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Containment and Virtualization Slot Technology and the Remaking of the Casino Industry

Kah-Wee Lee

ABSTRACT: This paper examines how the casino industry was transformed by slot technology between 1950 and 1990. The criminalization of slot machines in the 1950s led to their massive evacuation into Las Vegas casinos. In this concentrated environment, slot machines revealed to casino operators an automated surveillance technology that could disassemble the player into streams of virtual data, not through any overt means, but through the very activity of play itself. Slot managers and gaming technologists found themselves empowered professionally as they experimented with ways to transform data into profits. From the 1970s to the 90s, this technological development effectively linked up every economic activity in various casinos across the US, creating a virtual network that defeated the geographical injunctions designed to segregate gambling from other spheres of life.

Keywords: Slot technology, techno-politics, virtualization, casino gaming, Las Vegas

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Technological dreams

In the 1970s, a technological revolution took place in the US. Gamblers were using computers to build "systems" to help them invest in stock markets, identify the best odds for horse racing and reduce the house advantage of casinos. Claims of foolproof ways to win lotteries and beat the casinos are not new at all. What is new in the 70s is how computers gave the gambler a way to handle complex probability calculations that would otherwise be impossible. The idea of a "system" of playing where winning is almost guaranteed if one stuck to the precise rules

was no longer a monopoly of casinos, but flooded into the imagination of every gambler who saw in the computer a way to use mathematics against the house. In 1979, an avid gambler created a quarterly newsletter, "Computers and Gambling," aimed precisely at this community of technologically savvy gamblers. One letter from a subscriber published in the inaugural issue gives a sense of what they were up to:

My interest in your proposed format centers around the simulation (on microcomputers) of poker competitions, including: 1.

The logo for the University of Nevada, Las Vegas (UNLV), consisting of the letters "UNLV" in a large, bold, serif font.

Identification of weak, strong and breakeven strategies (for various games); 2. General application of game theory to personal (psychological) conflict situations; 3. Mathematical quantification of the elements leading to strong or weak play ...¹

However, computers then were too expensive and beyond the reach of most Americans. A company under the innocuous name of “Tony Anderson Sales Company”, positioning itself in the field of consumer protection, offered to test various systems in the market for a price. It would dispense advice such as which table in which casino at what time offered the best probability for gamblers (down to a difference of 0.03% between betting on Banker or Player in a game of Baccarat), explain how computers generate random numbers and test whether or not certain systems worked. By 1972, they had tested 45 systems in the market, and gamblers could purchase their analyses via discreetly packaged mail.² Most systems, Mr Tony Anderson cautioned, were fraudulent. With computers, the criterion for good systems was tougher – at least 10,000 winning plays, with profits to make the investment worthwhile. 10,000 plays, he calculated, translated to 14.58 days of non-stop continuous play.³ The worst enemy, he further argued, is the player himself. To play using a system is to replace the “gambler’s psychology” with “cold logic and mathematical calculation.” While most systems simply did not work, this psychology also prevented good systems from working. One system of his own – a “computer calculated roulette system” – illustrates this. Unlike other systems, this was “logically developed” by computers, and proven to win over “3100 times out of 5000 trials.” Gamblers using this system would place their bets based on 38 decision charts:

Using the charts, *there is nothing left up to the player*. You simply watch the wheel for a spin and see what happened. You then turn to the page for that particular result and follow

the computer strategy. It’s the same as having the IBM computer sitting right there next to you to make every playing decision.⁴ (*italics mine*)

A skilled gambler must entrust his fate to the laws of probability. He must block his senses and empty his emotions, and become a servant of the computer. Another computer tutorial for poker trained the player to play like a machine, so as to deflect the psychological and sensorial distractions one would encounter in the casinos.⁵ This self-dehumanizing strategy was articulated in many ways by the various systems in the market – “Gamble intelligently”, one admonished; “Any casino game based on mathematical principles can be beaten by properly applied math”, a Dr Frank Walker (PhD Math) declared; others tried to exploit “mathematical imperfections” in gambling machines.⁶ Books like “The Theory of Gambling and Statistical Logic” (1967) and “Playing Blackjack as a Business” (1972) sought, similarly, to disenchant gambling by exposing and exploiting the mathematical logic of casino games. ([See Figure 1](#))

This prelude sets up dialectically the technological dreams that gripped the western gambling world in the 1970s. The tactics of these gamblers both mirrored and provoked the ways the casino industry reformed itself around numbers and machines. In a 1974 interview, casino consultant Bill Friedman responded to the challenge posed by these intrepid gamblers. He did not do so by threatening to bar them from casinos. That kind of punitive action should be directed at people who behaved in a disorderly fashion, not these card counters or system players who actually played by the rules. Rather, he tried to prove, using computers, that the human brain could not possibly break the mathematical armor that protected the house advantage:

They have run 200,000 hands through a computer but I once had an opportunity to make my own system on a computer and the mathematician I was working with wisely say “Let’s find out how big a problem we are

facing. Let's see how many possible hands can be dealt." The computer practically covered an entire page with zeros. The figure was so big the mathematician couldn't even pronounce it. So 200,000 hands isn't even the smallest part of one percent of the possible combinations, so the samples are meaningless in terms of telling us what the advantage is.⁷

The technological revolution was truly an "avalanche of printed numbers."⁸ From regulators to investors to casino operators, the objectivity and certainty promised by numbers agitated against the specter of chance and the suspicion of criminality. The annual reports of the Nevada Gaming Board built the case of economic benefit, professionalism and social order through statistics – gaming fees and revenue were listed quarterly; number of jobs created by the growth in gaming industry was calculated in relation to state population; the locations of licensees and the numbers of slot machines allotted to them were tabulated.⁹ At the first Annual Conference on Gambling held in Las Vegas in 1974, the "serious study" of gambling was dominated by economists, psychologists, sociologists and mathematicians who employed quantitative methods.¹⁰ Like Anderson, Friedman was a key witness and protagonist of the transformation of the casino industry during this period of time. He taught in the College of Hotel Administration at the University of Las Vegas since 1970 and was a dogged proponent of gambling as a legitimate form of entertainment and business. On one side, he would give seminars to vacationers on how to gamble so as to have "a fighting chance against the casinos,"¹¹ and on the other, he would teach casino operators how to modernize their businesses and maximize their profits. In all his different capacities, he showed that the way to defeat Anderson was a different model of casino gambling, one that would make the laws of probability even more impervious and totalizing while at the same time re-enchant the casino so as to restore and tame this "gambler's psychology."

