I Introduction

Deep in the heart of India's Lost Delta lies the Temple of the Forbidden Eye. This temple was built to honor the deity Mara. Legend has it that the temple can offer guests one of three gifts: earthly riches, eternal youth, or visions of the future. But one must heed this warning: do not look into the eyes of Mara, for if you do, your path will lead to the Gates of Doom. Famed archaeologist Indiana Jones has discovered this temple and all it has to offer. Now, guests are being taken on a journey through the temple in hopes of acquiring one of the three gifts. This is the basis for the Indiana Jones Adventure at Disneyland. In actuality, this temple is located in Adventureland, not somewhere in India. Guests don't really have the opportunity to gain earthly riches, but they will definitely gain an experience they won't soon forget! This paper analyzes the distributed cognition which is present in the operation of this attraction.

II Methods

The data presented comes mainly from two distinct sources. The first is my experience as an employee (Cast Member) on this very attraction. I worked as an "archaeologist" for just under two years at the Indiana Jones Adventure. During my time there, I worked each position a great number of times, and have extensive knowledge of how each is designed to operate.

In addition to this knowledge, I visited the attraction and made observations of each Cast Member's contributions to the system as a whole, concentrating on interactions of Cast Members with each other, as well as interactions with guests. I also took notes on exactly *how* each job was done and what artifacts were utilized in the process. To do this, I observed from two principle locations. First I observed from atop a barrel at the eastern corner of the station, where I could easily see almost all Cast Members. Because the station is so richly populated, I was generally not noticed as being out of place, except for one guest who asked if I worked there. The other place I made observations from was the center of the Station known as the 'island'. In order to be able to stay there for a prolonged period of time and not arouse suspicion, I acquired the approval of one of the working leads who explained my purpose to those who I'd be observing in close proximity. To complement my notes, I also took photographs of various locations of the Station to aid in my description.

III Overview

The attraction is divided into three main parts. The first part the guests encounter is the pre-ride area (queue). This consists of themed landscaping and various themed sound and lighting

effects. As guests venture through the temple, they arrive at the boarding area for the vehicles (the Station). The Station is where the guests are grouped, seated, checked, and dispatched into the heart of the attraction, the ride itself. Due to its rough off road-like nature, all guests must be at least 46" tall in order to ride. After the ride, guests return to the Station and are directed back outside through the exit queue. For my project, I'm focusing on the interactions of Cast Members in the Station with each other, with the guests, and with the environment.

The Station

In order to analyze the distributed cognition within this system, it is necessary to describe the operation of the attraction with respect to the Station [diagram 1].

The Indiana Jones Station is entirely contained in one large room, with a passageway leading to other rooms such as the break room, vehicle storage, and bathrooms. The station is divided into two main sections, the north and south sides. These two sides are joined by an island in the center of the room. The island is defined by the tracks that run along either side of it. There are 2 ways to get to the island. The most common path is the staircase which ascends above the north track. The other way of getting onto the island is via the 2-way elevator system that is primarily used for handicapped guests. I should mention here that the division of the Station into the north and south sides is mostly a figurative one; there are no rigid outlines to make this distinction clear, however much of the dialogue and referencing that occurs between Cast Members takes advantage of this denotation. There are a total of three distinct labor rotations that operate throughout the attraction. The idea of a rotation is that Cast Members rotate from position to position about every 15 minutes, which is the length of a standard break (lunches are 30 minutes). This way there is always someone on break who "bumps" the person ahead of them. This is perpetrated along the rotation until the next person goes on break, etc. The three rotations are defined as follows.

The Tower Rotation

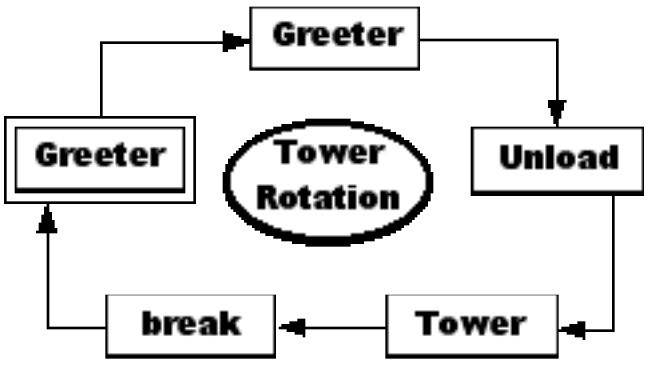
This rotation is named so because it includes the tower position. Someone 'bumping into' the Tower Rotation would start at the outside marquee. (Greeter). Greeters are in charge of checking the heights of children and greeting guests as they arrive. There are 2 people stationed at Greeter since it can get very busy out there.

