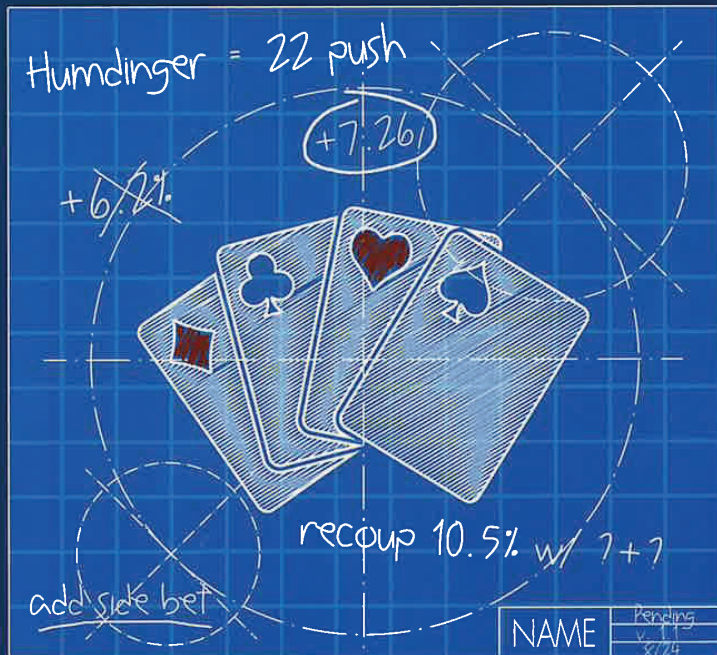


THE ESSENTIALS OF CASINO GAME DESIGN

FROM THE COCKTAIL NAPKIN TO THE CASINO FLOOR



DAN LUBIN

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to the Casino Floor

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This book is dedicated to:

The late John H. Winn, who codified the modern game of craps. A true Old Testament prophet in the game design area — circa 1910.

Mike Shackleford, who gave the industry the honest and true spec sheets on every game worth knowing or playing.

Geoff Hall, Derek Webb, Roger Snow and crew, Paul Omohundro, Al Lwin, T.J. Tejada, and all of our game-designing ilk.

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Deke Castleman, a world-class editor in all things gaming-related; Laurie Cabot, whose fine production work I came to admire during the process; and Anthony Curtis, publisher of Huntington Press, believed I could write about and very well explain "all the tubes and wires" involved in building a game that'll work for real on the casino floor.

Finally, my wonderful wife Prapaisri Yuennan Lubin stuck with me through the thick and thin as I went forth on this endeavor, oftentimes seeing no light at the end of the tunnel or pot of gold at the end of the rainbow. But we did get there.

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Preface

As a casino-game designer, former table-games manager for a distributor, and owner of my own game-design company, I've worked with countless casino-game designers, both new and veteran. In a sea of game submissions, I've consistently found widespread design errors and a general lack of knowledge impeding some fine original game ideas.

I've seen great game ideas not make it. I've also seen poor game ideas get too much good money thrown after bad, due to a lack of critical information, perhaps because no broad and essential resource, such as this book, was available.

Whether the reason came down to, "I should have known something at a certain point in order to succeed, but I didn't," or, "I wanted to know, but had no idea how or where to look," doesn't matter. The sad truth is that many, if not most, aspiring game designers are working on their projects in good faith, even passion, but also in pockets of ignorance, and paying excessively for it. To me, they seem to be stretched out along the same road, with blindfolds on, not knowing how to proceed or what turns to make, or whether to abandon or continue the journey.

If that's you, you've come to the right place.

I wrote this book primarily for the game designer, both aspiring and current. Anyone designing his or her first game needs every shred of information about the process, while the journeys of veterans could have progressed more smoothly and less expensively had there not been gaps in their knowledge.

The larger audience includes two industry groups: casino operators and casino-game manufacturers. Both must know what to look for in a game, how and why it was designed, and how it can be accurately projected to perform for them. Both frequently misjudge and misevaluate games, whether they're acquired from outside designers or developed in-house; they release and install a lot of duds, justifying them with, "Well, it's a game of numbers." This is true, but casinos and game manufacturers can afford to release way more flops than gems—in order to get to the latter. The kitchen-table game designer often can't afford a miss, having only one real shot at it.