In this paper, I attempt to trace the contours of this new model of casino gambling brought about by the "avalanche of printed numbers." Working through the internal discourses and practices of the casino industry recorded in trade journals, manuals, industry reports, and academic discussions between 1950s and 1990s, a figure was unmistakably significant - the slot machine. In the span of 40 years, slot managers and gaming technologists grew in prominence in the forums of professional exchange and transformed the casino industry beyond recognition. The slot machine revealed to casino operators an automated surveillance technology that could disassemble the player into streams of virtual data, not through any overt means, but through the very activity of play itself. Every bet and push of the handle became a piece of data that could reveal patterns about player habits and game profitability. By the 1970s, slot technology effectively linked up every machine into a virtual network, thereby defeating the geographical injunctions designed to segregate gambling from other spheres of life. In this epiphany, table games, hospitality services, and corporate management practices were absorbed into a "virtual superstructure of numbers," where objectivity and certainty could prevail. Yet, beneath these overarching processes of abstraction and rationalization, there were strategic imprecision and dangerous unpredictability. As more numbers were produced, more anxieties were generated. Slot managers and game technologists were both caught up in this performance of objectivity they must both produce and denounce in order to ensure their professional existence.

Containing Vice

We can begin by looking at a moment of technological transition - the invention of the first electro-mechanical (EM) slot machine. This hybrid machine standing between fully mechanical and fully electronic machines marks a critical moment when the laws of probability slowly escaped the constraints of

mechanical parts. In the service manual for this machine, it was reported that the EM circuitry introduced in 1964 revolutionized slot technology. Within 5 years of this new technology, the mechanical slot machine based on the “Liberty Bell” invented by Charles Fey in 1895, became obsolete. Consider this passage in the manual:

The first new concept was the 1964 Model 785 Double Progressive. With two meters there was always a sizable jackpot after a large win was ‘hit.’ These machines became very popular after the introduction of the 1971 Model 922, 5-line Progressive followed by the Model 952 5-Coin Multiplier the next year. The multi-coin play resulted in five times larger jackpots. It took just one more year for Bally to produce the Model 984 Big Shot Continental that featured four, 25-stop reels. The latter machine was able to offer a giant jackpot due to the 1 in 390,625 chance of hitting the big win one. This was an immense gain over the 1 in 8,000 odds offered in 1964. In the late 1970’s it had become popular in casinos to link a bank of 5-reel Bally progressive machines and offer a jackpot up to \$250,000.¹²

The quote clearly lays out the path of development that would drive reel-type slot machines for the next 20 years in three stages – 1. increase in the number of reels; 2. increase in the number of stops per reel; and 3. linking up machines together so as to pool the total number of reels and stops.¹³ All pressed ahead to raise the size of the jackpot prize. Yet, to appreciate the significance of this trajectory, it is necessary to look briefly at the criminalized history of slot machines. It shows how this technological possibility was already present in the early slot machine, but was untapped due to its criminalized status.

The key events that brought about the mass concentration of slot machines into Las Vegas casinos were the 1951 commission on organized crime led by Senator Estes Kefauver, and the 1951 Johnson Act that

prohibited the interstate transportation of gambling devices to where they were illegal. Law’s response to the problem of gambling was to create two overlapping spatial regimes of control – a contained space of autonomy where local governments could decide their own gambling policies, and a dispersed space of intervention which strategically targeted organized gambling syndicates operating across states.¹⁴ Although Kefauver’s reports had all the tone of a moral crusade (he used the word “evil” countless times), he made it clear that the problem was one of crime, not morality, and more specifically, the kind of trans-boundary organized crime that undermined interstate commerce through violence, monopolization and political corruption.¹⁵

As Panasitti and Schull noted in their study of the shifting discursive terrain of morality in Las Vegas, there was a “conspicuous lack of concern for morality in legislative measures after the 1950s,” focusing on “more mundane themes pertaining to, amongst other things, the circulation of gambling devices, the monitoring of movement by those in the gambling industry and most importantly, tax evasion.”¹⁶ Thus, this discursive shift is also a shift in the application of force. The self-imposed moral blindness of lawmakers and enforcers, and the spatial exodus of machines after 1950s, however, masks a longer history in the technicalization of illegality. With or without a moral basis, law had to find ways to differentiate between legal and illegal mechanical games in ways that were practical and effective. At this level of intervention, it was the fine line between gambling and amusement, rather than the chains that bound gambling to organized crime, that needed to be defined. Between 1900s and 1950s, legal injunctions against gambling devices generally identified three elements that constituted gambling – consideration, chance and prize. And, accordingly, attempts to evade the law also tried to work around these definitions. The key innovations that the police tried to criminalize both directly and preemptively can be gleaned in the

tedious legal definition of a slot machine for the city of New York:

any machine, apparatus, or device that is adapted, or one that may readily be converted into one that is adapted, for use in such a way, that, as the result of the insertion of any piece of money or coin or other object such machine or device is caused to operate or may be operated, and by reason of any element of chance, or other outcome of such operation unpredictable by the player, the user may receive or become entitled to receive any piece of money, credit, allowance or thing of value, or which may be given in trade, or the user may secure additional chances or rights to use such machine, apparatus or device; irrespective of whether it may, apart from any element of chance or unpredictable outcome of such operation, also sell, deliver, or present some merchandise, indication of weight, entertainment or other thing of value.¹⁷

To evade the law, early slots paid out “tokens”, “trade checks” or “free play” instead of cash to avoid the feature of “prize”; some paid out candies every time the machine was played to avoid the feature of “consideration.”¹⁸ Even more elaborate schemes were created to insist that some kind of skill was involved in these games. By the 1950s, the police were aware that gambling manufacturers, “although desiring to simulate the *appearance* of amusement pinball games, actually eschewed the complex and time-consuming play aspects of the amusement counterparts, and sought to minimize them.”¹⁹ Writing in the 60s, Rufus King, a lawyer who helped to draft the Model Anti-Gambling Act, pointed out that an amusement pinball machine took two to three minutes to play, while a game on the gambling version took only a few seconds. The former could earn about \$15-25/week, while the latter, \$200-300/week. To encourage higher stakes, coin-insertion mechanisms that could accept varying

numbers and denominations of coins or other tokens were already installed. In 1950, an entire issue of the *American Annals of Political Science and Social Science* was dedicated to the problem of widespread gambling in the US. A New York magistrate lamented, in the opening paper, the inability of the law to catch up with the cunning connivance of these innovators:

