body shop, chairs, fiber glass, and is always under scrutiny because of stock outs. There are piles of inventory everywhere and nobody but Nicolas seems to know what is really happening. He tries to do his best, but as he says “I cannot work as if the world is going to end tomorrow”. Nicolas was the one who received the clear message that something had to change in his department.

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A young engineer, William, a real skeptic, was trying to apply the concepts learned in the university to this improvised and informal environment.

I was highly impressed by the intervention of the sales department. Usually they seem to be disconnected and in conflict with production and this was not the case in MANABUS. César Mijares and Manuel Candia, from the sales department had good comments and showed preoccupation to make a change. A gentleman of many years in the company who they all called the “Professor”, confronted the new ideas, so to gain his approval I placed him as “plant manager” in the simulation. During lunch, Federico Conrado, manufacturing manager, commented on how simple it was to explain the problem and explain the meaning of a “bottleneck”. [As a result of the training, he began to report production status on a whiteboard, without sophisticated reports].

The session ended with the Goal video and the Drum Buffer Rope simulation game. I had asked Contreras about the possibility of having one of the owners in the training, but that seemed to be impossible. According to him, this was not needed. In TOC we learn that without the commitment of top management things do not change. The following day Contreras, gave the introduction to the second group. I could not believe his words: “Gentlemen, I thank you for the effort to be here on a Sunday, I need you to take advantage of all the information you are going to receive today. The Auto Paint people convinced me to organize this course and they gave me a book that I had not read before. Last night, that book kept me wide-awake until 3 in the morning. Today is going to go very quickly and I promise you that nobody is going to be bored... we must listen to the message

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and begin to think how to change...” These words automatically turned him into the Alex Rogo of MANABUS.

I returned to Europe, with the satisfaction of having delivered a good workshop and with the hope that this one could be a good case. I think I always had the intuition that I will return to work on an organized and successful implementation.

Time had to go by during which Nicolas began to think about the amounts his section had to make.

Recently, Manuel Candia mentioned to me that the following Monday, after the training, he and “the dwarf” as he calls Contreras walked together around the shop floor. They began to look at the inventory through different eyes. There were enough pieces of cut Formica for two years of buses, metallic parts in piles everywhere and the tube section was full of material.

The first person making important changes was Nicolas, and immediately this had an impact in other departments. The pieces that he supplied for the body shop were taken directly to the assembly line, where red light bulbs will give the sign for stock outs. Of course the plant looked like a bright Christmas tree with all the lights on, missing parts everywhere. He could not have any control, but at least he was producing in more reasonable amounts.

### **October 2006**

Contreras was interested in my help, and in October of 2006 I sent a proposal to work during the month of November. His answer, from my email files was the following:

MARIA CRISTINA

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I SPOKE TO ERNESTO MARCANO AND HE LIKED THE IDEA OF YOUR CONSULTING BUT HE IS NOT CONVICTED ABOUT THE DATES. I THINK HE IS RIGHT HE EXPOSED THE FOLLOWING MOTIVES

:1. - WE ARE GOING OUT ON HOLIDAY ON 15TH OF DECEMBER AND THERE IS NOT GOING TO BE CONTINUITY ON THE WORK, THEREFORE PEOPLE CAN LOSE THE MOMENTUM TO CHANGE THE PROCESS.

2. - MANABUS MUST INCREASE THEIR INVENTORIES IN THE MONTH OF NOVEMBER AND DECEMBER SINCE THE VENEZUELAN GOVERNMENT EVERY YEAR GIVES A PERMISSION TO BUY PRODUCTS WITHOUT TAXES AND IT TAKES APPROXIMATELY FROM 2 TO 3 MONTHS TO AUTHORIZE THIS AND IT EXPIRES 31ST OF DECEMBER.

3. – DURING THE MONTH OF NOVEMBER THE CONTRACT DISCUSSION WITH THE UNION STARTS.BY EXPERIENCES WITH OTHER COMPANIES IT HAS TURNED TO BECOME MORE COMPLICATED.

4. –ON THE 3RD OF DECEMBER THERE IS PRESIDENTIAL ELECTIONS AND WE HOPE THAT NOTHING IS GOING TO HAPPEN IN VENEZUELA  
BECAUSE OF THESE REASONS WE THINK WE COULD DO THE WORK STARTING ON THE MONTH OF MARCH, WHEN MANABUS IS GOING TO HAVE A NORMAL AND STABLE CONDITIONS FOR WORK

. THANKS FOR YOUR SUPPORT AND WAITING FOR YOUR ANSWER.

### **January 2007**

Again in the “little school”, at MANABUS – another workshop; some of the faces were known to me and others were new ones. I started making a recap of the July training and the subsequent seven months and many were encouraged to comment on changes. This time I had had the opportunity to walk the shop floor and the inventory reduction in metallic parts was dramatic. Nicolas commented on the cleaning up and the amount of obsolete inventory that he threw away alongside all the efforts to produce what was really needed. This training was

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exactly about this point - the introduction of the concept of “buffers” and what is that magical number for correct inventory.

This time I had the whole of the purchasing department, including the purchase manager and nephew of the owners, Enrique Ignacio, among other people from the operations. The subject of supply chain TOC approach is simple and I believe that the same simplicity causes people to think that it is not easy to implement. It was really too much new information in such a short time. I tried to give to more practical examples but I had my doubts if this was going to work well.

### **May - June 2007**

I was back in Venezuela, this time working for National Tyres and Federal Motors. In all the companies you must have somebody with the vision that believes in TOC. One of the most exceptional people who I had the opportunity to work with is Orlando Romero, the president of National Tyres Venezuela. The implementation that I had recently begun in National Tyres was starting to give important results. The template which I designed with the help of Martin Powell (Goldratt UK), to automatically capture the information of *buffers* with colors was the daily tool to set the priorities. This same template was going to be used later by the bus company in replenishing its inventories, and again, a young student in National Tyres who did her thesis on the subject of TOC with *buffers* was later going to be another of the ingredients for the MANABUS project.

On Monday 28th May 2007 I arrived again at MANABUS. This time I took Martin Powell to get his feedback. We came driving from Caracas, and my son Alfredo who had come for the weekend was with us. We arrived first at Federal Motors.

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During the month of June I was going to be working for the rose project, a new truck assembly plant that hoped to initiate operations in October. I had offered to my son Alfredo to take him inside FM, but when we arrived at the main gate I had a message from Julio Parra saying that he unexpectedly had to leave hoping to see us on the following day.

We went on to MANABUS and I arrived at the gate, without an appointment and requested to speak with Contreras. Martin was astonished; I believe that his British mentality cannot understand the degree of the improvisation in Venezuela. Immediately not only did Contreras receive us but he gave us a complete tour around the facilities. He was driving one of the buses himself taking us from one part of the site to another one - my son was fascinated and Martin was in shock. It would never happen in England, where the formality is a life style. This is perhaps what I miss the most when working in a foreign country, the personality and spark of Venezuela and that informality which gives us immediate access everywhere.

For Martin, a huge contrast, last week we had been presenting in the President's room of Federal Motors (with previous confirmed appointment) the proposal for the Rose project. The President of Federal Motors Venezuela was trying to understand how much was the required for investment for the *buffers* at the new plant and why he must have *buffers*. Martin said that it was to cover the variation – didn't he suffer from variation. The President said he had variation everywhere even in the drivers that bring the personnel every day and do not show up to

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work. I remember that Martin's answer to the FM President, of Brazilian origin: "welcome to Venezuela".