Most casino table-game literature is geared toward how the player can gamble to minimize losses and maximize enjoyment. Authors such as Michael Shackleford, the Wizard of Odds, explain playing strategies backed by valid and factual math. Other books reveal advanced "advantage play" for professional gamblers and game-protection techniques for casino managers; the two factions face off in a graduate-level casino cat-and-mouse game.

Also available in small numbers are books that give general design advice outside of any in-depth development examinations and walk-through details for new games. This is what *The Essentials of Casino Game Design* specifically addresses: It reveals and comprehensively explains the whys and hows of game-design techniques and strategies in terms of the specific needs of the game being designed for the *real* drawing board. I not only introduce you, the prospective or current game designer, to the tools to use, but I also spell out how to properly use them and for which circumstances, in order to create the best casino table-game product with the greatest chance of success in the real world.

The list of table games that have appeared in live and approved casino play regardless of longevity or ultimate quality, and considering only the ones surveyed and reviewed at Shackleford's casino-game compendium website (wizardofodds.com), now consists of:

- 48 blackjack variants
- 74 poker variants
- 24 “alien” games (faro, red dog, Screw Your Neighbor, Zero, et al.)
- 26 Asian games
- 43 dice, wheel, tile, and other device-based games
- 13 keno-type games
- 14 “other” main/primary games
- 78 blackjack side bets
- 20 baccarat side bets

This totals approximately 340 separate table games prominent enough to be reviewed by Shackelford’s site, many on just a good field trial alone, others being tagged as notable new games, all mixed in with the existing hits. Altogether, 930 games have been approved in the history of casino gambling in Nevada, of which just 16 were original legacy games grandfathered in from the start, such as craps, basic blackjack, roulette, etc.¹

This leaves approximately 914 sponsored, proprietary, and inventor-attempted efforts. More people have climbed Mount Everest (about 4,000) than ever had their games installed for live play in the epicenter of gambling, Nevada. Perhaps 200 game designers made some headway, earning them back their investment, plus some profit, by achieving 40 or so “installs” (tables with actual player participation on the casino floors) in various niches, with a couple of dozen doing really well, meaning that about 700 games in the history of this gambling state crashed and burned. Who’s ever heard of or played China Doll, Benny’s Roulette, China Town, Bar-Boot Dice, Catalina Dice, Deluxe 21 Madness, Tommy’s Way Pai Gow Jackpot, and the like, compared to games that we’ve all heard of and played, such as Ultimate Texas Hold ‘em, Lucky Ladies, the craps Fire bet, Crazy 4 Poker, and Blackjack Switch?

The point is that the differences between Benny’s Roulette

¹ See: gaming.nv.gov to access the Nevada list in Excel or PDF.

and Ultimate Texas Hold 'em are in the design effectiveness based on forethought, directed technique, and expert review — practices generally unknown to most wish-to-be designers operating in a trial-and-error vacuum. This is how you end up with something marginal that's destined to be shot down.

Furthermore, the gaming mathematician, patent attorney, and gaming-approval agent don't judge or critique the quality of your game idea or work. They simply provide you with the math report, the patent filing, and the field-trial date of your game, letting the market sort out your effort. They'll never say anything like, "Dude! This game is garbage! Don't waste your money." They'll instead tell you, "You'll have your math report/patent-filing receipt/field-trial confirmation by May 17th" — along with the invoices declaring how much you owe them for services rendered. Gaming will tell you, "You might be approved after the field trial, based on how well it does." (In other words, "We'll see.") Also, be aware that your game may perform adequately enough for official gaming approval, but not well enough over the long haul for commercial success.