The manufacturers and distributors of slot machines and pinball games are engaged in a constant battle to circumvent the limitations and prohibitions of the gambling statutes. As soon as one type of machine is condemned as a gambling device by the court, another is manufactured with minor variations which are alleged to take it out of the category of an instrument for gambling and make it a device for innocent amusement.²⁰

Therefore, before the slot machines entered the casinos, this technology already contained a history of innovations that were provoked and contained by law. The compression of play-time to maximize profits and the understanding of player psychology were found in one form or another in these early machines. When Charles Fey invented the Liberty Bell slot machine in 1892, he deliberately designed the reels to stop in sequence, not altogether, so as to build a sense of mystery and expectation.²¹ The introduction of the jackpot in 1928 was so popular that it initiated an industry-wide process of retrofitting old machines to incorporate the feature. According to Marfels, the Draw Bell (1946) was one of the earliest to incorporate these innovations:

When the first spin turned up a potential winning combination, such as bells on the last two reels, who would not wager a second coin to win 16 coins? Or, how about relying on Lady Luck for the jackpot of 70:1 for the alignment of three “Bally Bars” when two of them had already come up on the first spin? It was an early forerunner of the video-poker mania of the 1980s and 1990s.²²

While the market for gambling devices was already lucrative and competitive before and during 1951 – at its peak in the 1940s, it was estimated that there were over “300 distributors in the United States, and over 15,000 operators with more than 100,000 slot machines installed in various premises”²³ - in the confined space of Las Vegas, the market was quickly dominated by two large corporations - Bally and then International Gaming Technology (IGT).²⁴ Perusing through Marshall Fey’s illustrated history of the slot machines from 1800s to 1980s, one would be struck by how, after the slot machines entered the casinos in the 50s, the diversity of this form of technology rapidly shrunk. Gone were machines that produced randomness through spinning wheels, dice-rolling, ball-dropping, gun-shooting and even weight-guessing. Some of these were relegated to amusement centers and arcades. But in the casinos, the overriding objectives of profit, security and reliability privileged only one type of machine. Thus, Fey’s photographic recollection of these old machines raises a visual counter-narrative to Kefauver’s report. Unlike Kefauver’s strict association between organized crime and slot machines, Fey’s history is more sympathetic and attentive to the range of social settings where these machines could be found. (See Figure 2) Most were profitable, but they were also “trade stimulators”, social condensers, and object d’art. It is not within the scope of this chapter to provide a detailed analysis of the socio-spatial contexts of these early machines.²⁵ But this reflection should alert us to the fact that, while much of the literature on casinos and slot machines emphasizes how machine technology flourished in Nevada after 1960s, the direction of this technological development, facilitated ironically by the legal response of spatial containment, is extremely narrow and strategic.²⁶ As I will also show, the concentration of machines in an enclosed and legalized environment transformed gambling into an empirical phenomenon that could be studied, tested and raised to the level of professional knowledge. Slot technology and

corporate strategic thinking found each other in the casino, and in this catalytic encounter, transformed the business of gambling completely.

Virtualization and the lure of large numbers

The significance of the EM slot machine foreshadowed its obsolescence immediately. The EM reel mechanism, while revolutionary, did not entirely escape the basic blueprint of the original Liberty Bell. Like the Liberty Bell, the reel mechanism used a sensor-arm to detect depressions on the contact plates of the rotating reels, which then regulated the payout. Thus, in the next service manual for the fully electronic slot machine (SERIES E-2000) released between 1980 and 1986, the entire mechanical assembly of the contact plates and the sensor-arms was replaced by a microprocessor chip. The fully electronic machine completely broke with the mechanical and EM way of producing randomness. By the 80s, there was theoretically no limit to the size of the jackpot. When Bally completely replaced the mechanical reels with the microprocessor, it declared that “the final barrier to high-jackpot innovative games” was finally removed.²⁷

Dissolving the material constraints of creating big jackpots is insufficient because this theoretical infinity is meaningless if people do not actually invest the time and money to grow the jackpot. It is to solve this problem that the third stage came about – linking up separate machines so that they all contribute to a single pool of winnings. Earlier attempts at this led to strange Siamese twins that looked like two machines, but worked as one (See Figure 3), or large machines where gamblers could play together.²⁸ By the 1980s, the microprocessor dispensed with such awkward/outsize couplings and each machine, while retaining its physical form, could be linked up electronically as one single system. These “wide-area-progressives” (WAP) took the casinos by storm. International Game Technology (IGT) introduced the “Megabucks”, an online system of video slots

in 1985-1986, followed by “Quartermania”, “Nevada Nickels” and “Nevada Fabulous 50s’.” Imagine, an article said, “a patron drops a silver dollar in a progressive slot machine at Harvey’s Resort in Lake Tahoe, and progressive meters in identical slots hundreds of miles away at the California Hotel in Las Vegas or the Comstock in Reno rise incrementally.”²⁹ As the CEO of IGT explained, the Megabucks was modeled after California’s lottery and giant jackpots, where “competing casinos would play the role of the lottery agent, providing space for the machine and receiving a portion of the take ... The only way it is possible to achieve something like this is through many, many casinos cooperating.” Between 1986 and 1995, IGT overtook Bally and shot to market dominance with these innovations, operating and owning about 3200 machines in Nevada and all 1,050 machines in Atlantic City.³⁰

This was also when corporations were beginning to think on the national scale, linking up not just casinos in Las Vegas, but also Atlantic City, and other non-gaming businesses around the US. The slot machine showed the multi-proprietary casino operators a way to conquer geography and extend the lure of large numbers to wherever a single machine can be placed. Like lotteries, the WAPs both increased the limit size of the jackpots and accelerated their rate of growth through a diffuse network of agents working round the clock. The advertisements for the Megabucks Progressives in 1990 reveal how game designers connected the seductive power of large numbers to the psychology of players, and in that connection, transformed the social and cultural practice of gambling dramatically. The key tagline was “One pull can change your life”. They continue, “Hit it and buy your dream house. Your dream car. Or your dream vacation.” The advertisements show a jackpot of \$2,345,678 - “How does a Megabucks pay so much? For starters, it’s the world’s first multi-casino (91 and counting) progressive jackpot. That means all those players in all those casinos throughout Nevada are contributing to a single constantly rising jackpot.”³¹ In a 1997 survey, 500

players were interviewed in Las Vegas, Reno and Laughlin. They were asked if a large progressive jackpot enticed them to play a few extra dollars they might not ordinarily spend. 62% said “yes” to some degree, leading to the conclusion that “the large size of the jackpot was the overwhelming reason why people were attracted to and played the WAP machines.”