Contreras seemed really interested that I will dedicate time to them. Walking the shop floor with Martin I started observe some interesting changes. Along the assembly line at the body shop level, there were now shelves with material near each station. It was an attempt at feeding *buffers*, but still the red lights were on. The direction of the solution was correct but it was necessary to have stability in this section in order to attack the true bottleneck: the paint cabin.

I wanted Martin's support to make the proposal for MANABUS and I needed to bring Alexandra so that she could start with the basis for the *buffer* templates and give stability to the body shop work stations. I proposed to Contreras to hire Alexandra, meanwhile I was going to arrange with Goldratt UK to spend the month of October full time inside the plant. Alexandra had been in contact with me, and wanted my advice. I tried to be as honest as possible; everything was waiting to be done in MANABUS and there was something special in the work atmosphere and the people of this place. The Human Resource department contacted her and she had the interview with Contreras - accepting his proposal. Alexandra did not know where to start. I was a little nervous about it and offered her my help remotely from England. She began clarifying and identifying the bill of materials for the different bus models. She was, in fact, the first woman working inside the plant and shared an office in the warehouse with Javier.

The most important thing was to bring stability to the body shop assembly line, avoiding missing metallic parts supplied by Nicolas's section. With the help of

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Javier and a team of 24 people, who continuously replenish the feeding *buffers*, it all started to work. She adapted the *buffer* template of National Tyres and created the first lists with traffic light (Red/Yellow/Green) priorities to communicate with Nicolas. By internet I was checking on the information but I was worried about her being happy; after all I felt responsible for her decision in taking this job.

Like a good Alex Rogo, Contreras was providing what was required. His words to welcome her were quite cold: "You are here to do Maria Cristina's work". After 3 months he called her to his office to praise her and increase her salary - her major achievement: the red light bulbs were not lit up anymore. The stability was in place; Nicolas was receiving his list once a week and understood how to work it out. First the red, then yellow, and finally green. Alexandra started to be a special person for this department; the only problem was that everything was relying on her.

The conditions for my arrival were perfect. I had passed the details of the proposal in August and waited for a last confirmation by email. My agenda had been arranged to be there from the 1st to 31st of October in Valencia, working directly full time inside MANABUS. One week before my trip to Venezuela, a one week training session was being held in Phoenix, Arizona, USA. Lisa Scheinkopf, from Goldratt Consulting USA, a TOC expert and author of the book *Thinking for a Change* was conducting the training. The objective was to understand and learn how to use the new tools of Goldratt (the strategy and tactics trees) for Sales and Marketing. Martin Powell and I were to attend the

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training and I convinced him to stop for 48 hours in Venezuela on his way back to London.

As we attended the training I was starting to see an application of it for the case of MANABUS. Obviously, it was necessary to sort out operations first and to give important results. The worry was that I had not received the formal confirmation from MANABUS and I was already on my way to Venezuela.

### **October 2007. Week from the 1st to 5th**

Monday 1st of October 2007 Martin and I arrived early at MANABUS. William, the young skeptical engineer of the first training and Alexandra, the young engineer who had worked a year with me in Tana and was now in MANABUS, dedicated the whole day to us. Contreras and Ernesto Marcano, were not there – unknown to me they were in an exhibition in Miami for one week.

We made a tour in detail through all the areas. Alexandra proudly showed us her feeding *buffers* at the work stations. Martin asked questions and I translated.

While we passed through the warehouses we saw a pile of new bicycles in an area. Martin asked me if with every bus you buy you get a free bike!! ... As part of developing of new products they were making a few police patrol vehicles that inside had bicycles as part of the unit. We walked by the section of metallic pieces and Nicolas, explained to us, the problems of that area. The area of assembly of luggage compartment cases was problematic; they never had the time to build *buffers*. On the other hand the department was working to full capacity and the bending machine accumulated big amounts of material waiting

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to be processed. It seemed to be a bottleneck and immediately Martin asked if there were any priorities in how they organized the work here.

Martin Powell and Oded Cohen are those people who I consider wise, and I always try to look for the advice behind their words. Martin feels frustrated with me sometimes; he was struggling with my translation of the answers to his questions because, in his British mentality, something that should take 3 words, for us Latins can easily be multiplied by 5.

We discussed the situation in the paint cabin and he helped me to try to design a dynamic like the “dice game” in The Goal, to try to explain the problem.

We discussed the situation of the layout, the restricted space to move the vehicles inside the paint cabin and how this affected the flow. It was not difficult to see that they had grown in the same space, and there was no way to handle it using the same design that we were using for the Federal Motors truck plant in the Rose project.

I was worried, technically I did not have the official confirmation of my work from MANABUS and I had promised Martin to clarify the situation as soon as possible. Now I did not have any choice but to start the work and wait until Contreras and Ernesto Marcano came back.

It took me about three days to understand where I was standing. The plant was organized as follows:

MANABUS 1: Location where three different body shop product lines that arrive at ONE paint cabin and then splits into 3 different lines of product assembly at the end.

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The product lines are the following: one designed to build Mini Pullman and/or Special units at a rate of 2 units per day. Another dedicated to popular buses, designed to operate at 4 units per day and the last one which was supposed to produce one Pullman per week. The metallic parts section operates within the same place, being the main supplier for the body shop section.

MANABUS 2: Location where engines, transmission and chassis are assembled and that works jointly with another line of assembly of large buses (model 9900), designed to give one bus per day.

Tapispartes: where everything regarding wood work (including the desks and furniture of the company - incredible but true), air conditioning ducting, and chairs is assembled.

Fibropartes: located a few blocks from the main facilities where the fiber glass materials (floors, carry routes, bumper, boards and others) are produced.

Following the flow of the process it was not difficult to know where to start: basically I had a traffic problem. Within MANABUS 1 there were 3 lines of product that arrived at a funnel: the paint cabin. MANABUS 2 was independent as far as the painting, but everything altogether depended on the synchronization of materials between the different areas. My first worry was to understand how these people knew where they were, and how the information of what and how much to move was communicated.

I asked then about the production meeting that in my mind had to be daily. It happened to be only once a week and that Wednesday I attended what they called the production meeting. I arrived with Alexandra and William and began to

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recognize the faces of some of the people. It had been more than a year since that first short training and I did not remember everyone. The incredible thing was that ALL remembered me and seemed to be happy with the idea that I was there. The meeting lasted 2 hours and I confess that I was falling asleep because I could not understand anything. There were all sort of complaints among them but at the end nothing concrete. Mr. Martinez, supervisor of Tapispartes was strongly attacked about issues with chairs. Apparently the number of complete buses manufactured last month which “had been delivered” to sales by something which they called “deviation” were in fact without seats!! Zaldivar “chavo”, in his low tone of voice that was difficult to hear, complained because he did not have the parts of fiber glass that Patricia, the head of plant of Fibropartes had to deliver. Nicolas felt the strong pressure from the luggage cases for the Mini Pullman/Special unit line supervised by Marcos. Among other things there were missing parts that appeared in a daily list of critical items. The only problem was that the critical category was that they were already not available. At the end of the meeting William gave a copy of what the management had decided regarding the production target for the month of October.

People did not seem very happy. They seemed to have to fight for everything they needed from other departments. At the end, it always seemed to be like this; the numbers were impossible to achieve. Henry questioned the Pullman target of 7; the line could only give one per week and the line was not even full!

The biggest difference was with the Pullmans - there must be a problem with delays and perhaps they thought that placing a higher number will make them

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achieve this target. The certain thing was that the month of highest production number in the year had been August with a total of 155 units, of which, 34 were incomplete or by “deviation”! This meant that really they had been able TO SELL only 121.