The Unload Position

The third position is called the Unload position. This person is stationed in the Station just north of the track. [diagram 1] The Unloader is in charge of assisting wheelchair-bound guests out of line at this point and into the elevator. Since the remainder of the queue ascends a flight of stairs, these guests need an alternative route. The Unloader is also in charge of assisting guests with a Child Switch Pass. Briefly, if a party has a child that is too short to ride, one adult may wait with that child while the rest of the party stands in line. This adult is given what's known as a Child Switch Pass. Afterwards, the adult who waited may take one other person and walk up the exit queue and be able to ride the attraction with very minimal waiting in line. Finally, the Unloader also handles guests who have various medical conditions that keep them from being able to wait in line. By "handle" I mean either to put these guests on the elevator or into the queue, as required. The Unload Cast Member is the only person who works in the Station from this rotation. However, since the Unloader does not interact with guests regularly, and does not interact with other Cast Members regularly, I will restrict my analysis to the other positions within the Station.

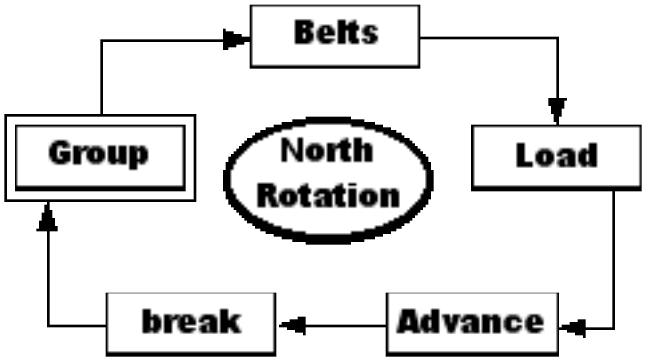
The Tower Position

The 4th position in the Tower Rotation is the tower position itself, where a Cast Member will sit and watch monitors, field phone calls, and serve as a dispatch center between other regions of the attraction and the rest of the park. The Tower Cast Member has before them a control panel with which to interact. There is a public address system through which information can be relayed, a network of monitors connected to cameras in various parts of the ride interior, a visual representation of the track layout, and vehicle control buttons such as the Emergency Stop, Ride Stop, and Station Stop. The diagram below demonstrates the rotation.



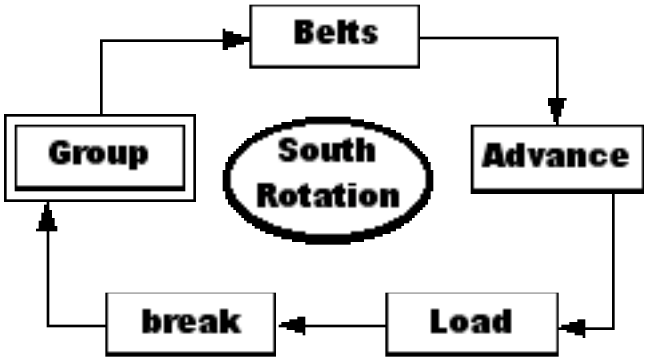
The North Rotation

This rotation is named as such because it occupies what is referred to as the north side of the station. The Grouper position begins on the island [diagram 1] and this person is in charge of grouping guests into the vehicles and dealing with guests in wheelchairs. The second position in the rotation is the Belt-checker. The Belt-checker is in charge of checking seat belts of all the guests, and dispatching the vehicle into the attraction. This person stands at the belt-check console located at the easterly most part of the station. [diagram 1] The Loader is the third position. The Loader is in charge of making sure the guests safely board the vehicle and that the guests departing do so on the correct side of the vehicle. Lastly, the Advancer stands at the advance console [diagram 1] and advances the vehicle to the belts position after all the guests are seated. It should be noted that the rotation order does not correspond to the order in which guests will encounter each position. The order is optimized for Cast Member convenience, such that one generally moves in a circular path around the station.



The South Rotation

The south rotation occupies what is known as the south side of the Station. All of the positions are more southerly than those of the north rotation. The south rotation's positions have the same function as those of the north rotation, except that the south Grouper does not have to deal with wheelchair-bound guests. Also, the Advance and Load positions are switched in the south rotation, this is due to the spatial positioning of each location and its proximity to the north side of the Station where the break room and paths to the attraction exterior lie.



The Operation

Along the queue, the first person encountered when one reaches the Station is the Unloader. At this point the queue is divided in two, one which will funnel to the south side of the Station, and another which will funnel to the north side of the station. Just before the staircase there is a small gateway in the ropes to let people out of the main queue. The Unloader assists the wheelchair-bound guest and party over to the elevator, and explains the procedure. The elevator takes them up to the 2nd floor, where they walk across to another elevator that takes them back down onto the island.