The same question – “what makes people gamble more” – had quietly transformed from a criterion of criminalization into a strategy of stimulating demand. Criminalized, immense profits were made by siphoning small amounts through a dispersed network of many machines and distributors. Costello, the renowned mafia-boss and “slot-machine king,” siphoned \$3 million of profits annually from New Orleans between 1936 and 1937.³² Legalized, casino gambling remained within enclosed buildings and state boundaries, but in effect reproduced the criminalized geography of dispersed operation. However, these small amounts need no longer be hidden, but displayed in its accumulated surreality as the giant jackpot anyone could win with minimal investment. Criminalized machines where profits were divided between lessees and distributors, where operations were furtive affairs, and where the lessees ran mostly small establishments, could not promise anything more than a few hundred times over the stakes placed.³³ (Figure 4) Concentrated machines where all stakes flow into the central bank of a casino could offer jackpots of sizes unheard of.

Game designers realized very early that while winning big was a huge draw, players also wanted to win often. The early gambling machines found on bar counters and in drinking parlors were already designed with the experience of play in mind. After all, one popular way to evade the law was to insist that this was amusement, not gambling. Then, designers understood instinctively that the experience of play was a productive activity that masked or compensated for the low chances of hitting the jackpot and helped to stimulate spending on other goods. But in the casinos, gambling was not a “trade

stimulator” but the key economic driver and there was no need to evade the law. Fun was being reformulated as a legitimizing, scientific and economic project. Between 1950s and 70s, pro-gambling journals and newsletters were beginning to tip the discursive scale of gambling from “vice” to “nice” using the weight of psychology and tourism.³⁴

Reflecting on the 70s, a Bally representative talked about the performance of the “Blazing 7s” slot machine: “The player response was just exceptional. You could see the excitement. You’d put 10 machines, 20 machines out there, and the jackpot would hit every 15 minutes. Players would see someone hit the jackpot, and they’d want their jackpot too.”³⁵ Twenty years later in the 90s, a slot director at Excalibur repeated this balancing act between the attraction of large jackpots, the actual chance of winning and the experience of play:

I don’t think we can ever do enough to thank the customer for coming here. My whole idea was to make the player feel better when he got up from playing than when he first sat down at the machine. So we started out to offer a high progressive jackpot game, but not at the expense of what a normal dollar slot machine would be, which is liberal. I felt that the price the customer had to pay in terms of hold, was too high for normal large jackpot game. I wanted to provide a fair hold, plus an attractive top jackpot, plus the frequency of what the customer wants in \$1,000 jackpots. And bonus pays are the key to that.³⁶

Both managers were attentive to the expectations of the gambler, but they were more interested in articulating and shaping the experience of playing slot machines in a casino. Their diagnoses were only possible in the context of casinos where they could observe this mass phenomenon and draw patterns inductively from it. In the 70s, managers learnt that gamblers playing together in a room exerted a certain group psychology on each other; hence one should

put more machines out there to drum up the excitement. In the 90s, the manager wanted to make the individual player feel better after playing, thus one should try to meet his/her expectations by letting him/her to win more often. Over this span of 20 years, such empirical observations about group and individual psychology were combined and translated into the designs of slot machines. They became both a subject of analysis and a catalyst of experimentation. Going through “Casino Gaming Magazine,” the first industry journal dedicated to casino gambling in the US, the internal discourse of the industry between 1985 and 1990 was a busy exchange of ideas about: 1) the physical dimensions and design of slot machines; 2) the graphic and signage design of slot machines in relation to other machines and the casino floor; 3) the varieties of “celebration music” that should be played when a jackpot was hit and how that contributed to and were affected by the general ambience of the casino; 4) the optimal balance between pay frequency and jackpot size to encourage more play; 5) the ways to lay out slot machines in a casino and how to mix the different machines to maximize “real estate”; and 6) the different ways to build excitement and suspense through new kinds of games or game features in the slot machines. The overwhelming consensus of this discourse was unmistakable – a kind of scientific rationality conjoined with new technologies promised a more efficient, systematic and objective way to understand the player as both an individual and a demographic, and that this knowledge could be used to explain, and more importantly, change playing habits.

From mechanics to professionals

The editors opened the inaugural issue of Casino Gaming Magazine with this unequivocal statement of fact:

What has changed? Principally, it is the increasing use by the casino industry of sophisticated electronics of all sorts. This trend has, of course, been spearheaded by the increasing importance of micro-processor based

gaming machines to casino revenues. *But it goes beyond that.* The dynamic technical and economic trends of the electronics industry are opening up ever more exciting possibilities for bringing more innovation and fun to the players, and expanded marketing and control tools to management.³⁷ (italics mine)

These “expanded marketing and control tools” were a mixture of empirical observations gleaned from the casino floors, corporate practices, applied mathematics and new possibilities opened by digital technology. Ten years earlier in 1976, Bally had introduced the first online accounting and security system for slot machines, Slot Data System (SDS). Its main function was to link up the slot machines electronically and capture, at any one point in time, the total number of coins circulating in and out of the slot machines, the numbers of games played, how many times the handles were pulled, hold percentages and gross wins. By 1986, the interest in the SDS had “blossomed to the extent that, in addition to the regular features, customer tracking features have been added into the system.”³⁸ A slot manager reflects on how SDS ushered in “corporate-style strategic thinking”:

We just had a wealth of information, and a system that would give you the information in just about any form you could think of. You could see, sometimes in a matter of hours, the results of your efforts. If you put a new type of machine on the floor or moved it to a new location, you’d know immediately whether you made the right move or not.³⁹

This was in contrast to the pre-SDS era of the 70s, when he had to record the meter readings of each machine manually on a “5-by-7” card, send them to a bank for data analysis and wait about two and a half weeks for the results to return. 15 years ago, he was just a mechanic repairing and maintaining machines. In 1986, he became a slot manager working with data continuously extracted from the activity of play. Speed, precision,

accumulation and flexibility – these newly anointed professionals could isolate and call up instantly from this flux of data a range of variables to test their correlative effects on each other: “detailed maps ... concerning the general mix of the floor, location and denomination”; “employee utilization of time”; “graphics which show coin-in [or handle-pull] by model for a given week”; “machines not reaching, within a set time, a certain point of their theoretical hold.”⁴⁰ In 1994, a Bally spokesperson advertised the second SDS package by pointing out to how it could produce “sharp, three dimensional, full-color graphs of *everything* from slot performance by model, denomination and geographical location to player activity by day, month or year.” (italics mine)⁴¹ Visualization of numbers became real-time, more customizable and easily disseminated for immediate action – in other words, utterly pervasive, interruptive and indispensable. (See Table 1)