The peculiar thing was that they all seemed to be very proud of the results of this month in which they had even received a special bonus. The bonus was gained starting a minimum of 140 units. Surprisingly, this included the incomplete buses that had to be finished the following month.

I returned to the plant and spent the rest of the afternoon walking along the working stations in more detail. I approached the line of popular buses managed by Zaldivar “churro” trying to understand his complaint in relation to fiber glass. Indeed, he depended on 3 components of fiber glass: bumper, board and carry route, to be able to pass the units to the paint cabin. Alexandra took me towards Alexis, who supervised this line along with Mr. Figueredo.

Alexis helped me to identify the units that were “stopped” waiting for parts from Fibropartes and to understand the stages of the process. There were 5 workstations in the body area: platform, welding, outer shell, inner shell and fiber glass. The first 4 depended mainly on metallic pieces and had their feeding *buffers* next to each working station. The workers looked like ants working on all the pieces of a perfect Lego type assembly. Since there was stability in the buffer replenishment of these parts everything was flowing up to fiber glass where there was a traffic jam of buses waiting for fiber glass. The bumper was fitted in front of the paint cabin and then the units were mobilized in a backwards movement

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towards the right outer part of MANABUS 1 where the board and the carry route were fitted. Once completed, Montero, the supervisor of the painting area, would move them from outside to the cabin to initiate the painting process as long as he had space.

The journey of the units seemed crazy but with the space so restricted everything had to fit like a perfect chess game. Since the previous workstations up to fiber glass continued to move, everything began to stop at this point creating a big jam. I began to understand Zaldivar's concern; with more than 40 years in the company and very committed to his responsibility. He is also actually the initiator of many of the details of design of the bus. He told me his daughter lives very close to me in England and I promised to invite him for dinner next time he goes to visit.

I then entered the paint cabin which was completely full of buses. Montero, the supervisor, had also attended the training. The working environment here is a tough one with around 36 people preparing and painting buses. The dust, the strong smell of chemicals and paint in a closed area made it definitely tough for the personnel.

I spoke with Montero to let him know I was going to be there many times every day. I asked him how he followed the sequence of what to do next. He took me to a desk in the corner all sprinkled with paint, and from inside a drawer, he took out a handful of keys each one with a hand written number identifying the chassis number of each bus. When Marcos and Zaldivar finish the units, they pass the keys to him so he can begin working on them. Montero's priority was to have the

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paint cabin full with units inside and try to deliver 6 units every day. He organized and decided, obviously based on what was available, which units he was going to work on most efficiently.

After the paint cabin was the final assembly sections. Henry was the person in charge of the popular buses and had two lines that worked in parallel to produce 4 buses per day. From here he sends them to Technical Service, where Garcia, the supervisor, will take them out for road testing. Finally they will return to retouch the paintwork into the hands of Henry "Wolf"; finally to be approved by Quality and deliver the corresponding Cards (completion) to sales.

In the line of Mini Pullman/Specials the supervisor was Reyes. With a single line designed to deliver two buses daily, he followed the same sequence towards Technical Service, but then the buses will return to him to be retouched and approved by Quality with their corresponding Cards to sales. He was also responsible for the Pullman line, which supposedly delivered one per week.

The day finished and at least I was starting to have an idea of where to focus. I did not have time to go to ECAVA2 to analyze the big buses but as this an independent line with a production of 1 per day; the biggest problem was in MANABUS 1.

On Thursday I went to the sales department. Behind the flow there must be a sequence that connects with the clients. I asked for the information of the detail of the units delivered per day. The ERP system had to capture this information and by logic it was not possible to invoice buses that had not entered the system.

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I spoke with César Mijares , the sales director. The conversation with him gave the hint of what I was looking for to be able to follow the flow. Each unit came with a chassis number that was the same as the keys that Montero had. This number was associated to a production order number coordinated by sales and was the identity card of the vehicle assigned to a specific client. Sales, according to the priorities will assign this unique non-transferable number to the unit that starts in the chassis department.

At the moment in Venezuela there is a big demand for vehicles. The waiting list for anything that has wheels is endless. Therefore, the assembly plants are not able to cope with an increasing demand that has grown 300% in the last 3 years. Cesar was worried about his deliveries. He said to me that it was a big problem to have everything already sold, and not being able to approach the distributors because everything was late.

On my way back to the plant, I looked for Alexandra and I went again following the flow. I started to locate the chassis numbers for each unit. The numbers seemed to be ascending by type of product, and there was a defined client waiting for each of these buses. Following the sequence of the process I arrived to the patio.

The patio seemed a cemetery of painted and unpainted units that should be moving throughout the process.

There were a total of 22 buses: 13 units, hoping to enter the paint cabin and 9 painted units hoping to get to the final assembly stages. The bus began its life

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with sequential ascending numbers, but at this point, at the patio, everything was out of any order, the follow up was madness.

With this list I returned to Montero, to see if this corresponded exactly with the handful of keys that he had. We identified the keys, they were all mixed and we could not find two of the numbers. We found them in the hands of Marcos, the supervisor of Mini Pullman/Specials, who already had worked them but they had an engine problem. I asked about number 1293, which by the sequence was quite old, and they told me that it was a special unit that they had left on the side also because of engine problems. Behind these numbers I could picture in my mind the face of annoyed customers to whom somebody was probably giving an estimated lead time.

I carried on working to locate every chassis number at each stage of the process inside MANABUS 1 and organized the information following the flow to produce what we baptized with the name of “Process Map” tool in Excel.

On Friday 5th of October with this information in my hands, the map itself gave me the analysis I was looking for. I introduced a color code to identify the status of the unit at each workstation.

- Green: flowing without problems
- Yellow: moving but with missing parts
- Red: not able to move

The line for Mini Pullman/Specials was working to full capacity and generating units that went to the cemetery of the patio. The paint cabin continued to paint

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these units and was over producing for a final line that can only handle two units per day.

Meanwhile, the line for popular buses was stopped because of missing fiber glass components. After the paint cabin, the final line had 3 “holes”, as we started to call the empty spaces on the Process Map tool, which will never be recovered, jeopardizing the 4 daily units that it had to produce. Henry was desperate, because he had no continuity on his line, and he even started to work on Mini Pullman/Special vehicles that did not belong to him.

I could not believe it, as Eli Goldratt would say, it is common sense: the line for Mini Pullman/Specials must stop immediately and concentrate all the efforts to ramp up the production for popular buses. Patricia in fiber glass was using her capacity to keep on producing parts for Mini Pullman/Specials; meanwhile Zaldivar could not have his bumpers on time. Also Nicolas felt the pressure of Miguel pulling the metallic luggage cases and taking out his capacity in things that were really not required ... The bottle neck: the paint cabin had to be working all the time in the CORRECT PROPORTION between the lines.

I went with Alexandra to look for William, the Manufacture Manager, who could give the needed authorization. I asked him to stop Marcos’s Mini Pullman/Specials line. People used to come on Saturdays to work overtime. He said to me he could not do that with a panic expression in his face. I took him to the patio and showed him my discovery: all these units that should not be there and kept on accumulating. I showed him the Process Map tool and he said he had tried to do something similar before but it was impossible to keep up to date.

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I reminded him about the training with unfinished cardboard trucks everywhere. He was still not convinced. Finally I said to him that I will assume the responsibility with Contreras and Ernesto Marcano, but he was the only one that can authorize it. William, in spite of having been exposed to the basic concepts, was a little scared. He understood the theory, but it was difficult for him to take the TOC required actions. He went to speak with Marcos and I was thankful for his vote of confidence – I stopped the line. My Process Map tool had begun to work.