The Grouper

Guests then continue up the stairs and down again, arriving onto the island where they are met by the Grouper. The Grouper's job is to ask how many people are in their party. Once this has been determined, the Grouper must decide in which row to place guests, or in which multiple rows. The Grouper must also deal with guests in wheelchairs, crutches, walkers, etc. as they exit from the elevator. In addition to these responsibilities, the Grouper should be watching young children as they arrive to be sure that they are in fact at least 46 inches tall. The Grouper must also be aware of vehicles with broken seat belts, since this changes the number of available seats in a given vehicle. The north and south Groupers work side by side, as both queues drain out at the same location.

The Loader

As the guests arrive at their assigned row awaiting their vehicle, the Loader stands between the guests and the track. Due to the nature of the vehicle ride control system, which relies on hydraulics, the frame of the vehicle where the guests are seated is raised about 2 feet above the chassis. Therefore, in order for the guests to board, the sides of the track are raised about 2 feet,

thus creating a ditch that's about 2 feet deep. [diagram 2] Anyone falling into this ditch could sustain very serious injury or even death if they were to be struck by an oncoming vehicle, thus the job of the Loader is mainly a safety one.

The Advancer

As the guests are being seated, the Advancer stands at the advance console. This is the first time in the system where there is any automation. After the guests are all seated, the Advancer must await signal from the Loader before the vehicle may be advanced to the next station. This signal is given by the use of a hand signal. [diagram 3] Once this signal is given, the Advancer may send the vehicle to the Belt Checker, assuming she sees no further problems. The Advancer though has more duties than just to advance vehicles. There are a number of buttons on the console which must be tended to.

The Advance Console

The most important button on the advance console is the Emergency Stop (E-Stop). This button is for use only in extreme situations, when all vehicle activity must stop immediately. An example of one such situation may include a child falling into the ditch where the track lies as a vehicle is approaching. There is also a Station Stop button, which will stop all vehicles currently in motion on that particular side of the station. However, this does not cut power to the vehicles, and hence it takes the vehicles a few feet to come to a complete stop. Also on the console is a track switch indicator which shows the Advancer which side of the station the next vehicle will arrive on. There is a vehicle return button which, if pressed while a vehicle is stopped for loading, will ensure that vehicle of returning on the same side of the station. This is a very important function which will be discussed later. There is also a Station backup light which illuminates (on both advance consoles) if vehicles begin backing up prior to entry back into the station. There is also a closed-circuit telephone from which the Advancer can call the Belt Checker, the other Advancer, or the Tower. Finally there is the load advance button. This button illuminates a bright green when the previous vehicle has been dispatched from the Belt Checker and onto the ride. When pressed, the vehicle is sent on to the Belt Checker.

The Belt Checker

Once the vehicle arrives at the Belts station, all the guests are seated and begin to strap on their seat belts. As you might imagine, the Belt Check Cast Member must check to be sure

everyone's seat belt is fastened around their waist. This is another safety concern, since the ride is quite rocky and jerky, much the same as a real romp through an old temple in a Jeep might feel like. This is also the second point at which the two rotations come together. At the Belts station, the North and South Belt Checkers work side by side and share the same console. Since the two positions are almost identical, I will not differentiate between them. The Belt Checker uses an LED display on the side of each vehicle which shows whether the seat belt for each seat is buckled or not. There is a special green LED that illuminates the driver seat, so that the Belts person does not have to mentally rotate the side-ways display to determine exactly which seat belts are not fastened. In addition to this, the Belts person must personally check each and every seat belt to make sure that no one has cleverly buckled the seat belt *behind* themselves in attempt to thwart Disney's safety policies.

The Belts Console

The Belts Console has many of the same functions as the Advance consoles. The additional functions include a P.A. system for the entire ride (not individual sections like in the Tower), a diagram and buttons for pulling a vehicle, and two separate dispatch and station stop buttons; one for each side of the station.

Pulling a Vehicle

The Belts person must also be concerned with the need to pull a vehicle off the main track for maintenance. Sometimes a vehicle will malfunction, or there will be too many broken seat belts to make it worthwhile to continue loading guests. Sometimes, in cases where attendance is very low, a vehicle may be pulled to decrease the chance of station backups, which partially ruins the show atmosphere for those guests whose vehicle is stopped on the track. In any of these cases, it is necessary for the vehicle to be pulled off the track and into the maintenance bay (hand-off area). When a vehicle is ready to be pulled, one of the Belt Checkers must enable the storage mode, and then 'jog' the vehicle forward into the hand-off area. There are controls for this at the console. While this is going on, no vehicles may be dispatched onto the attraction since the track switch is in the wrong location. As a result, vehicles are only pulled if it is necessary as a safety issue, or if doing so will improve operation.

The Ride itself

When the guests depart the Belts station they are whisked way into the Chamber of Destiny and then into the Hall of Promise. For the next 3 minutes and 18 seconds, not a human is in sight, and the computers on board the vehicle and the ones lurking behind all the show effects take control of the adventure. Of course, if something should malfunction, the Tower operator has the Ride Stop and Emergency Stop buttons at his disposal should they be needed, since none of the other people with access to these functions have any view of the vehicles once they leave the Station.