Then there's the table-games manager who's considering installing your game. He might be under pressure to put some new games on the floor or figure that if yours gets hot and shows some good numbers, a promotion won't be far behind, so he gives you a go the first time around. More commonly, he doesn't know the difference between false flash and true potential, no matter how valid the math report (or how pretty the artwork). Casino managers often don't know and are being honest when they tell you, "Call me when you get an install somewhere else." This is routine, especially from managers who've been burnt before. If your game does well somewhere else, he'll call you back wanting to pick it up (at which point you can offer him some special lease pricing in recognition of his earlier consideration). But again, even if he can't recognize a gem, he might inadvertently green-light one by luck, so you have to be ready with the real thing. In other words, if you play your cards right, *you do have a shot.*

Ultimately, though, provided your game proceeds past all earlier hurdles and gatekeepers, it's the gambler who makes the final call as to whether your game lives or dies. By the time the gambler sees it, all the technical challenges have been overcome, so if it works for the gambler, it'll now work for all involved.

The Essentials of Casino Game Design is the only manual in existence that shows you how to design, develop, market, and safeguard a new casino table game, so you can have your chance to hit the jackpot by getting it installed on the casino floor. I cover all the game-design areas, which are linked to development histories of, and solutions for, games that either made it into casinos or failed, with the reasons for one or the other dissected and explained.

In closing, let me say that I've tried my utmost to write a book that will provide you with a good foundation for game-design essentials, put you on a precise and detailed path to the table-game jackpot, and in the process be as entertaining as it is informative.

Let's get started.

Why Take the Leap?

Why try to create a new game? Why sit at your kitchen table with a deck of cards and a cheap white tablecloth all marked up with a Sharpie to look like a casino game layout?

For most, the upside of success in this business is so alluring and satisfying that the game improvement they invent becomes the undertaking: Mount Everest is there; now watch me climb it.

For a few, it's precisely because the odds are so stacked against them that they take on a seemingly insurmountable task, perhaps if only to find that it is doable in the end. They reason, other people have done it, why not me?

Whatever your reason, if you take the leap, it has to be a commitment. The cocktail-napkin sketch of a great game idea is only the first step on the long hard road to the casino-floor Promised Land. By commitment, I'm referring to the usual Big Two: time and money.

While you don't spend all your time on it (in fact, you can see and evaluate your game better when you're not always immersed in it and leading a normal life in the meantime), you spend enough time to address all the issues I cover in this book, many of which you can't even imagine when you get started.

You're also willing to spend money, a lot more, possibly, than you initially might have thought (or you're prepared to try to secure backing from investors, whom you'll repay in good faith and gratitude). Game development isn't, as some believe, like screenwriting, where you need to invest only in script-formatting software, ink and paper, and a filing fee, so you can try and try again if at first you don't succeed. Here, you're paying

for mathematicians to run computer simulations of your game, lawyers to protect your intellectual property (IP), designers and graphic artists to assemble your game kit, travel, time off from work, and the like. Again, unlike a screenplay, you can't simply rewrite patent and math-laboratory work you've already paid for. A rejected script is a ream of paper and a learning experience. A field-trial result represents \$20,000 by the time you're either accepted onto or pulled off of the casino floor.

Looking realistically at the upside, if your game does well after introduction and grows to, say, 100 installs (which is considerable, as it represents tens of thousands of gamblers playing your game), you can expect to make, via a distributor, \$100 per table per month times 100 tables, or \$10,000 a month, a cool \$120,000 a year.

However, your chance of succeeding big after your first install is about 1-in-50. As explained in the Preface, the vast majority of new games seldom outperform the staples of the casino floor.

But a game that makes it to the floor has an expected value, or a current value from *possible* future earnings at this point, of \$24,000. Here's how that's figured. A new game that's ultimately successful can expect to make \$1.2 million for the inventor (\$120,000 a year times a good 10-year run), but has only a 1-in-50 chance of hitting that jackpot. Hence, a game that makes it to "Live Day One" has an expected or potential value of 1/50 of \$1.2 million, or \$24,000. That's a \$4,000 profit above the \$20,000 spent to develop it, assuming an *efficient* game-design process.

A game that makes it six weeks to the end of its field trial (the minimum field-trial length, where a new game is examined in live performance by a gaming authority for its legal approval) or its six-week casino intro (where a field trial isn't needed as it's a simpler side bet or game variation) with good patronage is worth, perhaps, \$100,000. This is because only one out of four brand new games genuinely looks promising six weeks or so in when scrutinized by the casino offering it to the players and industry analysts passing a "live-or-die" judgment on it. The vast

majority of new games are pulled by the casino for performing worse than what's already on that casino's floor. In this regard, a field trial or game introduction is a technical examination, not a commercial guarantee, as most games complete a field trial regardless of patronage and are later (and quickly) removed.