### **October 2007. Week from the 8th to the 12th**

That Monday I arrived first thing in the morning updating the information from Saturday. With the help of William we called the people to our first production meeting at 8:30 a.m.

Contreras arrived shortly before we started; I had time for a few words and then we started the meeting - projecting the Process Map diagram.

I had to create a work method to be able to have daily focus where it was needed. I explained to them that the meeting could not last more than half an hour and a representative of each area should attend. Together we analyzed the logic of having stopped Marcos's line. The problem was that there were enough buses on the patio cemetery for it to be stopped for at least three weeks. Marcos and his people were not going to be very happy about this, but we had to convert the patio into buses for sale.

I explained all the logic in the information and the color code system. We had specific comments that were updated and a column for important observations. I

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was going to pass with my *laptop* early every morning through each work area to update the information. I requested the collaboration of all to capture the data.

The production meeting was now every day at 8:30 a.m.

At the end of the meeting I remained talking to Contreras. First of all I needed to clarify the situation with my contract. The actions were already in place and there was no authorization from the Board. He promised to sort out the situation as soon as possible. I returned back to the plant and on my way back I identified a character which I never had seen before: Mr. Armando Marcano, president of MANABUS.

His black shiny Rover was parking in a position identified with his name. Mr. Armando arrived with his driver and another person who accompanied him inside the plant. I was sure that he did not have an idea of who I am and what am I doing there. Throughout that week I saw him along the assembly lines. According to the people he has a large knowledge of the details of the buses and gets involved with the production personnel. With this information I was panicking what he was going to think when he saw Marcos's line stopped.

That week we continued with the daily production meetings. At the start I was always against the clock. In order to have the information ready for 8:30 am - on the previous day I captured a tentative view of the start up for the next day. I visited the paint cabin up to four times in a day.

I started to notice something interesting in the line that Reyes handles: there are 2 types of vehicles: Mini Pullman and Specials. The only difference is that internally one has air conditioning ducting and the other a top rack for

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packages. The chairs are identical for both and must arrive at the rate of two sets, one in the morning and one before 3:30 p.m. so that he can deliver his two buses of the day. Next to the workstations he must have all the accessories so that there are no delays. The problem is that this was not the case, they rely on Tapispartes and I needed to find out why they were always late.

After Reyes I would go to the retouch area and look for Henry's information. We would locate Garcia to give the details for units on Technical Service and road test and I would have tentative chassis Cards that we will be hoping to deliver to sales every day. Henry will update the information on the movements of his lines and everyone will follow my screen as they watch the progress in the flow.

Montero will give the chassis numbers of the units inside the paint cabin and Zaldivar, Alexis or Mr. Figueredo will help me to update the body shop area.

There could be still problems with the fiber glass supply so I would go outside to check the status of missing parts. Alexis is very precise in the information and Mr. Figueredo seemed to be scared every time he saw me. Since Marcos's line was stopped the information remained the same.

I had to fight to get a projector; Celia would borrow it from the Engineering department, and it was not always available.

Each meeting is a learning experience for everyone. We analyze the situation with Tapispartes and the accessories he had to supply to Reyes; we put an asterisk in front of the chassis numbers that correspond to Mini Pullman to differentiate them from Special. The big difference is in the air conditioning ducting; they are tailor made on special tables and there is capacity to produce

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only one per day. Therefore, we must alternate Mini Pullman with Special unit so that the line is synchronized.

The Process Map has helped us to identify where we have holes and what is the sequence to work inside the paint cabin. This week still we have delays in fiber glass and Montero has holes every day. For the line of popular buses that produces 4 units - paint must have 2 units of *buffer* in the morning and 2 in the afternoon and for the one of Mini Pullman/Specials that produces 2 units - paint must have one in the morning and one in afternoon.

The situation of delivering the Cards to sales is difficult to understand.

Traditionally, the units are reported in final line, but this does not mean they are ready for the customers. Then, what happens is, they are incomplete and parked outside in no-man's land. I could not believe that sometimes they remove a part from an "incomplete bus" to put it on another bus and this is usually only discovered towards the end of the month when everybody is running like mad to get the numbers.

There is a caged area, where sales lock up their units, once they receive the Cards. We spoke with Jose, a young guy who is in charge of delivering the units to the clients. We needed young Jose at the production meeting every day taking note of the Cards chassis numbers. His function was now to help us to speed up this process and lock up his units for the clients in the cage.

Meanwhile, Contreras was having problems to obtain the approval for the project.

I had to prepare in writing the details of my activities that month again (I had already done it in the proposal) and Martin was putting pressure on me from

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England requesting to stop the work if the confirmation with a purchase order number did not arrive. Wednesday afternoon Contreras gave me back a copy of the invoice signed by the president. I asked him about the purchase order number and he said that this was enough to guarantee the payment. I spoke with the office and I had to personally write the email guaranteeing that the contract was approved. Before the end of the week we spoke about the training sessions we had to organize. I wanted to run an advanced training with the computer simulators and the other one was to start implementing buffers with the purchasing department. We still had missing components everywhere.

I also went to MANABUS 2 to capture for the first time the information of big buses - model 3300. The discovery was that there were 8 units of model 9900 in the cemetery of that zone, hoping to enter a line that produces 1 per day!

Obviously it was necessary to immediately stop the line upstream as we did with Marcos. We discussed it with Narvaez, the supervisor of this area and he did not have any problem understanding. Lucas and Cruz, responsible for the chassis production, also were clear that all the production of this line was closed. The 7.5 average chassis measurement per day William followed was not computable. The mathematical calculations of balancing lines taught in university do not work, and this was difficult for him to understand. The impact of idle workers was going to be even bigger now — around 200 people.

Another important point for me was to locate Diana, the young engineer who had worked with me in National Tyres. I needed help for the daily follow up of the Process Map and on the *buffers* in other areas.

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Diana had been apparently selected to convert from a temporary role to an employed engineer into National Tyres, but President Orlando Romero had been transferred to be President for National Tyres to Costa Rica. The new President of National Tyres, an ex-director of Tana group, whom I know very well, had apparently stopped all new contracts and I knew he had strong cost world thinking.

Diana had participated actively in the National Tyres project - they gave her the nickname of National Tyres's little ant. Contreras was not convinced about bringing her in, but I needed someone that was not scared of the shop floor and had already received the training. Contreras interviewed her saying that there were no available vacancies for new engineers and she will start on a 3 month test period. That she was there because I said I needed her. He warned me that she must be able to do the follow up and conduct the production meetings as I did.

That same week we also called the Auto Paint people. Danilo de Lima and Julio came immediately. As the paint cabin was the bottleneck I needed to understand the process from experts. They had made a time analysis which demonstrates that organizing the work differently they were able to produce more in the same time. They warned me about the personnel who are stubborn and refuse to accept suggestions. The last thing that I wanted was to create a conflict with the people, but I felt that they were right in what they were telling me.

Whenever I enter the paint cabin I have the sensation of a dusty town in the Wild West with pistols and guns. I do not understand the work process and I have to

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get inside each unit to track the chassis numbers. In the background I listen to the people whistling an old famous Cuban song that says: “Maria Cristina wants to govern me...”

### **October 2007. Week from the 15th to the 19th**

William helped me to organize the training group. We decided to use a meeting room located in the mezzanine level that belongs to IT. We chose a group of 15 people and I was going to need 5 computers to work and install the simulators. It was the first time I had entered the IT department and the sensation was that everything there is stopped in time. The meeting room had a collection of old computers, monitors, printers coated with dust everywhere.