These are far more than just about how much and how long people play at the slot machines. Slot technology opened up the casino industry to the possibility of an automated surveillance system that disassembled the player and the activity of play into bits of capitalizable data that could be reassembled to construct the internal economy of the casino.⁴² It was a new way of knowing that utilized and enriched the language of mathematics by stretching its capacity to explain different sets of relations and thresholds once inexplicable. As these slot managers effused, there was an exponential growth in the applicability of this “wealth of information.” Yet, these bare rudiments of knowledge also produced ambiguities. In 1974, before SDS was introduced, Friedman would say this about how to lay out slot machines on the casino floor:

An establishment should situate its machines strategically to maximize their customer appeal and potential earnings. A casino can evaluate its coin Drop to determine which types of machines generate the largest Drop

and which the smallest. Actually this information has limited use since many factors may contribute to the difference in slot activity ... *at present time, each slot manager must develop his own intuitive theory of what constitutes the most effective slot mix. As one manufacturer of coin-operated gambling devices has stated: "Damnest thing. Still don't understand it. Take a box, put lights on it, make it do something, and people will put money in it."*[italics mine]

Even in the 80s, this sense of the unknown is not uncommon. In the first five years of Casino Gaming Magazine, when numerous slot managers talked about how to rationalize the relationship between space, humans and machines to maximize profits based on this "wealth of information," there was always an irreducible element of intuition and experience. For example, a slot manager for two different casinos related how he standardized the types of computer analysis and printouts for both properties, but stressed that the same numbers had to be interpreted differently: "Sometimes you can look at the past history of a game and put your finger right on it; you can say, 'I have more of that type of people at the Hacienda than I do at the Sahara.' ... Of course, sometimes the theories don't work, and they pull the rug on you."⁴³ Twenty years later, in a 1994 manual for casino operators produced by IGT, four slot managers were interviewed about the elusive "ideal slot mix". One said that it was based on past experience and trial and error. Another seemed to echo this, saying that "daily analysis" was necessary and the "pursuit of the perfect mix" was an "ongoing process." The third agreed that this pursuit was an ongoing process, though he thought that this was an "unanswerable" question. And the last thought that determining the ideal slot mix was an "evolutionary process," a matter of "setting those win objectives and meeting them, and combining that with the customer perception of looser machines."⁴⁴ And the manual's final advice to casino operators? A matrix that

could be used as a "blueprint for maximization of revenue." This blueprint should be customized based on space constraints, competition and management philosophy, while, it stressed, maintaining a "vigilant eye on your customers' gaming tastes."⁴⁵ (See Table 2) The process of taming an unknown world through numbers is evident here. But what is more interesting is the simultaneous unknowability and reification of the "ideal slot mix." Slot managers seemed to suggest that the wealth of information only helped them transform "unknown unknowns" into "known unknowns," in the process producing more unknown side effects that necessitated supervision and experimentation. Thus, not only did this expanded cast of "known unknowns" *not* replace the need for intuition and experience, it made the embodied knowledge of the slot manager more necessary.⁴⁶ In other words, by making more unknowns appear, slot managers aggrandized their professional value. Gaming technologists were part of this process. As the rest of the manual showed, each machine was defined by its space requirement, theoretical profit, coin denomination, win frequency, jackpot limit, game feature and cabinet design. And if this proved too complex, IGT provided a comprehensive "order completion time schedule" for customers who wanted to begin running their casinos pronto - from plan to installation, the entire process would take only 20 weeks. There was no room for chance or error. But, like the wise slot manager, gaming technologists avoided professional suicide by becoming indispensable through the very knowledge they produced. Despite the overt commitment to positivist measure and calculation, they insisted on the contingencies and unpredictability that made constant vigilance, experience and intuition necessary. An advertisement from a gaming technology company shouted: "How to get slot machines to tell you their deepest secrets?"⁴⁷ The marketing brochure for SDS II began ominously: "The fact is, what you don't know can hurt you."⁴⁸ The escalation of knowledge

mirrored the growing fear of non-knowledge, and the price of not knowing became monstrous. In this convulsive moment, gaming technology companies were not just discovering, but rather creating, a new terrain of professional expertise by using numbers in ways that also cemented their professional distinction.

Remaking the casino

In the 1970s, slot machines were “widely viewed ... as window dressing, or as something to keep the ladies busy while the men played the tables.” In the 1980s, slot machines “typically accounts for around half of the revenue in given casino, and slot management has grown into a highly-specialized, strategic and technical profession.”⁴⁹ Casino operators began to question how to reform the rest of the industry based on what slot technology revealed to them. In 1987, a casino director of Admiral Cruises wrote to the editor of Casino Gaming Magazine lamenting that increasingly profitable slot machines were replacing table games. Casinos should “reassess their fundamentals” and try to reduce the costs of running table games. His suggestion is prophetic. Since the main costs of running table games were the salaries of employees, importing technology from slot machines would reduce manpower by automating surveillance and security procedures. More importantly, this would give a more complete picture of the internal economy of the casino by absorbing table game activities into the databank already produced by the slot machine departments. “In the casino of the near future,” he said, “chips would have a bar code on their edges and could be read by scanner strips on the bottom of a float tray. This would give an on-line reading of exactly what the float was on any table ... More information about play patterns, activity, cash drop and peak times, etc. would help in all areas of casino management.”⁵⁰ Comparing table games to slot machines, another journalist described the outdated way players were tracked at the tables. Pit-bosses and table managers were assigned the task of

identifying loyal patrons, but this left out a large part of the market base – “people who don’t raise any eyebrows with their betting levels but whose consistent play make up most of a gaming hall’s table action.”⁵¹

In 1989, the managing director for Technical Casino Services, a gaming technology company based in London, lamented about the slow pace of technological integration in Las Vegas, arguing that in Europe, table games had been integrated into the same “reporting structure,” and that the system could be applied “to all other sales outlets within the organization, such as shops and bars.”⁵² In the same year, Tropicana became the first casino in Las Vegas to test an online player tracking system for table games.