The Return

When the vehicles return to the Station, they are greeted at either the north or south side of the Station by the Advance and Load Cast Members. Generally it is the Advancer who gets the most attention, since the guests will be exiting to that side of the vehicle (left side for vehicles returning on the north side of the station, and right side for those returning on the south side). Of course, an exception to this rule is made for guests with wheelchairs who must exit back onto the island to retrieve their chair and exit via the elevators.

IV. Distributed Cognition?

In sorting through all my data, several connections emerged between various parts of the system which were very striking, some of which involved up to 3 or 4 people, often those working in different rotations on different sides of the station. It was truly a fascinating thing to watch.

The task of getting one group of 12 guests onto a vehicle and onto the ride is rather large. To summarize, first the queue must be sorted to find parties that add up to twelve, or close to it. Second, these guests must be loaded into the vehicle and seated. Next, all their seat belts must be buckled and thoroughly checked. Only after this is complete may the vehicle be dispatched into the ride. The system that performs this task has been optimized for efficiency and safety. One person doing all this alone could achieve neither (especially the efficiency). Because of this, the tasks have been divided up into 4 positions, and then duplicated into 2 rotations which doubles the speed at which guests are sent through the attraction.

The Grouper

The Grouper is probably one of the toughest jobs in this attraction to carry out very effectively. The reasons are clear: the Grouper has a substantial task that has no automated

components. To be done well, the job requires a good working memory, the ability to mentally visualize the vehicles, and to quickly add up the number of people already in the vehicle. The information that the Grouper must process includes the number of people in a given party, and the number of people that have already been grouped into a vehicle. Additionally, there may be other factors to remember such as the fact that car #13 has a broken seat belt in row number 2, or that there is a group of 3 people waiting for the next car so they can sit in the front row. The physical representation of information for the Grouper is always the same; it consists of these numbers that must be manipulated in a certain manner. The formal representations vary slightly, as sometimes a party will not speak English and the Grouper (if he does not also speak their language) must communicate in a different manner. Most often this consisted of holding up the number of fingers that the Grouper *supposes* is in the party. It is likely that the guests have been on other attractions, so the idea of needing to know how many people are in their party is not a new one. Generally though, this information is propagated verbally.

Once the Grouper has grouped a party into a vehicle, that party walks past the Grouper to the loading area. Each vehicle has three rows with four seats per row. Each of the 3 rows are demarcated by railings and brass floor plates depicting the row number [diagram 4]. If the Grouper has forgotten how many people have been grouped into a vehicle, he may refer to the loading area and visually see how many people are standing there. In this manner, the loading area acts as an external memory device to the Grouper. Generally this is not a good habit to get into, as I learned myself. Many times a group will ask to sit in the front row even if this means waiting for the next car. Since the aisle for row #1 is wider than the others, it is common to tell that party to go and wait in that aisle for the next car, since the remainder of the car still needs to be filled, and it's very difficult to do so with a party blocking the end of the queue. If this happens, the number of people waiting in the aisles is not an accurate representation of the number of people grouped to a given vehicle. In a similar manner, the vehicles themselves act as external memory devices, since one can tell at a glance exactly how many people are seated. In examining the external memory of the loading area, it's interesting to note that the aisles themselves serve as a long term memory device for the approximate number of people who are supposedly waiting to board. However, the people who stand in the aisles serve as short term memory devices to the Grouper, since they are constantly changing, and represent a variable number of people depending on their configuration. So the Grouper can look at the guests themselves to get an approximate idea of how many people have been grouped, or he can look to the aisles to see approximately what percentage of the total vehicle space has been grouped.

The labor of this task is sufficiently distributed among the Grouper and the guests, since the Grouper (most of the time) merely tells the guests where to go, and the job of getting there and arranging their group falls on the guests. The Grouper rarely if ever will tell a group how to divide

themselves. The closest example of this is telling a group of 5 to sit "three in row 1 and two in row 2." However this has nothing to do with the guests themselves, but rather with the available seats in each row. A party of 8 for instance would not be instructed on which people must sit in either of the 2 rows they are to occupy. The guests are also asked for the number of people in their party, which takes the job away from the Grouper of having to count each person and then decide how to group them. Instead, the Grouper can already be thinking about what to do if the next party is 3, 4, 5 or any other number of people. Once he hears this number, he can immediately tell them which row to go to.