Alexandra had shown me the dynamic tables that Mr. Trejo, the manager, had made for her. All the information comes from inventory transactions that are introduced to their ERP system. The heart of the required information to set up the *buffers* was there. Many companies spend millions investing in new systems that become rigid and they can never recover the investment. The challenge was going to be getting the system to work towards the TOC methodology. This would have to be left for a second stage, now the priority was to strengthen the basic working method.

Monday and Tuesday we had the training using the TOC simulators. Looking at the faces of those who once made my cardboard trucks now working with an exact computerized system was fascinating. The important thing was to reinforce the bottleneck concept and to create the awareness of the importance of buffers before and after the paint cabin. Contreras arrived with Roberto, a sales person

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whom I had never met before. He seemed to be someone important; then I found out that he was desperate waiting for the big Pullmans. There was a legal threat if we did not deliver those soon. Cesar Mijares, participated actively and his team was the first to get the best results. I concentrated to help the team where Enrique Ignacio, the purchase manager was. He and Jessica had been off sick the previous week and we were suffering with all the stock-outs. On purpose, I left Alexandra to work with Contreras's team; the objective was to make sure he will never forget the consequences of neglecting the blue resource (bottleneck) in the simulator and relate the learning to the paint cabin.

Everyone had something to contribute. Henry says that my position is like the one of a referee and there is a rumor that somebody has baptized the daily production meeting as the "f\*\*king meeting". This name is in a humorous sense because everyone is being exposed and is naked in front of others.

The best thing I heard during the training came from Nicolas, the supervisor of metallic parts: "this one must be our new way of working, and it must become the culture of MANABUS."

I took advantage of this comment to reinforce the importance of the process and the daily production meetings. I tried to make an analogy of what happens in the airports. The control towers watch the traffic of airplanes to meticulously coordinate takeoffs and landings. Everything works synchronously like a clock to guarantee that there is no accident. At Heathrow airport, in the city of London, one of the most congested of Europe, around 480,000 flights per year are handled, operating to 99% of its capacity. At an average of 74 flights per hour,

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more than one per minute, the control tower coordinates the traffic of airplanes.

As things are not perfect, there are delays and/or advances, days of greater or smaller movement.

I worked two years in Central Europe, traveling every month, returning Friday night (the day of biggest traffic in the week), sometimes we were 25 minutes circling in the air waiting for the control tower to authorize landing.

In the plant, the Process Map is the tool that tells us where to focus. We identify the blockage and that signals when to work or stop. The moment this becomes unmanageable means that we are not working according to TOC. We all must move to unblock the way and guarantee the maximum complete units possible for sales. As Nicolas says this is the tool of MANABUS, its way of working, the spirit is not one of looking for the guilty, but to focus and identify who needs help.

We were applying the 5 focusing TOC steps:

1. Identify the constraint of the system: the paint cabin.
2. Decide how to exploit the system's constraint: guarantee the buses for Montero to work on and tight follow up of the work inside the paint cabin.
3. Subordinate everything else to the above decisions: chassis and body shop must produce according to what the paint cabin can handle.
4. Elevate the system's constraint: Yauca, an external contractor who works within MANABUS is also painting to help recover delays in the paint cabin.
5. Return to step 1), do not to allow inertia to become the system's constraint.

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The production meetings were on time every day. In the morning I would follow the flow, but with the new rules in place everything was running smoothly and it was easier to collect the information. All the departments involved were cooperating and we were now working following the ascending sequence of the chassis numbers connected to the CLIENT. Henry introduced his information in his computer so that I did not lose time in the final line; Alexis had a format ready with the numbers and everything moves as a perfect puzzle.

Some of the important benefits that were obtained that week were:

1. Fiber glass parts shortages disappeared.

Fibropartes's capacity was now being used to produce what was really needed. I began to notice something interesting: Patricia the plant manager of Fibropartes, had a control writing the chassis numbers in a perfect handwriting on the parts that she sent. Previously, since everything was out of sequence, these parts will not get to the chassis number she had written. Being synchronized, automatically the numbers matched, and I no longer had to get inside the bus to verify the number or use the light of my mobile to read it through the front wheel.

2. The level of emergencies for metallic parts diminished.

Nicolas felt less pressure, to the point that the bending machine, that in the first day visit with Martin was presented as a bottleneck is not a problem anymore. Contreras stopped calling attention to it being idle because there was nothing to work on that was immediately required. Imagine they were seriously considering buying a new one ...

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3. Nothing got lost and we had managed to reactivate the production in the line for luxury buses - Pullman.

We were following an ascending order that started from the chassis. The buses moved in the line like a perfect puzzle where everything was matching. That week we added the information of the production line of luxury buses and I have an anecdote which I must relate.

When following the numbers in the line, from number 81 it jumped to 83. I could not find 82. I asked William - insisting about number 82. His answer was that probably there is not an 82, that the sequence had jumped a number. He was putting pressure to get a Pullman inside the paint cabin. We were holding him back in the production meeting until Montero could cover the holes. The size of the Pullman is equivalent to 2 normal units and endangers the output for the rest of the lines. The outrageous situation was that we found missing number 82 – already painted within the disorder of the patio. I could not believe it, the biggest bus, unmistakable in its outer structure and the one with least production ...

4. We were all focused on giving complete units to sales every day.

The rate of deliveries to sales had been improved. Manuel Candia and Mario Salvatierra were noticing it. They had already received 63 units - a record for that time of the month. With curiosity, I asked them the number that they normally handled and Sevilla said to me that it was between 17 and 20. This represented an improvement of 300%!

In the production meeting I ensured that main attention was given to the processed Cards, for me this is the indicator of money entering MANABUS. I

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asked Jose to write down these numbers every day and one day I said to him:

“Jose, be sure to look for the 13367 and the 4080, to which he responded to me:

“Calm down, the customer drove overnight from San Cristobal and he arrived early this morning. He and the owner of 4080 are waiting at the main gate”. I

asked him how they knew and he said to me: “I called them on their mobiles yesterday telling them to come today”. I could not believe it, every day the

department of sales seemed like an open market of clients arriving to pick up their buses.

In spite of this, there were problems with stock outs and the delays of the arrival of the chairs from Tapispartes were still happening. I thought: “Before the week finishes I must investigate what is going on”. Diana was already working with me full time. We decided that after lunch every day we were going to go first to the final line to check if the ducting system and chairs were on time, and from there to Tapispartes.

You have to go out of MANABUS 1 and cross the big patio to reach Tapispartes.

Mr. Martinez is the supervisor and has been working in MANABUS for 22 years.

In the 8:30 a.m. meetings, he says one thing and something else happens. The chairs do not arrive on time because the “cachama” did not arrive or because there are no structures that come injected with foam rubber provided by “Goma Partes” (external supplier), or because he does not have enough personnel.

“Cachama” is the name of the truck that is used to move the materials from one site to another. Since it is an open truck, when it is raining they cannot send the ductings and/or the chairs. It is shared by other areas and it seems to be

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impossible to guarantee that he is always available. The problem of the structures was also caused by us; MANABUS provides the metallic structures that Goma Partes process for the chairs. We talked to Pablo Castellanos the supervisor, and the whole place is in a complete mess. He was never sure how much is available and how much is left, the dispatches follow an irregular pattern. The inventory inside the warehouse is everywhere.

It is not their fault, there is no *buffer* control in this area and it was URGENT that Diana helped me with this straight away. In the ducting area, as it is a manual process, there are only two working tables and the ducting systems are not standard. Each bus internally can vary in the measurement and not only is it necessary to coordinate the manufacture one by one, but to guarantee that we are working with the measurements of the one that follows in the flow.

The personnel problem was easier to solve. Part of the people who were doing nothing in the lines of Marcos and Narvaez were relocated to this area. They must guarantee two sets of chairs before 3:30 p.m. every day.