A new game that's removed is clearly unsuccessful, but it still might have some value. New games are often pulled for political reasons or because of some other one-off mitigating factor, such as a badly designed payable, which is an easily fixable snafu. In other words, having a new game uninstalled is often, but not always, fatal. The powerhouse game of Three Card Poker was removed from Atlantic City in its early days (again, because of one bad payable), but was quickly fixed and re-introduced to great success in Mississippi, to later dominate the gaming world.

A successful game has 50 or more installs two or three years down the road with only a few (say, 10%) removed, while still increasing its install numbers. *Now* your game has its big value. Examples of healthy games that have passed the test of time include Ultimate Texas Hold 'em, High Card Flush, EZ Bacarat, EZ Pai Gow, Blackjack Switch, and more recently DJ Wild, where four out of these six were designed by independent game designers, not gaming-industry execs. Every rock star was once in a garage band, not a staff studio musician.

So yes, it's doable.

Of course, the learning curve is steep. But if you take it seriously, work hard, and see it through, your expenses are essentially paid for, an even shot. It's the poor efforts, and the failure to recognize them, that are genuinely costly.

Looking realistically at the downside: You can bail out at the last moment, right before the full patent and math-laboratory expenses kick in, saving yourself \$18,000 or so of the \$20,000. In other words, you had a hobby that could have turned professional, you gave it a go, and you washed your hands of it before you blew the household finances and precipitated a divorce. The game might even look good in terms of its math, patent/IP

security, and artwork, but it might not play up to par and you see and admit that.

Knowing all this, you're probably asking if this is a reasonable, practical, or intelligent undertaking. My answer is: maybe. Perhaps it's not, but you might convince yourself that it is and you might be right. The proof, as always, is in the result. If you succeed, then certainly it was an intelligent and lucrative thing to do. But practically speaking, you're not really doing this to be reasonable and intelligent. Developing a casino table game from scratch is a definite gamble; you take it on to occupy yourself with something of interest at least and with an out-and-out passion at most. Either way, you have to be convinced in your reason, because if there's any hesitation in your leap, then you'll crash and burn. In this regard, it's about the shot at success via a prescribed process: If the process is done right and with a hunger to do it, a successful result is possible.

So now, ask yourself why you're undertaking a game design project. I can think of three reasons:

- Money. It'll feel so good to see my name on the front of a royalty check and signature on the back. It'll also be a kick to have a big bank balance.
- Status. I want to be a big shot in this arena, as very few people can join such an elite club. And I like the game-design conventions in Vegas.
- The casino games I play (or oversee, or deal) are missing some juice and I can isolate and define exactly what it is to bring about the needed improvement. In a nutshell, I can do it right—for the gamblers, as well as for myself.

I don't want to be a jerk over here and say that the first two reasons are wrong; they aren't. But the crux of game development boils down to reason number three. You're not an inventor unless you actually make something better, in this case, a casino game. And only if you have this notion in your heart will

your mind, hands, and feet follow suit, so to speak, by creating a better game within the finite realm of casino-pit real estate. So you shoot for making things better, because if you do, you'll then become the inventor you wish to be.

A more realistic way to think about your game's possible upside (if you're going to focus on that) is to reframe the question: "How much will I have to *spend* to get a game to the point in the process where I have a shot of seeing a return?"

The answer isn't pretty. The average cost for a first game design, where plenty of mistakes are made, is about \$50,000. Subsequent games are about \$20,000, because the game designer can work much more efficiently, knowing the process.

Also notice in reason number three is the clause: "and I can isolate and define exactly what [the improvement] is." This is key, as game design isn't random trial and error as much as it's working to discard the chaff and refine the true wheat into the porridge payoff with known technique and directed purpose. This is the main work: knowing the good from the bad in game-play "mechanisms." (Mechanism, as I use it throughout this book, is a specific and identifiable characteristic, feature, or gimmick of a casino table game. For example, in craps, the basic mechanism is the 7-out, versus making a point; in EZ Pai Gow Poker, the mechanism is the queen-high push; and in Blackjack Switch, the mechanism is the push when a player busts with 22.)