Another aspect of the Grouper's job is to watch for children who may not meet the 46" height requirement. Before guests even enter the temple, they are greeted by two Cast Members at the marquee. Their principle job is to physically measure each child who seems close against the height requirement. If the child is not at least 46" tall, he or she must wait with an adult or visit another attraction. As you may imagine, this method is not 100% effective because parents can travel up the exit queue and meet the rest of their party in line after passing the marquee, or sometimes a child just slips by the Greeters altogether. In the Station at the end of the staircase there is a mock-bamboo pole exactly 46" tall. [diagram 5] As the guests come to the end of the queue, they must pass right next to it. This makes it very easy for the Grouper to see if small children are tall enough, since they know every child's head should be at least even with the top of the pole. If there is any question, the Cast Member can ask the child to stand up against the pole. Akin to the aisles in the loading area, the pole serves as a long term external memory device for the Grouper, since it represents a static 46" measurement by which each guest is theoretically tested against. Obviously, this standard does not change with each guest, so the height that the pole represents is a long term store of that memory.

The Belt Checker

The Belts Cast Member is responsible for a more important part of the task, yet her job is in many respects much simpler. The only job that is not automated is the job of manually checking each and every seat belt. I noticed that as the vehicle approached, the Belt Checker would be ready, flashlight in hand. As the vehicle came to a halt, she would immediately stand up on the vehicle running board and begin using the flashlight to check the guests' belts. This allowed her to more easily see the people and whether their seat belts were buckled.

The information that must be communicated to the Belts worker is whether or not each guest is belted and locked in. Once the vehicle reaches the Belt Check area, any seat belt that is locked cannot be unlocked by hand. This prevents people from unlocking the seat belts on the attraction and putting themselves in serious danger. This information is represented verbally, as the

Cast Member usually asks everyone to buckle their seat belts before checking them. Many times, guests in the latter rows who may have not been paying attention a second before will see what is going on and be able to respond correctly.

Many times in addition to this she would raise her arms up over her head and ask the guests to do the same. This makes it much easier to see the actual black strap when guests' hands, purses, cameras, etc. aren't in the way. The typical behavior was to walk along the running board, from forward to rear, and shine the flashlight at each person's seat belt. After completing the visual check, the Belt Checker would walk over to the front of the vehicle and check the LED display to make sure the correct number of seat belts was in fact buckled. This double error-checking system is absolutely essential, since sometimes the LED will not function properly, and someone's seat belt will not show up even though it is buckled and locked. In this case, the Belt Checker must mark the vehicle number down on a special sheet reserved for seat belt and 'indicator' problems. If she were not to check the indicator, a guest could very easily pretend to have locked the belt, and not actually have done so. Not checking the belts manually could result in people buckling the belts behind themselves, a phenomenon that the LED cannot detect. Therefore, information is communicated to the Belt Checker by the guests and by the LED. Neither of these is 100% trustworthy, but relying on both cuts down significantly on the margin for error.

There is not much room for error checking once the vehicle has been dispatched. It *is* possible that when the vehicle returns, the LED could once again be checked by the Loader or Advancer to make sure the correct number of seat belts are buckled, but this is highly impractical since the seat belt lock is released a split second before the vehicle comes to a complete stop, and guests begin unlocking the belts and exiting the vehicle immediately. There is no time to survey the vehicle and the LED without taking sufficient time away from the other, more important duties of each Cast Member. Not to mention, this information would have to be relayed to the Belt Checker in a somewhat efficient manner, and even still, there would be no way to determine if the vehicle had been checked on the north or the south side of the Station. Therefore, the double error checking that occurs before the vehicle is dispatched serves as the only means for evaluating performance. Obviously, this is not very good since (presumably) a Cast Member will never dispatch a vehicle unless she thinks every seat belt is buckled that should be. What would be of particular use to know is the number of times she makes an error and actually sends a vehicle with an unbuckled seat belt. Thus far, in the 4.5 years that this attraction has been in operation, there has never been a situation serious enough to warrant such a closed loop.

The cognitive labor required for this position is nicely divided between the Belt Checker, the guests, and the LED, with final responsibility always resting on the Belt Checker. The Belt Checker will ask the guests to buckle their own seat belts, and check to make sure there is a belt across each lap. Then she will consult the LED to make sure that it agrees with her count. If there is a

discrepancy, she will likely check the vehicle again to make sure she did not make an error. Only when both LED and Cast Member agree does the vehicle get sent.

One final consideration that is important to mention is the design of the track. It is at this point that the two sides of the station converge into a single track. One foreseeable problem is that of two cars being dispatched at or near the same time and colliding with each other. This is a very serious predicament, and thanks to computers it is not a concern. Depending on how many vehicles are on the track at a given time, there must always be a certain interval from one vehicle to another. Once a vehicle has been dispatched from the south side and begins to move, the computer will not send a vehicle from the north side (or another one from the south side) until the required time has elapsed, even if the dispatch button is pressed. If this system should malfunction, the Belt Checkers could press the Ride Stop button or the E-Stop to avoid a collision. Once the two sides of the station merge, the track never crosses itself, so there is no danger of such a catastrophe occurring inside the ride, where there is no supervision save the cameras monitored in the tower.