MANABUS 2 is next to Tapispartes and every day, we review the situation with chassis and buses 3300. Lucas and Cruz give the us the chassis information, Cruz tells me he is working to complete missing parts on the line and he does not feel the pressure of the 7.5 units per day any more. Correa, in the 9900 line tells me that he has a problem with a buffer. When I ask him, he shows me his empty wallet. Many workers have been affected and the song that they now sing is: "Maria Cristina wants to govern us because she wants to take out the overtime". I am worried about this; I do not want that people are being affected economically.

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### **October 2007. Week from the 22<sup>nd</sup> to the 26<sup>th</sup>**

All the deliveries are now stopped because of a plastic corner edge. It was more than urgent to start the work with the purchasing department. It was going to be impossible to solve the problem during this month, this will have to wait for a second stage of the consulting project, but at least I should start with the basic training.

I talked to Contreras and we organized the group. Normally it is a full two day training, but I managed to condense everything in two 4 hour sessions. Tuesday we had the first training with the basic concepts, and some examples.

Watching the faces of the people I had my doubts if this was going to work. I had the impression that they perceived me as someone from another planet with a magic solution for missing parts.

I once heard Dr. Goldratt saying something I will never forget: “the most difficult part of implementing the *buffer* solution for replenishment is that it implies a change in people’s behavior”. In production it is not complicated to understand because there is a resource that limits the performance of the system: the bottle neck. In purchasing the challenge is to let go the way we were doing things to move on to something totally different and that involves a change in the attitude of the people of the purchasing department.

I concentrated on *buffers* for the local components, not even thinking about dealing with imported parts for the moment. At the end of the session we assigned homework for next week: each one must plot the consumption and the

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inventory of one of the products they handle. This is the starting point to set the *buffer* levels and understand the model we want to implement.

During the session, several issues were discussed:

- 1) The information from the ERP system is not in real time. Generally, they dispatch material to the line using a memorandum document, and later on a single entry with the invoice accumulates all the quantities dispatched.
- 2) Due to Tax convenience, the invoice for products received 4 days before the end of the month cannot be accepted with that date, even if the product is required. For that reason the product cannot be introduced into the system and there is high rework requesting changes to invoices.
- 3) Criterion for selection of the supplier: sometimes they buy from the cheapest supplier with poor delivery times and low reliability (quality of the product; says that they have but don't and unstable deliveries).

I suggested to Contreras to invite Finance and IT Systems for the next meeting.

The people in the purchasing department spend most of their time matching invoices and asking for changes on dates.

That week I had an encounter with the Quality Control people. Peter and Jenny came to ask about the production meeting. There was no representative of this department in our daily meetings. Naturally more people had been attending, but to be honest I had not thought about Quality Control. The truth is that I have never seen them on the shop floor; usually these departments seemed to be isolated from what happens in the plant. They told me that I was pushing the production too fast and they had to be informed of what was happening. I did not

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want to create a conflict. Everyone was welcome to attend our daily meetings.

What I wanted to clarify is that under TOC, we were producing more units in the same time, without jeopardizing the quality of the product. They were not very receptive, but it was not worth the trouble to waste my time now in trying to explain to them. Obviously what they were feeling was that they had to inspect and to approve more units every day.

In spite of the stock outs, the production continued to flow. Montero, in the paint cabin had less “holes” and we all we began to get used to a new work routine.

When we arrived at the body shop section it was not necessary to review the fiber glass; just watching the line and the happy faces of Zaldivar and Alexis was enough. Diana and I became the police of the floor, we had the time to cover all the areas, but at the end of the day we were exhausted. Zaldivar asked me once, if every night I had to soak my feet in hot water because of the distance I walked on the shop floor. However, it was this way that everyone talked to us. This story would not be complete without mentioning Mr. Leonidas, who has been working in MANABUS for 42 years. Every day we would find him touching the buses along the production line and telling us the name of the different models. One day he brought me a magazine with an MANABUS publicity advert where there were pictures of the early buses from 45 years ago. He is like an icon of MANABUS.

In the middle of that week, the missing plastic corner edge was received, but now an imported spraying system was missing. The containers with imported material arrived then. Outside on the patio, in the same place where at the beginning of

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the month 22 part finished buses were parked, an endless row of containers waiting to be opened were lined up. I asked Alexandra how can we locate the spraying system and she said we had to talk to Yagua. She warned me that the situation was not easy with him. She had been trying to reorganize warehouse 2 and depended on him to make the movements with the forklift.

I found Yagua driving the fork lift around the containers. I asked him about the spraying systems and he answered to me that it was only he who could open and handle the containers and he was desperate to get back home. He was annoyed, but I could read in his face that something personal was affecting him. I think I have a special intuition, to feel these things. In the consulting business I believe that this is a very important ingredient. I asked him what was wrong and he told me that his wife had just had surgery and he had to help at home, he was worried about her recovery. I told him to go back home and locate the spraying systems whenever he had time. Next day, Yagua arrived at the assembly line bringing them himself.

Contreras was not convinced that Diana could lead the meeting when I was not there, so I created sort of an agenda to follow. First we reported the most important: Cards delivered to sales. Then we analyzed the potential deliveries of the day and from there straight to the bottleneck: the paint cabin. Finally we discussed the feeding to the lines and the stock outs situation.

Wednesday they installed in the meeting room a spectacular giant plasma monitor that they found in the sales department. I was really happy, this meant

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that not only was the problem of always having a projector available solved: but also TOC was part of the day to day of MANABUS.

That week we started to design the *buffer* template with the chair information for Goma Partes. Federico the engineer who is responsible for scheduling in Goma Partes came that week to visit and we agreed to prepare the daily information. Diana was going to be the contact person. We must create the procedure and train Pablo Castellanos.

That Saturday I spent half a day at the plant. Now there was a problem with hooks that hold the batteries in place. Carmelo Arcia, someone in charge to “chase this type of fire”, tells me that they can be bought locally, but not on a Saturday. Without this, Garcia cannot take the buses for road test. Nicolas volunteered to make them and even Garcia offered to mount and dismount them one at a time in order not to stop the process flow. At the end we decided to wait until Monday and do a special operation to get up to date as soon as possible. The attitude of work and cooperation were the correct ones, nevertheless we discovered that Carmelo Arcia was the author of the f\*\*\*\*\* meeting name. I spent all Sunday analyzing the information to set up the *buffers* for Goma Partes. I had tried to get them to understand that like Clear of Venezuela, another one of their regular clients, we were trying to show our inventory every day. Federico mentioned Clear, but he said that it did not work with them because the information was a disaster.

The similarity with Clear did not help me at all because I know the case very well. Previously I had given some TOC training for them, but the ingredient of the right

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people with the right mentality had disappeared from this place. The most important source, my good friend of many years Milagros Polanco, who worked for Clear for 7 years was the one who gave me the answer I was looking for. I have known Milagros for more than 10 years. I first met her through Ing. Juan Suarez Centeno, another one of those Alex Rogo types, to who I am very grateful. At this time he was the general manager of a shock absorber plant: in Venezuela, the first company who took me to Valencia to introduce TOC. Milagros designed the ERP planning system of this plant and immediately we established a special connection of work and friendship that has remained in time.

When I first showed her the template, she said to me: "I do not understand it, let's go to the practical side". The idea is that if Goma Partes visits MANABUS every day, it must work, like the Coca-Cola truck that replenishes what is missing on the shelves in its daily visit. There must be a starting working inventory, in order to replenish according to the color *buffer* priorities. She explained to me what she had set up for Clear: she had a production board that was equivalent to our process map. Two years ago, Milagros decided to put all her knowledge and experience for her own business. She and Margarita, who was the finance manager of Clear, today apply the TOC common sense thinking very successfully to their own Accident repair shop. Of course, after she left Clear the production board approach was changed and all the logic structure that supported the replenishment process went away with it.