I can't tell you how many times I've been in the presence of wannabe game designers (some of whom are actually gaming executives) who have said, "Something's not right about this game. I know something's wrong ..." snapping fingers near forehead, as if to pluck an answer out of thin air, "*but I don't know what the hell it is!* So let's mess around with it and see if we can find it!"

True, that's a starting point, but barely. It's the "messing around with it" approach that sends prospective game designers storming off in the wrong direction.

Messing around isn't the hard work successful game development entails. To sit around and randomly throw ideas

against the wall to see if anything sticks isn't a solution in game design, it's one hell of a waste of time. Rather, you have to be able to readily spot and isolate *exactly* what's wrong in order to fix it by knowing the tool kit. You'll need to grab onto steel handles, not straws, for any traction in this process. Learning about the tool kit is key, as opposed to just hacking away at it, which is how 99% of game designers do it, in my experience. This is the craft: Having effective game-review sessions requires you to know what to look for in a casino game, so you can fix what's wrong without breaking anything else in the process.

So you'll examine table games (especially your own) and run through a reasonably well-developed checklist, such as: a) hit frequency of the bet is wrong; b) dealer qualifier kicks in too frequently to provide the needed house edge; c) the side-bet structure too closely overlaps the main bet's structure; d) the game's defining mechanism, called the "humdinger," returns too little to the gambler in game-play action (also known as weak "juice" in terms of the game's premise); e) strategy is too complex or not obvious; and much more—all of which I cover in the following chapters; this is just the warm-up.

However, "d)" here, the defining mechanism or humdinger, is the starting and ending points, the *raison d'être*, of what makes a new game *really* new and better. The humdinger isn't so much a gimmick, but the premise, the basis, the very foundation that makes the game new, improved, and worthwhile. It isn't any sort of new and improved game if it doesn't incorporate That Better Way.

A Note to Those Designing Slot or Video Poker Games

This is a book about table-game design. However, I have to assume that at least some readers have aspirations of creating the next great machine game, which is likely due in no small part to the exploits of one Ernie Moody.

Of the many catalysts that have launched hopefuls down the road of game design, the most prominent is surely the story of the former stockbroker who quit his job and developed Triple Play video poker. While the numbers vary according to whom is quoting them, it's safe to say that, at their zenith, Moody was raking in multiple millions *per month* in royalties for his multi-line video poker products (a 2003 article in *Cigar Aficionado* speculated it was "as much as \$15 million"). Ernie has a 500-plus-acre ranch with a horse racing/training track outside of San Diego and an office with a Gulfstream jet parked inside that borders a runway at McCarran International Airport in Las Vegas.

Yep, a whole lot of prospective game designers are in it for a shot at Moody-esque success and, accordingly, many assume that slots or video poker is where the opportunities lie. Perhaps, but here are some realities.

Slots/video poker design is a different beast than table-game design, though they have several similarities.

Both require producing a gambling humdinger, though slot/VP games, at a couple of seconds per hand, are less multi-step oriented.

Table-game play is more drawn out and social, and each round is a small journey.

Table games have the benefit of being electronic-component-free: Aside from progressive side bets, they're played in an unplugged fashion.

The tasks involved are similarly demanding for both: finding the humdinger, doing the math, researching and filing the patents, creating the accompanying artwork, and pitching the product for a deal to be struck. In this regard, a lot of the material presented in this book is also pertinent for a slots/VP designer.

As for slots, the reel-based machines remained essentially unchanged until electronics and computer screens entered the picture in the 1970s. These technologies enabled all kinds of

new games to be developed by the slot manufacturers, including five-card-draw poker, which was the first true slots humdinger.

Enter Moody, who realized that casino games needed to evolve. While working on some poker-based table games, he came up with a humdinger and a half: multi-line video poker. The player is dealt three identical five-card hands, in which the held cards remain for all three, enabling three chances to improve the hand. It was simple, straightforward, and immediately sensible to the player; the possibility of ending up with one, two, or even three good hands greatly accelerated the juice over one line of video poker. Triple Play Poker was picked up by International Game Technologies and, along with Five Play, Ten Play, Fifty Play, and even Hundred Play, became such a huge success that Ernie Moody is considered the most successful independent casino-game designer of all time.