As I mentioned before, the Belt Checker does have other responsibilities, such as communicating with other Cast Members over the phone system when necessary, and pulling or adding a vehicle occasionally, but these are rather infrequent (in case of pulling or adding a vehicle) and inconsequential (in the case of using the phone) to the major task at hand.

The Loader

The Loader position, as mentioned before, is mainly one of safety. However there are more implicit roles taken on by this Cast Member that became apparent during my observations. As the Grouper is filling the aisles with guests waiting to board, the Loader is standing right there watching. Sometimes the guests would forget (or perhaps they never understood in the first place) what row they were supposed to go to, or how many were supposed to be in each row. I noticed that the Loader would often times catch this discrepancy and be able to sort things out before the next vehicle approached. Since the Loader has experience grouping as well, he often knows what the Grouper may be thinking, and at the very least knows exactly where there is space in the vehicle. This goes on from the time the people begin to occupy the aisles until the approach of the next vehicle, when the Loader's attention is shifted.

At this time, the Loader will move to the space (about 16 inches in width) between the edge of the track and the railings dividing the aisles. I noticed that he usually stood in aisle 2 and held his arms out to cover aisles 1 and 3, basically making sure that no children (or adults) could get in the path of the oncoming vehicle. Once the vehicle came to a stop, the guests that have just finished the ride are ushered off and the new guests are allowed to board. At this time, the Loader watches

everyone in the vehicle as they take their seats. When everyone is seated, he gives the signal to the Advancer [diagram 3] that the vehicle is ready to be sent to Belts.

The Loader also works in conjunction with the Grouper and Advancer. If a vehicle is only partially filled, many times the Grouper will check the closest parties in the queue for one that will fill the empty space either partially or completely. If the Grouper finds such a party, they will have to pass by others while moving to the end of the queue. As this takes time, the Grouper will raise a fist in the air and shout "hold!!" This alerts the Loader that the current vehicle should not be dispatched, even though all the people may be seated. This is important because often times a vehicle will be sent when not completely full, so the Loader does not always know when the car is completely grouped. The Loader will usually raise his hand to alert the Advancer that the vehicle should not be sent. Ideally, the Advancer should not send the vehicle anyway without the signal from the Loader, but sometimes I noticed that this practice seemed like a formality since both the Loader and Advancer could plainly see when everyone was seated. The information to hold was thus propagated from the Grouper to the Loader to the Advancer, by means of a hand signal and possibly a vocal call as well. During the times I observed this behavior, the Advancer would keep her fist in the air until the party was seated in the vehicle, and then immediately give the dispatch signal. [diagram 6]

Another informational system is evident when a vehicle needs to be returned to the same side of the Station. This happens when a vehicle contains wheelchair-bound guests. Since guests board the vehicle from the island and exit to the left onto the north side of the Station (on the south side they exit off to the right onto the south side of the Station and walk across the track to the north side where the exit queue is joined), it is necessary that guests with wheelchairs exit back onto the island so they can retrieve their wheelchairs. Sometimes a guest will have a leg cast or some other type of walking ailment that prevents them from using stairs. These guests will also arrive on the island via the elevator, and must be grouped onto the north side of the station and returned, since if they return on the south side, they'll have many stairs to climb. These guests do not exit back onto the island after the ride, since the north vehicle exit doesn't have any stairs.

When a vehicle is to be returned, the Grouper is the first to realize this fact. He will signal this to the Loader by a hand signal alone; there is never any verbal communication. [diagram 7] The Loader sees this signal and perpetrates it on to the Advancer, who then depresses the Vehicle Return button. This flow is almost identical to the "hold" phenomenon, except that the vehicle return information is not propagated through any verbal means.

The cognitive labor for the Loader is divided ultimately between the Grouper and Advancer. The Loader takes and interprets information from the Grouper in order to ensure the guests are all lined up in the correct aisles. Then the Loader communicates with the Advancer when the car is

ready to be sent to Belts. In between the Loader performs his job of safety; the only job not reliant on either of the other workers.

Most of the information relayed to and from the Loader is done via hand signals and not verbal communication. This allows the Loader for the most part to have both eyes and ears on the guests and the situation at hand, rather than trying to talk over the vehicle noise and guest chatter, or hear someone talking to them.

The Advancer

Standing at the Advance Console the Advancer is mainly concerned with sending the vehicles on to the Belts station. As a vehicle approaches, the Advancer will often motion with her hands for the guests to exit on her side of the vehicle. This makes the job of the Loader an easier one, since it reduces the instances of people getting partially out of the vehicle on the wrong side and having to go backwards through the vehicle to the other side.

Perhaps one of the most interesting observations about the Advancer position is that it is distinctly separated from the Loader position. Concerning the practicality of both positions, they could very conceivably be combined, such that after the guests have been loaded into the vehicle and seated, the Loader could hit the advance button and send the vehicle to Belts. This would not reduce the efficiency of operation and would eliminate the need for two (north and south) Advance Cast Members.