These technological interventions absorbed activity at the table games into the virtual bank of data created by slot machines, and initiated a process of economic re-calculation that rippled outwards to encompass the entire scale of the industry. Thus, as SDS and other similar online systems started to incorporate more sophisticated player tracking functions, the synergy between corporate marketing and the management of multi-propertied gambling operations was hard to miss. A director of marketing in a casino at Laughlin remarked in 1986 that although gambling halls in the 70s would run flashy promotions, they were “just sitting there waiting for customers to stroll in.”⁵³ Marketing programs then were informal and largely targeted at high rollers and junkets. Another marketing director in a Las Vegas casino reflected that the dominance of public companies, the slot machine boom, competition between casinos and the advent of Atlantic City all contributed to the importance of market research in the 80s.⁵⁴ At another hotel-casino, a complimentary card program modeled after airline frequent-flyer concept was introduced: “gamblers accumulate points they can use for limousine rides, suites and taking guests to dinner in the Claridge gourmet restaurant ... it’s the only computerized player rating system in the

business right now that includes all table games and all slots.”⁵⁵ In the 70s, Friedman was teaching future casino managers how much to compliment customers through a mixture of intuition and conscientiousness, and how to recognize those frauds who tried to weasel benefits without gambling enough.⁵⁶ None of these would matter with these player tracking technologies - the amount of complimentary benefits would simply be “directly proportional to the amount of money the customer spent.”⁵⁷ Slot technology had begun to merge the various activities in the casino into a virtual superstructure of numbers.

Between Las Vegas, Atlantic City and other jurisdictions that were beginning to relax gaming laws in the 1980s, corporations foresaw a future through these technologies where a vast and seamless network could track players as they gambled at different locations and left the casinos to continue with their everyday lives. It projected an end point to the market size - the global population. The slot machine has become the television screen feared by cultural theorist, Jean Baudrillard. Thinking about how media saturation is changing social and political life at the point when domestic space is encroached upon by the television, he shifts the Marxist critique of alienation to the more dubious phenomenon of transparency: “everything is exposed to the harsh and inexorable light of information and communication.”⁵⁸ He theorizes about a world without interiors, a world that can hide nothing from capital. The value of communication is nothing but communication itself, he laments, something that sounds very similar to how Bally sold its 1996 products - “if one activity is most crucial to any size casino, it is the act of communicating information to the proper decision makers.”⁵⁹ In the interiorized space of the casino, the screen of the slot machine signals the dissolution of the geographical

injunctions designed to segregate gambling from other spheres of life. Legalization through spatial containment created spectacular buildings in the midst of a desert, but their walls were completely porous to the flow of data and capital. Gamblers produced numbers as they gambled. Numbers accumulated and became statistics. Marketing techniques connected with statistics, and followed gamblers in and out of the casinos. Playing habits translated into dining, sleeping, shopping and entertainment habits in the casino-resort, as well as family vacation plans, work schedules, and other bits of information outside the casino-resort. Between WAPs and SDS, slot technology foreshadowed the appearance of internet gambling. In the 80s, this scale of expansion was only national, but the relaxation of gaming laws in many jurisdictions was already making the casino operators drunk with possibilities. By 1990, in the US, the “casino” as we understand in the etymological sense, “to enclose” and “make private”,⁶⁰ no longer exists.

About the Author

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Illustrations

Figure 1

TABLE FOR FIRST OBSERVED NUMBER OF: 20

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	A1	A2	B1	A1	A2	B1	A1	A2	B1	A1	A2	B1	A1	A2	B1
2	A2	C2	A2	A2	C2	A2	A2	C2	A2	A2	C2	A2	A2	C2	A2
3	B1	A2	A3	B1	A2	A3	B1	A2	A3	B1	A2	A3	B1	A2	A3
4	A1	A2	B1	A1	A2	B1	A1	A2	B1	A1	A2	B1	A1	A2	B1
5	A2	C2	A2	A2	C2	A2	A2	C2	A2	A2	C2	A2	A2	C2	A2
6	B1	A2	A3	B1	A2	A3	B1	A2	A3	B1	A2	A3	B1	A2	A3
7	A1	A2	B1	A1	A2	B1	A1	A2	B1	A1	A2	B1	A1	A2	B1
8	A2	C2	A2	A2	C2	A2	A2	C2	A2	A2	C2	A2	A2	C2	A2
9	B1	A2	A3	B1	A2	A3	B1	A2	A3	B1	A2	A3	B1	A2	A3
10	A1	A2	B1	A1	A2	B1	A1	A2	B1	A1	A2	B1	A1	A2	B1
11	A2	C2	A2	A2	C2	A2	A2	C2	A2	A2	C2	A2	A2	C2	A2
12	B1	A2	A3	B1	A2	A3	B1	A2	A3	B1	A2	A3	B1	A2	A3
13	A1	A2	B2	A1	A2	B2	A1	A2	B2	A1	A2	B2	A1	A2	B2
14	A2	C2	A2	A2	C2	A2	A2	C2	A2	A2	C2	A2	A2	C2	A2
15	B2	A2	A3	B2	A2	A3	B2	A2	A3	B2	A2	A3	B2	A2	A3

Fig 1: Mr Tony Anderson’s “Calculated Roulette System”
Source: Gambler’s Monthly Report, 1972, v3, pp 7 (UNLV Special Collections)

Figure 2



Fig 2: A gambling device - a wheel of fortune at the end of the bar - in its social context in San Francisco, 1897. Source: Fey, M, 1983: 19

Figure 3



Fig 3: This looks like two machines sitting next to each other, but a sign on this machine says “Both machines must be played.” Thus, the highest prize of \$500 is hit the player rolls all 6 cowboys on both machines. Popular in the 60s, it preempts the “Wide Area Progressives”, where machines are linked electronically to create a central jackpot.

Source: Fey M, 1983: 204

Figure 4



Fig 4: Criminalized machines. Above: Mills, 1938-1970, is a small and non-descript metal box with flaps to hide the spinning reels. Below: Watling, 1936. Many slot machines stored the jackpots within the casings which further limited the size of the jackpot. Source, Fey, M: 1983, 171 and 130

Tables

Table 1: Features and capabilities of Bally Systems products in 1996

Source: "Bally Systems" corporate materials, UNLV Special Collections

	SDS/Gamekeeper™
1	Multiple-property reporting
2	Variable date creation and modification for tracking special events
3	Easy-to-use data selection buttons
4	Over twenty graph types for a wide variety of visual analysis tools
5	New graph controls for customizing any graphs
6	E-mail support for quickly distributing reports and graphs
7	Selectable fields for displaying just the information you need
	SDS/GameWatch™
1	Display graphs of slot floor activity in near-real time
	Player Marketing Features of SDS/6000
1	Automatically sends personalized greetings and messages to valued players
2	Automatically identifies "hot players" based on play rate for a specified period of time. Criteria can be customized and floated based on activity on the floor. Thus, someone "who is a hot player at 2a.m. on Tuesday may not be considered a hot player at 4p.m. on a Saturday."
3	Tracks players across different properties and different games