While the entirety of this book focuses on table games, most of the macro concepts within—discovering a humdinger game mechanism, discerning the math for both the player and casino, the realities of intellectual property, etc.—apply to all casino games. Hence, your time within these pages will not be wasted. For slots, video poker, and table games, the goal is to design a demonstrably *better* mousetrap, not just a *new* mousetrap.

So let's get started by taking a detailed look at the humdinger.

The Legitimate Humdinger and the Purpose-Driven Game Design

In the previous chapter, I used the word “humdinger” to depict a particularly effective characteristic of a good casino game. In the spirit of crediting my sources, the specific gaming usage of the word humdinger originates with Michael Shackleford, who called it “a new game mechanism of great and authentic value to the gambler.” A wonderful Shacklefordism and an apt description. To it, I’d add, *without that juice, you’ve got nothing, no matter what you put on top of it.*

The only problem with humdingers, per se, is that there are way too few of them. What we generally have instead, and in too great abundance, are gimmicks and hacks: ineffective mechanisms cobbled together and tossed into a new casino game that the designer thinks is good, doesn’t know is *not* good, and invests a ton of his money to get going, only to see his game fail down the road.

One of the most basic and critical skills of the game inventor is the capacity to distinguish (and later create) truly great game mechanisms. Though this is rare, it’s critical; a humdinger of a game premise becomes the “why” in “why the gamblers play your game.” So you’d better give them a very good reason!

The humdinger imperative is a talent, a gift to some degree, where real game-design ability begins and ends. Like any talent, you either have it or you don’t. Still, some game-design skills are acquirable and concrete evaluations and litmus tests can and will be used to differentiate the Real McCoy from a mere gimmick.

To delve a little deeper, the humdinger offers some sort of concrete service or option that's sensed and experienced as pleasurable, useful, or beneficial by gamblers on a game, even if they can't describe it or know exactly what it is. Our prime directive is to create that for them. It could be a raise option when the player appears to be in a strong position, like doubling down in blackjack or raising strongly and early in Ultimate Texas Hold 'em, or a save feature when the player finds himself on the wrong end of a surprising loss against the dealer, such as Free Bet Blackjack's free doubles and splits when the dealer draws out to a better hand, or Heads Up Hold 'em's free bad-beat feature, where the player still gets paid for a distressing loss on a straight or higher against the dealer.

However, these opportunities can be quite elusive to identify, to the point where players and even experienced game designers can't quite put their finger on what they are, except to say that Game X seems to "play better," or just feels better. So the designer needs to isolate and dissect exactly what game-mechanisms might create a gift to the gambler, incorporate them in a way that hides any house-edge mechanisms that compensate for them, and finally, produce them pretty much out of thin air. In other words, these game enhancements or humdingers come mainly in eureka-type moments that can't easily be forced or summoned.

To highlight this process, in this chapter I provide examples of successes and failures in this area, pinpointing the key game improvement that's absent in one design (yet may appear as some novel, though weak, mechanism) versus what's authentically good in other game designs. The false flash and the table games built on it are responsible for the majority of the 900+ Nevada game approvals throughout history that failed, as opposed to the 20 or so games that didn't. This high mortality rate is due to running ahead with nonsense unrecognized, instead of excellence confirmed.

The Skip Straight

Let's look at the Skip Straight for Three Card Poker.

One day in 2014, I was working in my office at Galaxy Gaming. The receptionist called and said a man on the phone wanted to discuss his game and the process of us considering it. I told her to put him through; I'd give him the details.

In dealing with game designers, I'm not one to mince words, in spite of the emotional attachment they often have for their offspring. This is business, which calls for honest assessment.

Next thing I knew, I was talking with Mr. Game Designer, or Mr. GD.

Mr. GD: Sir, I've developed a game I think you guys at Galaxy might be interested in. I believe it's something that we can both make a lot of money on. May I pitch it to you?

Me: Absolutely, yes, please. Pitch me your game.