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After consulting with Martin and with Milagros suggestion, I remade the template.

I now had to return to explain to Pedro and Diana again. I ended my weekend analyzing the production numbers that Celia gave me from other months.

The amount of buses delivered from January to June did not include incomplete units. There was no separate record like the one William started to record since the month of July. Taking the last three months (bigger production numbers) as a basis for a comparison I had to convert this to the equivalent of 22 working days for the month of October.

The result was: before TOC, for a month of 22 working days, the average of units delivered to sales was 95 complete buses and on top 31 incomplete units. That was going to be the base for my comparison for improvement.

### **October 2007. Week from the 29<sup>th</sup> to the 31<sup>st</sup>**

That Monday I showed Contreras the analysis of the production information. I validated with him the logic of the calculations and he agreed with the numbers. I still had to analyze the impact of the WIP reduction.

That same day visualizing the process map information, it was the time for Marcos and Narvaez to start again with production that I had stopped for three weeks; decision that they would have never taken on their own without the help of TOC. The 22 buses that I found in the cemetery at the start of the month were either finished or processing along the production line.

Marcos was the one that was more desperate, in the production meeting we emphasized that we only needed 2 cars a day from his line. In his impatience he started to work ahead of time, and it was Cruz who warned me. He was noticing

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it through the rate of consumption of chassis he was sending. I consulted with Contreras and I took an afternoon (on purpose, to lower the speed of the line) to organize a workshop with *The Goal* movie and a Drum – Buffer – Rope simulation. We invited Marcos and Narvaez with all the personnel that had been stopped for three weeks. I asked William to give the introduction and to help me with the details; I wanted him to be involved. He was still trying to understand the average calculations, and I was dedicating all my time to Alexandra and Diana. I did not want him to feel that I was leaving him on one side. We had the session in the dining room and I asked Contreras to attend; it was important that people noticed he was present.

I stopped the film at several points doing the analogy with the real situation of the plant. I was afraid of the reaction of people; we had managed to relocate most of them where it was needed, but many had been affected in their income with no overtime.

I explained that the situation of this month was unique, due to the way we had needed to change to working according to TOC. I emphasized the point of the paint process being the bottleneck and how all we had to protect the work of the cabin. Montero, the painting supervisor, is the director of the orchestra, and he needs all the members playing at his rhythm that he indicates, with the correct product mix.

We finished the session with the drum buffer rope game and the volunteers tied up, simulating the scene of the boy scouts hike in the film. Then we reached a critical point - questions and answers. To my surprise, NOBODY mentioned the

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By Maria Cristina Sierraalta (Goldratt Venezuela and UK)

money situation. People were interested in how they could help to make more buses. There were suggestions of the need to improve the quality of the fiber glass in order to alleviate the amount of preparation work in the painting cabin and to review which of the units take another color (external contractor) and do not need as much detail when they are processed. I took the opportunity so that Narvaez and Marcos could talk to their personnel, thanking them for the collaboration of all. At a distance I spotted Contreras smiling, and once again, I could corroborate the necessary ingredient of the “right people with the right attitude”.

On the following day we had the session with the purchasing department to review the *buffer* assignment. Contreras was putting pressure on me - for sure this will need to be organized for the second stage of this project. The objective was to start with the basic concepts and to encourage them to practice with simple examples. He was sure that nobody was going to have the homework ready and if anyone will have it, it will be wrong. I also had my doubts - some of the participants do not even have a computer or know how to use one.

To the surprise of both of us, everyone brought the homework and it was correct. The first one to arrive was Paul, a very quiet person that I am sure has never sat before in front of the computer. He works for Fibropartes and he brought an example of an activator that he orders for the fiber glass production. He understood his chart and he managed to get some help from Penélope.

We now had to buy in Trejo, the IT manager and Juan, the finance guy. The idea was to have the possibility to implement *buffers* automatically extracting the

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information of the system in real time. The first one to arrive was Juan. When we brought up the problems created by changing dates on invoices and the amount of rework to match them from the purchasing department, he was inflexible. For tax reasons this could not be changed; the smart thing was to analyze how to solve the problem without changing the rules. What in fact was happening is that since there was no systematic purchasing process in place, everything was a last minute emergency.

At this point it was not possible for them to understand that this could change if we set a proper *buffer* replenishment system. The method would have to prove itself. Then Trejo arrived. Although we were not going to change the rules for the dates on the invoices, we wanted real time information. Trejo did not understand—I believe he will never do so— what we are trying to implement. He could not see the need to analyze the behavior to replenish according to real consumption. In our discussion he would always go back to the projected sales forecast, the traditional method.

I ended the session thanking everybody for their effort. Jennifer, Yelitza and Doris were going to have to help with Enrique Ignacio, the purchasing manager, in working towards this direction. Everything here has to be changed; this is just the peak of an iceberg. Not only was the change going to come from establishing *buffers*, but also from ensuring that the suppliers understood the working method. We had already had the first consequence of it with the window supplier. Alexandra, with the help of Jennifer, had set up the information for one of the window suppliers and they did not know how to read it. As a result we had the

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first mistaken shipment. Contreras was annoyed, on the one hand Alexandra had worked with the information of the system that was not in real time based on a projection, and on the other hand, Jessica had passed a table with too much data and the supplier had interpreted by reading the wrong column.

It was necessary to start contacting the suppliers to explain to them. Like we had done with Goma Partes, that week we called Fika, Gevesa (rubber) and Tri Glass (windows).

The first one to arrive was Manuel from Fika. This supplier provides glue and coating products with high regular consumption in the assembly lines. They have a special refrigerated warehouse which they are supposed to replenish once per week. As the *buffer* concept is not implemented, the numbers never match and the inventories are unbalanced.

We explained to Manuel our new method of work and how we wanted to synchronize the replenishment of materials. He mentioned all the problems they had at the source; the product comes from Switzerland and with all the currency and customs difficulties it was impossible to ensure availability. The solution that they had raised was to invest in a bigger warehouse. When I asked him how much paranoia —that was not real demand— was in their clients due to stock outs, I started him to think.

Javier, was going to be the contact person, and every week he was going to send the *buffer* information of his products. We taught the model of Goma Partes to him and we requested his support to work this way. At the end of the meeting

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he asked for my business card and for the possibility to talk to his boss about implementing the same with the rest of their clients.

The next to visit was Daniel from Gevesa. He and Guido, his planner, listened with attention. They were a little skeptical - they had their own method to calculate how much MANABUS needed. It is based on a projection from their IT system!! Contreras intervened and he requested me to project the process map, and the file and he talked about the changes we had made and he even invited them to consider applying the same ideas for their own company. That week we had had a stock out of a rubber part that he had not been able to supply due to a raw material shortage and we had made him convert his scarce raw material from another product that we did not require immediately.

I felt very proud with his explanation; he sounded the perfect Alex Rogo of *The Goal*. Alexandra said that the smile of satisfaction on my face was impossible to hide.

The last visit of that week was from Tri Glass. Contreras had requested Rosaura the planner from the plant, to come to visit. The problem was the excess of the windows that came from Tri Glass and Rosaura was ready to dispatch the rest of the order on the following day with incorrect quantities.

Without much detail, I explained to her the work method that we wanted to implement. Immediately she got the idea and she said that I must go and talk to her boss, who drives her crazy if she is not producing all the time. I identified myself a lot with her - she is the "warrior" at the battle front who struggles to deliver to MANABUS what is really required.