In looking at the system, it makes a lot of good sense to separate the positions as they are. First and foremost, the Advancer acts as a second error check to the Loader. A guest may be having trouble getting seated and the Loader doesn't see this person and gives the Advancer the go-ahead. The Advancer has ultimate control of sending the vehicle. Also, the Advancer has a telephone at the console. If for some reason the Tower Cast Member had to notify her to hold the current vehicle because he saw the vehicle acting funny on the monitors, the Advancer can turn almost all her attention to the phone call and not worry about the system faltering while she's receiving instruction.

The information received by the Advancer is generally a non-verbal hand signal from the Loader indicating that a vehicle is ready to be sent on. However, because of the phone, she might also receive instructions that need to be passed back to the Loader. For instance, if a party has lost a hat or other item, they'll most likely talk to the Advancer about it since this is the first person they encounter upon returning and exiting the vehicle. The Advancer will find out from the guest what was lost, and in which row and seat, if possible the item was lost in. Then the information is relayed to the Loader across the track. The Advancer will first get the attention of the Loader, and then the rest of the information is transcribed nonverbally. The Advancer will mimic holding or carrying the

item that was lost, be it a purse, backpack, pair of sunglasses, etc. Then she will hold up either 1, 2, or 3 fingers which corresponds to the row in which it was left. From this point, the Loader will note which vehicle (they're all numbered 1-17) is at the loading point, and check for the item before allowing the new guests to board. The Advancer will then press the vehicle return button to assure that vehicle comes back on the same side. Meanwhile, the North Advancer will get on the phone and call the South Advancer to tell him what item is missing, since there is a good chance the vehicle with the missing hat will return to the opposite side of the station. As the Loader checks each vehicle, he knows when the first vehicle he began checking comes around again that all vehicles have been cycled through, so if the item has not been found then it must have fallen onto the track somewhere or been picked up by another guest. When this is complete he will alert the Advancer that the item was not found. If it *was* found, he will pass it across one of the vehicles to her. If the item is found on the other side of the station, it will be passed across the station until it reaches the clutches of the little girl who lost it.

The use of nonverbal communication amongst the Advancer and Loader is great, and for good reason. Due to the high noise level in the Station, verbal communication can be tough, even when using the phone. Also, verbal communication can be easily misinterpreted if not enunciated clearly and concisely. Hand signals such as the ones that are used greatly reduce such variability and are often communicated quicker than verbal language. It only takes a second to make the hand signal for a vehicle return, while the verbal command "return this vehicle" or some similar variant would take considerably longer.

V The Grouper (again)

As I made my observations, I became more and more interested in exactly how the Grouper does his job. I began to see a myriad of little components that are completely transparent to the casual observer but which are important to the successful and efficient operation of the attraction. [diagram 8]

I noticed that the north Grouper usually stood at the base of the staircase between the 2 lines, this seemed to keep the lines from forming one huge mass at the bottom. This made it easier for both Groupers to know which guests were a part of their queue. The Grouper would first make eye contact with the guests and greet them with a smile most of the time. If the party did not already tell the Grouper how many people were with them, the Grouper would ask. Now comes the interesting part. The Grouper must now decide where in the vehicle to assign the guests. Most of the time, the first group of guests was loaded into the front row. This is a wise option, since it affords the Grouper the greatest chance to completely fill the vehicle, which ultimately is the goal. Most of the time, there is someone (usually a child) who wants to sit at the "driver seat" so this is

generally a good way to start. After the first party has been grouped, the second party is grouped accordingly. The second party will be grouped all into the same row if possible. This seemed to be the prevailing requirement for grouping; that the party stay as together as possible. So if the first party had 2 members and the second party had 4 members, the second party would always be grouped into row 2 or 3. Completing a row is another goal, since rarely are there parties of a single person to fill one empty seat in a row. However, a row with 2 empty seats is more valuable than a row with one empty seat, since parties of two are quite common, and it's likely you'll find such a party to finish the row. Things get a bit more complicated with parties of more than 4 people, since these parties must necessarily take up multiple rows. Going back to the scenario with 2 people in row #1, let's see what happens when a party of 4 comes along. It might seem a trivial matter whether they be placed in row #2 or #3, since either way they complete an entire row. What I observed was that this party of 4 was most often placed in row #3, since this allowed a party of up to 5 or 6 to also be seated in the same vehicle. [diagram 9] Of course, this is a more efficient method of grouping, since it allows for the greatest possible number of people in a party to be seated in any given vehicle. It also minimizes open seats in a vehicle which also adds to the efficiency of the operation. For parties of 5, they are generally best split into 3 and 2. This way, no one in the party has to ride alone. A party of 6 may be divided nicely into two sets of 3 or a set of 4 and 2. In this instance, I observed that a party of six was grouped depending on which was most convenient given the current seat arrangement. If there was no one already in the vehicle, they were usually grouped as 4 and 2. This is a smart idea, since it leaves 2 empty seats together instead of separated; so a party of 2 can fill them.