Mr. GD: Well, in a word, it's brilliant. It is a new side bet for Three Card Poker and it's based on a wholly new poker element, the Skip Straight. Let me tell you how I came to develop it—

Me: Uh, that won't be necessary. [I cut him short. Background info about his flash-of-genius moment is not only unnecessary, it shouldn't be a part of any game pitch. The pitch is about the baby, not about the pregnancy. He gets to the game.]

Mr. GD: If you have a hand of 2,4,6, or 5,7,9, or 9,J,K, you have one of these new straights and you win the side bet. It has sizzle. You can have odd- or even-specific wins, too. There's a lot you can do with it!

Me: Okay ... [But I'm thinking that you can apply an odd or even criterion to the top or bottom of any straight or flush in Three Card Poker as it stands.] Well ... if you can, tell me what advantages it offers the gambler. *Why would the gambler be compelled to play this new side bet?*

Mr. GD: Well, it's new. It's never before been seen in live casino action.

Me: Maybe there's a good reason for that. It doesn't offer anything to the gambler that the current game doesn't already offer. The current Pair Plus pays on 3-card straights, real straights that are in a row that people recognize.

MR. GD: Sure, but it's *new*, you see. It's a new way to win!

Me: Yes, but in this business, it doesn't have to be new as much as it has to be better, and not only better, but *much* better than what we've already got. In fact, if it's too new, it can be

REJECTION AND ITS RESPONSES

I'm not unaware that rejection is painful, but I'm not there to hold anyone's hand or falsely encourage them so I can put a lousy game on my boss' desk and say, "Look what I brought in for us!" I'm there to look for the needle or two in the haystack. The designers, too, should know the score. Better a broken engagement than a broken marriage.

The responses to rejection run the gamut. Many submitters are pleased just to be getting some feedback from experts in the business. Some, even at the end of a very long game-design journey, admit, "I'm glad I now know." A few say that not only are they glad they tried, but the process was engaging and worthwhile. Among those, a handful claim that they never would have forgiven themselves had they not tried. Of course, many times I've been told that I had some nerve or something to the effect of, "You'll see what a big mistake you're making when my game takes the casino world by storm." It always reminded me of the famous scene with the Wicked Witch: "I'll get you, my pretty, and your little dog, too!" Then, click.

From the many submissions I fielded while I was at Galaxy, agreement parameters were discussed with only three independent inventors. You've got to make it exceptional.

alien and off-putting. I can see a gambler saying, "That doesn't look like any kind of straight to me; it's got holes in it!" That's the trick. These odd or even skip straights offer nothing over established straight-type hands that are easier to see and that gamblers know, love, and trust. Newness fades, but when it does, some substantial gambling juice must absolutely remain.

As you can see, Mr. GD didn't come close to a humdinger. His first error was designing a side bet for a proprietary game. Three Card Poker is owned by a distributor, making it unavailable for third-party ad-hoc modifications, as opposed to blackjack, baccarat, or roulette, which are casino self-installed, meaning that these public-domain games can accept variations.

Secondly and specific to his skip-straight idea, you can apply a payable to any combination of cards that fall within the parameters of a given game. Since this alone is neither new nor fun, it doesn't offer the gambler anything more interesting than what's already out there; confusing the merely new with the actually better is a common mistake in game design. Perhaps we've heard "new and improved" so many times in our lives that we now think they're the same thing; they're not. Quite often the new masquerades as improved. Nowhere is this truer than in game design.

Also, there's a natural tendency to believe, "Because I thought of it or created it myself, then it *must* be awesome." In this regard, a good game-designer's goal is to develop the opposite belief and actually become jaded and critical, which is necessary to develop the ability to discern value regardless of the source, yet without any loss of interest or passion at all. By the time you show your wares, they need to be impressive to the critical eyes of others, not your own.

The Deliberate versus the Random Approach

Nine out of ten game designers sit in their basement or garage, or at the kitchen table, trying out various permutations with a deck of cards or a pair of dice and making notes with pen

and paper. I don't have to break into any aspiring game-designer's house wearing a Harry Potter cloaking shawl to know that the vast majority are seeking the "lightbulb" moment of a totally random brainstorm that somehow emerges like a gift from the heavens. After they recognize and grab hold of it, they'll call over their spouse: "Waddaya think, honey? Looks good, right?!"