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We did not waste any time and we sat to work with her so she can take the first tentative list to analyze what she can do to stop the next day shipment. In less than two hours she had her list with the priorities for the week. I agreed to visit her plant next time I came to Venezuela and I promised her a copy of *The Goal*. It was my last week in MANABUS, and during the production meetings I tried to delegate to Diana the process more and more. Every day of that week we analyzed what will be the situation for the end of the month. Contreras had said to Ernesto Marcano that the projected number was to finish with 130 units. My calculation gave around 134 complete units; we were not going to reach the bonus (140) but we were going to be very close. The definitive final number turned out to be 136 complete buses.

The President had asked Contreras to meet me separately. I asked for Contreras's advice, after all I had never had spoken directly to the President. The week that we had the training session with the purchasing department he approached the door and suddenly everybody shut up in silence. Contreras invited him to come in, and he said to us in a joke: "I thought that they were giving away something here, but if it is a training, I do not want to continue learning..."

I had been working on the presentation for the board meeting, but I knew that the President was not going to listen to me for more than 10 minutes. Contreras advised me to show him the process map and the comparative table with the results. The President had requested Contreras to ask me if I can come back again in March, so he had noticed the results from the TOC work.

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Ernesto Marcano was not available the 30<sup>th</sup> so the meeting was postponed for the following day. The 31<sup>st</sup> was the last meeting of the month and my last full day at MANABUS. The projected number for the closure of the month was 134 complete units. Harry “bear” had two additional ones but he was not sure that he had enough time to finish them. In the meeting I took the opportunity to make a review of what was achieved during October.

One by one they were contributing with their comments and I wished I would have been able to record their words. Lucas and Cruz, from the chassis department felt that there was less stress and they used their time completing missing parts and solving problems on chassis units that were already in the line. Narvaez and Marcos, that had their lines stopped for 3 weeks, reorganized their people, lending personnel to other areas and completing parts at the stopped work stations. Zaldivar, Alexis and Mr. Figueredo worked with smoother flow in their line; Patricia was in time with the fiber glass parts and Zaldivar “churro” did not raise the normal complaints. Napoleón did not feel the pressure from the assembly of luggage compartment cases area anymore, having clarified that the requirement was of two daily units. Montero, was going to be heavily watched for “holes”, at least the keys could not get lost from now on. He will remain the “Herbie (fat guy)” of the system and there was less chance of losing weight now that he no longer had to do long walks towards the patio in search of the units. Even now in the painting cabin, under initiative of the workers, the steering wheels of the buses covered in paper had the chassis number written to help with the identification of each bus. I recalled again that he was and will always be

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king of the party, the orchestra conductor and we all were there to look after him. Granado and Mr. Martinez in the area of chairs and ducting systems had worked in a more synchronized way. Correa said that for the first time, all the buses in line 9900 arrived with their chairs to Technical Service, as it was supposed to be. Reyes, Henry and Harry “bear”, could feel a big difference; they had not felt the typical end of the month syndrome chasing from before TOC. For Javier previously, the end of the month at the warehouses were madness; the change was also dramatic here. One of the happiest was Jose, his objective of delivering units every day, without the trauma of persecuting anybody, was definitively a better way to work.

I thanked everyone for their cooperation and reminded them that nevertheless this was the f\*\*\*\*\* meeting; they will have to continue with the work even though I was not going to be there. I asked for applause for all and recognition for Ing. Fernando Contreras, the Alex Rogo of MANABUS. Before leaving, Napoleón gave me a box of chocolates as testimony of his gratitude.

That afternoon, Jessica told me that Contreras was waiting for me in his office. When I entered, I saw everybody in the meeting room. They had organized a goodbye surprise party. I was embarrassed and surprised. We took pictures and had a snack. Definitively this had been a very special month, now all what was left was my presentation to the people in the “cave” as it was called, the board meeting.

Contreras called everyone to the meeting. There were Jaime, from Finance, Manuel Candia and Cesar Mijares from Sales, Mirna, a lady that I believe is in

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charge of imported parts and seems to be at a high level, Francisco from spare parts and of course Contreras. While we waited for Ernesto Marcano, I explained to Jaime that I was not clear on the money value for the WIP reduction; I was going to present it in terms of difference of units, since they make the traditional accounting with added value. Then we had a discussion about numbers and he said he wanted to understand why the costs shown on his accounts were always higher than the standard for the number of buses produced. Where was the difference? I explained very superficially the TOC Throughput accounting method and he showed interest; he asked me to organize a Finance workshop for his department next time I visit.

Finally Ernesto Marcano arrived and we started the meeting. I had planned for a first part with basic concepts, but while I was speaking, he was reading some papers not paying any attention at all. I stopped the presentation and took out my playing cards and dice to explain with an example. Each card simulated a stage of the process and each person had to throw the dice to obtain the number of required pieces at each workstation. Each one needed four parts, therefore, getting less than four represented that the station could not move the unit forward. The painting was the third card and it had only painted units if the result of the dice was 4, 5 or 6. Each person was responsible for a stage and on purpose I gave Ernesto Marcano, the paint cabin. When it was his turn he threw a two, which meant that the painting had not delivered anything that day, generating a hole for the assembly line. Little by little I was catching his attention and I explained to all with my example the concepts of *buffers* and bottlenecks.

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From this moment they all followed me with attention. I projected the tables with the results. We had obtained an increase in production of 43%, we had produced 41 more buses than the average from best 3 months of production of this year and there were no “deviations”, incomplete buses. The reduction of inventory in process was of 40 units (52%). These results were really impressive. In successful implementations the improvement margins represent around 30% in 3 months. MANABUS had obtained a 43% in only a month.

We spoke about next steps and we decided to continue with the project for purchasing, sales and marketing. The competitive advantage that we could achieve if we incorporated the *buffer* replenishment methodology for all the materials should be transformed into a strategy to make even more money. I offered to bring Martin from the Goldratt UK office to support in this part. Mrs. Mirna accepted to take part in the training for imported parts and I asked Ernesto Marcanoto dedicate me a day of his busy time to participate with other managers. We joked and I said to him that finally I had had access to the second floor “cave” without ever speaking to the President. I mentioned all the adventures towards the approval of the contract and I requested a special recognition to Fernando Contreras, definitively, without his support and the connection with them this would have never been possible.

That night I called Gabriela Gresi and Danilo de Lima to thank them for the connection to MANABUS and informed them of the results achieved. Gabriela highly excited requested me to organize a presentation in Auto Paint as a result of their work towards supporting fleet clients. I am sure that Gerald Barreto and

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Sergio Rodriguez, the heads of Auto Paint are going to feel very satisfied with the results MANABUS has obtained.

I had a remaining *buffer* day personally and it was in danger. I left very early the following morning, I had to pack and get ready to fly to Las Vegas for the annual TOC-ICO meeting that started in two days. On my way back I could not stop thinking about MANABUS - the work had been very intense, I had lost 3 kilos that month and I felt the satisfaction on having achieved something that was going to remain over time. As the TV advert says for everything else there is Master Card. That night I went for dinner with my friends Jose and Lorena, my friends who make me return to the world of normal people, as my mother will say. I could not avoid telling the stories about MANABUS... Theory of Constraints is more than a job, it is my day to day, a way to think and approach the world.

On the following day at 8:30 a.m., just like Jonah, from the airport, I called to the production meeting at MANABUS. They gave me the definite final number: 136!!!

At the end of the conference call Contreras said to me that people had a question: "That if from abroad Maria Cristina still wants to govern them"