Another interesting thing I noticed was that as the people in the parties walked by the Grouper towards the loading area, the Grouper would silently count the people to herself. A number of times, I noticed that the number of people in the party did not correspond with what the Grouper was told or expected. In these cases, the Grouper would hold the next party at the end of the queue and walk over to the loading area and try to negotiate a suitable arrangement. Sometimes the party that was mistakenly grouped would have to wait for the next vehicle. Often times this resulted in the original vehicle being advanced with empty seats, since it would have taken too long to go back to the queue and find a group to fill them.

The task of grouping is something that is very practical for a single person to handle. There are many variables that must be taken into account, but this labor cannot be divided amongst other people without compromising the efficiency of the system. Let's assume that there was another Cast Member, called the "Sorter" whose job it is to take as input from the Grouper the number of people in the party and to group that party accordingly. First of all, this extra person would take up physical space on the island which is usually at a premium. Secondly, once the guests have been moved from the base of the staircase, if for some reason they do not fit in the vehicle (if the

Grouper and Sorter have different physical representations of how to group, or if the Grouper loses count of how many people have already been grouped...) then it is difficult for them to be moved back to the front of the queue, and equally difficult for them to remain where there are, since it becomes a significant traffic problem. Therefore it seems very appropriate that the Grouper takes on both of these responsibilities.

As the Grouper's shift wears on, he has the opportunity to improve his efficiency through a simple closed loop. This is possible because the Grouper can see the vehicles as they're grouped, and how full each one is. For instance, seeing 4 empty seats in the same row again and again may be a clue that he is not being as efficient as possible. Also, as he has dealt with an increasing number of parties, certain vehicle configurations will become automatic, and thus much easier to group. For instance, things like knowing that a group of 5 is best split into three and two, and knowing that if you've got a group of 3 followed by another group of 3, a group of 6 will not fit into the same vehicle become almost reflex-quick. My observations on grouping proved inconclusive in showing that efficiency improved during a shift. I attempted to acquire more data on a separate occasion, but the attraction was closed for refurbishment.

A final consideration for the Grouper's job is whether or not it is truly necessary at all. In many amusement parks, guests are allowed to 'group' themselves and ride in whichever row they desire. Since this practice is so common, why would Disneyland choose to do things the way they do?

A clear advantage for the Grouper position is that this puts Disneyland in control of how full each vehicle is. It avoids the case where two parties both want to sit in the front row, and are willing to wait for the next car in order to do this. Sending vehicles with 3-5 people on them is terribly inefficient, and in addition to creating longer queues, more strain is put on the vehicles. Especially in the Indiana Jones Adventure, supervision as guests board the vehicles is essential, since there is such a high risk for injury. Also, since there is a height requirement, the Grouper serves as a secondary error-checking system. Clearly, the only drawback to having the Grouper position is that it requires one (or two) more bodies. But in comparison to what is gained, this is a tremendously worthwhile cost.

VI Conclusion and Summary

The Indiana Jones Adventure is a highly complicated social system with a simple goal: guest entertainment and satisfaction. The attraction is divided in to many parts, too numerous to cover in the scope of this paper. I observed that the different positions of the North (and South) rotations were created with two underlying goals in mind: safety and efficiency.

The system employs double error checking whenever possible to eliminate errors, especially those which pose a more serious risk, such as sending a vehicle when some of the seatbelts are not fastened and locked. In examining the Loader's role, which is primarily one of safety for the guests, we find another example illustrating how important a factor this is.

Efficiency is another plainly evident goal of this attraction. The queue is split in two near the end so guests can be attended to at twice the speed. Information is propagated through the system largely by hand signals, and only to those people in the system to whom the information is relevant. Each vehicle is filled as full as possible before sending it into the ride. Even the rotation order is optimized so Cast Members don't have to walk all the way across the Station to their next position. Also, Cast Members do not have to spend long hours in rotation or even in one single position, something that can breed exhaustion and carelessness.

Distributed cognition plays a clear role in this system as well. As the system has been optimized for safety and efficiency, the cognitive labor is vastly spread over a minimum of fifteen Cast Members (in all parts of the attraction, running at full capacity), various artifacts, and time. Within each Cast Member's role, there is a distribution of cognition among available cognitive artifacts, which can even include the guests themselves. Sometimes the artifacts are designed specifically for that purpose, such as the LED that shows which seat belts are buckled. Sometimes however, the artifacts are designed for something altogether different, such as the boarding aisles being used as external memory for how many people have been grouped.

I observed that the system works very well when each component is working properly. As with any system, there are specifications for what to do if some part of the system fails, however I did not observe any system failures during my observations of the attraction.