Table2: IGT's "blueprint for maximization of revenue"

Source: IGT, 1994: 22, UNLV Special Collections

	Upright Reel Slots	Slant Top Reel Slots	Upright Reel Poker	Slant Top Video Poker	Bar Top Video Poker	Total #	Total %
5¢	80	20	0	0	0	100	10%
25	390	50	14	36	40	530	53%
50	18	10	6	6	0	40	4%
\$1	256	20	6	8	10	300	30%
High Denom.	26	0	4	0	0	30	3%
Total #	770	100	30	50	50	1000	
Percentage	77%	10%	3%	5%	5%		100

Notes

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- ¹ *Computer and Gambling*, 1979 v1: 3, UNLV Special Collections
- ² *Gambling Monthly Report*, Aug 1972, v2: 16-18, UNLV Special Collections
- ³ "Editor's notes", in *Gambling Monthly Report* 1972 v3:2 UNLV Special Collections
- ⁴ "Computer Calculated Roulette System", in *Gambling Monthly Report* 1972 v3:7 UNLV Special Collections
- ⁵ See Pilgrim, P C, 1979 "The Personal Computer as a Blackjack Tutor" in *Computers and Gambling*, v1: 11-13
- ⁶ See, for example, a discussion of various systems to break the game of roulette. "Roulette Systems" in *Gambling Quarterly*, Autumn/Winter 1974: 28-33. It is interesting to note that despite all the mathematically sound advice this journal provides, it always includes a gambling horoscope for readers in need of some "mystical" advice.
- ⁷ Williams V "How a casino should be run" in *Gambling Quarterly*, Summer 1974
- ⁸ Hacking, I. 1990. *The Taming of Chance*. Cambridge: Cambridge University Press: 1-10
- ⁹ See Gaming Commission Staff. 1964 (revised ed.) *Legalized gambling in Nevada – its histories, economics and control*. Nevada: Nevada gaming commission and State Gaming Control Board; and Nevada Gaming commission and State Gaming Control Board. 1964. *Triennial Report: July 1, 1959 – June 30, 1962*. Nevada: Nevada gaming commission and State Gaming Control Board
- ¹⁰ Eadington W. (ed) *Gambling and Society: Interdisciplinary Studies on the Subject of Gambling*. Illinois, USA: Charles C. Thomas Publisher
- ¹¹ See the advertisement for such a seminar on the back cover of *Gambling Quarterly*, Summer 1974. The seminar was held over a weekend at the MGM Grand, and cost \$125/person.
- ¹² Fey, Marshall, 1994. *Bally Slot Machines: The Complete Service Manual for Electro-mechanicals, 1964 – 1980*. Reno: Liberty Belle Books, 16
- ¹³ A brief explanation of how the reel mechanism works helps us understand the quotation better. The EM reel mechanism can generally be conceptualized as a way to produce a number of combinations, some of which pay, of which only a few triggers the jackpot. Each reel has a contact plate and wiper arm. When a reel "stops," the wiper arm touches the plate at the certain spot, and this completes a part of the electrical circuit. The entire circuit route is thus made up of the different positions of the wiper arms on the contact plates for each of the reels in the slot machine. The total number of different circuit routes determines the total number of combinations. By increasing the number of combinations, one reduces the chances of hitting the jackpot, and thus the amount of the jackpot can increase. Before entering the casinos, slots in the 40s mostly had three reels with 10 or 20 stops each, thus allowing 1,000 to 8,000 combinations (10x10x10 / 20x20x20). With EM technology and digitization, the number of combinations leapt into the realms of millions. Writing in 1983, Fey recorded a video slot machine that could handle 15,752,961 combinations. See Fey, 1983 : 235
- ¹⁴ United States Government, Commission on the Review of National Policy toward Gambling. 1976. *Gambling in America*. Washington D.C.: United States Government Printing Office
- ¹⁵ See Kefauver E. 1951. *Second Interim Report of the Special Committee to Investigate Organized Crime in Interstate Commerce*. Washington D.C.: United States Government Printing Office. This ambivalent stance of lawmakers and enforcers seems to be prevalent – two books published by retired police officers from New York and Chicago both professed, on the one hand, the moral and social evils of gambling, and on the other, that "those of us who are interested in gambling solely in its relation to the crime problem have no concern whatever with the moral aspects of the question." See Peterson, V W. 1951. *Gambling: Should it be legalized*. Illinois: Charles C Thomas Publisher: 6. See also Drzazga J. *Wheel of Fortune*. 1963. Illinois: Charles C Thomas Publisher. Peterson was the Operating Director of the Chicago Crime Commission. John Drzazga worked in the police department in New York.

¹⁶ Panasitti M and Schull N. 1994. *Re-articulating the moral economy of gambling*. Kroeber Anthropological Society Papers, 77: 65-102

¹⁷ Quoted in Drzazga, J 1952-53, "Gambling and the law – slot machines" in *Journal of Criminal Law, Criminology and Police Science* v43(1): 118.

¹⁸ King, R 1964 "The Rise and Decline of Coin Machine Gambling" in *Journal of Criminal Law, Criminology and Police Science*, v55(2): 199-207

¹⁹ Ibid, 203

²⁰ Ploscowe M 1950 "The Law of Gambling" in *American Academy of Political and Social Science*, v269: 6

²¹ Fey M, 1983 *Slot Machines: an illustrated history of America's most popular coin-operated gambling device*. Nevada: Stanley Paher, 44-45

²² Marfels C, 1998 *Bally: The World's Game Maker*. Las Vegas: UNLV International Institute of Gaming Research, 32

²³ Drzazga J. 1963. *Wheels of Fortune*. Illinois: Charles Thomas Publisher, 198

²⁴ Bally is one of the oldest designer and manufacturer of slot machines and other coin operated machines such as pinball machines, vending machines and arcade machines in the US. It was established in 1932, and played a critical role in the early innovations of the casino slot machines between 1970s and 90s. IGT was founded by an ex-employee of Bally in 1975, and shot to market dominance with video slot machines and other online applications.

²⁵ However, a revealing quote is offered by Marfels when he interviewed Marshall Fey about the Ballyhoo, a small slot machine invented in the 1930s. Fey said, "You know, the Ballyhoo and other pinball games could be found wherever people came together – restaurants, ice cream parlors, tobacco shops, barber shops, even train stations. People liked Ballyhoo, it was easy to play, and it provided some inexpensive gun in those hard times"

²⁶ The narrative of a "new lease of life" brought about by the legalization of gambling in Nevada can be found, unsurprisingly, in most of the corporate literature produced by Bally and IGT. Gaming researcher Marfels (1998) also reproduced this narrative in his study of history of Bally as a corporation. Turdean's historical account of the digitization of the slot machine shows how players, casino operators and machine suppliers interacted in ways that motivated technological change. However, because she focuses only on Bally, and begins with Bally in the casino, she also summarily casts a scornful eye at the machine's criminalized past – "After limping along for decades under the concerted attacks of antivice crusaders, the slot machine entered the 1950s and the casino era in crude mechanical form..." Turdean C. 2011 "Casinos and the Digitization of the Slot Machine, 1950-1989" in *Annals of the History of Computing* 33(2): 46-59. Even Marshall Fey's historical documentation, which is both rich and sentimental, suddenly turns cold after entering into the period of Bally's dominance. Thereafter, he focuses on how the reel-type machine was adopted for casino use, and does not ask the critical question of what happened to all the machines he so lovingly preserved and reproduced in print in the preceding 150 pages.

²⁷ *Bally Gaming Corporate History*, UNLV Special Collections, Bally Corporate Materials

²⁸ The "Queens machine" was the largest slot machine during its time in the 1960s. Six people could play at the same time. See a picture of this machine in Spencer, D. 2009 *Mid-Century Vegas, 1930s to 1960s*. Los Angeles: Schiffer Books, 99

²⁹ "Megabucks: First inter-casino slots before Nevada Gaming Board" in *Casino Gaming Magazine*, Nov 1985: 56-57

³⁰ Salomon Brothers United States Equity Research, 24 Nov 1992, *Gaming*. UNLV Special Collections, IGT Corporate Materials

³¹ *IGT*, c. 1990, UNLV Special Collections, IGT Corporate Materials

³² Drzazga J. 1963. *Wheels of Fortune*. Illinois: Charles Thomas Publisher: 199

³³ In the early machines, the amount of jackpot that could be paid was also determined by the size of the machines – the prize was contained in the casing, and sometimes displayed behind a window to attract players. Fey, 1983: 113

³⁴ See, for example, the “Psychology Corner” editorial which ran on every issue of *Gambler’s World*, a pro-gambling magazine in the 70s; See also “Las Vegas: nice not vice” in *Gambling Illustrated*, Dec 1965: 2. In another magazine, a professor argues that gambling is not a pathological self-destructive act, but fulfils two basic needs of Man – to “satisfy his need to confirm his existence and his worth.” See Kusyszyn, I. “Why we gamble” in *Gambling Quarterly*, Spring 1974: 45-46. I have already mentioned the first Annual Conference on Gambling held in Las Vegas in 1974, which was dominated by economists, psychologists, sociologists and mathematicians.

³⁵ Green M 2007, *Bally’s 75th Anniversary 1932-2007: A legacy of innovation*. Nevada: Ascendmedia, 26-27, UNLV Special Collections, Bally Corporate Materials

³⁶ *Slotline*, 1997:2

³⁷ Burke D and Burke S. “The North American casino industry gets its own professional magazine” in *Casino Gaming Magazine*, May 1985: 3

³⁸ “Bally expands its Slot Data System” in *Casino Gaming Magazine*, Feb 1986: 40

³⁹ *Ibid*, 55

⁴⁰ *Ibid*, 40-41, 48.

⁴¹ Legato F, “Bally Systems: mastering the technology” in *Casino Journal Reprints*, June 1994: UNLV Special Collections. For a detailed analysis of the development and capabilities of the Bally Slot Data System from 1976 to 1989, see Turdean C. 2011 “Casinos and the Digitization of the Slot Machine, 1950-1989” in *Annals of the History of Computing* 33(2): 46-59.

⁴² Deleuze G and Guattari F (trans. Massumi B) 1980. *A Thousand Plateaus: capitalism and schizophrenia*. London and New York: Continuum

⁴³ “Leonard Wood: Directing Slots at Both Ends of the Strip” in *Casino Gaming Magazine*, August 1986: 45

⁴⁴ International Gaming Technology, 1994 *Getting Started in Gaming. Las Vegas*, IGT: 20-21, UNLV Special Collections, IGT Corporate Materials

⁴⁵ *ibid*, 22

⁴⁶ I am drawing upon some of the key arguments made by Ulrich Beck about “manufactured non-knowledge” as a contemporary existential condition. See Beck U, Cronin C (trans).2009. *World at Risk*. UK: Polity Press: 113-128

⁴⁷ Technical Casino Services Limited, “How to get slot machines to tell you their deepest secrets?” in *Casino Gaming Magazine*, Aug 1989: 4-5

⁴⁸ Bally Systems, 1992. “Let your slots tell you the real facts of life” UNLV Special Collections, Bally Systems corporate materials

⁴⁹ “Casino Gaming in America: Then and Now” in *Casino Gaming Magazine*, August 1986: 20

⁵⁰ Stanley, D “Table Games: untouched by technology” in *Casino Gaming Magazine*, April 1987: 40

⁵¹ Legato, F “Gaming Data System: A new twist to player tracking” in *Casino Gaming Magazine*, Feb 1989: 22

⁵² Williams, M. 1989. “Security and the Slot Machine: The Two Key System is Obsolete” in *Casino Gaming Magazine*, July 1989: 17

⁵³ “Casinos in America: Then and Now” in *Casino Gaming Magazine*, Aug 1986: 22

⁵⁴ *Ibid*: 22

⁵⁵ *Casino Gaming Magazine*, Nov 1986: 10

⁵⁶ These frauds, according to Friedman, included “name throwers”, “table hoppers” and “chip shufflers”. Friedman, 1976: 130-131

⁵⁷ “Casinos in America: Then and Now” in *Casino Gaming Magazine*, Aug 1986: 41

⁵⁸ Baudrillard, J 1988 "The ecstasy of communication" in Foster, H *The anti-aesthetic: essays on postmodern culture*. New York: The New Press, 145-155

⁵⁹ "Bally Systems", 1996, UNLV Special Collections, Bally Systems corporate materials

⁶⁰ For a discussion of the etymologies of the words "casini" and "ridotti", see Walker J. 1999 "Gambling and Venetian noblemen c.1500-1700" in *Past and Present*, v162: 28-69

About the Center for Gaming Research

Located within Special Collections at UNLV's state-of-the-art Lied Library, the Center for Gaming Research is committed to providing support for scholarly inquiry into all aspects of gaming. Through its website, <http://gaming.unlv.edu>, the Center offers several unique research tools and information sources.

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