You can do a million things with a deck of cards, in terms of payouts, bet options, dealing procedures, and the like. That said, you can do only a few dozen or so superlative things, meaning that only a handful of casino-table-game humdingers are left to be discovered or invented. Bottom line: You won't stumble on these gems by accident, by randomly messing around with a deck of cards.

Think of the million or so possibilities with a deck of cards as a million safe-deposit boxes, of which only 35 or so contain untraceable flawless diamonds, while the other 999,965 boxes contain only cubic zirconium—*glass*. You're in the bank vault with a crowbar and a drill, with only three hours to get it done and get out. Oh, and you can't differentiate the diamonds from glass to boot. This is exactly what you're doing when you "mess around" with a game design. Although you appear to be in the right place doing the right things, you don't know how to get your hands onto the real goods. It's an illusion.

You'll never develop, or even recognize, a beneficial game mechanism unless you form a good concept of it first. When you're on a search for anything, success is predicated on knowing what to look for. In terms of game design, this means knowing exactly what you want to see in a game going into it, as opposed to hoping to recognize something should you stumble across it, all the while trusting that it will magically present itself to you during a random session. This is like trying to meet up with an important stranger at the airport when you have no idea what he looks like, or a computer programmer writing code to solve a problem he hasn't identified, or a screenwriter

launching into full script when he doesn't have a plot, characters, or setting. If you don't know what you're looking for, how will you recognize it, even if it falls right into your lap?

Instead, you have to declare upfront what elements you want to see removed from or added to the type of game you're focusing on (blackjack, hold 'em-type poker, dice, etc.). Then you review and play the game with your envisioned changes to see if you've given a direct and unmistakable humdinger "gift" to the gambler. By doing this, you'll quickly realize that the current crop of installed table games are very well defined and refined.

You also have to figure out how you'll pay for this gift, in terms of what it gives up to the house advantage.

And then, you have to come up with a rule or ploy that counter-balances the edge percentage you just gave away — and conceal it from the gambler's view as effectively as you reveal the humdinger.

In addition, this all has to make sense to both the gambler *and* the dealer.

Only the dealer and gambler are where the table-game action is. It's where the casino rubber meets the player road, so to speak. Everyone else in table games — from the floorman all the way up to the casino manager — performs administrative functions, such as protecting the games, scheduling dealers, counting and allocating the money, and verifying that all is running clean and proper below them. If a game works for the dealer and gambler, it'll work for all concerned.

How I Developed EZ Pai Gow Poker

In this section, I discuss one Pai Gow advancement, plus four blackjack variations developed by Geoff Hall, who embodies this idea of purpose-driven game design. I also use a Texas Hold 'em variation. All six new-game examples show exactly how the critical game idea germinated:

- EZ Pai Gow — author as independent
- Blackjack Switch — Geoff Hall
- Free Bet Blackjack — Geoff Hall
- Zap It (Zappit) Blackjack — Geoff Hall
- Burn-20 Blackjack — Geoff Hall
- Heads Up Hold 'em — author for Galaxy Gaming

You'll notice that two of the six came from me. In a previous career, I was a casino dealer at the Fiesta Henderson, dealing poker derivatives, craps, and especially Pai Gow Poker.

One night dealing Pai Gow Poker, I had a player making constant oddball bets, such as \$134, \$69, \$77, and \$92, forcing the constant calculation of awkward commission payouts. I was annoyed; obviously, the player was shot-taking, wasting time, and showing off in front of his buddies. "Aha, dealer! *Excuse* me! You made a mistake! The correct payout is ... Look at me! I'm such a pro, I know more about the game than the dealer!" Worse, he was being a smartass; a lot of gamblers find their juice not in the true results of the cards or dice, but in petty (or not so petty) shenanigans that they try to get away with at the table.

On a game like Pai Gow Poker with a 5% commission, the key to calculating the correct payout for any oddball-bet amount (commissions on the common bet sizes are memorized) is to divide by 10, split that in half, subtract that figure from the original amount bet, then round down. I was constantly going through "a tenth of \$94 is \$9.40, half that is \$4.70, so ... his \$94 winning bet minus the \$4.70 commission is \$89.30, which rounded down to the nearest 25¢ is \$89.25." Then I had to cut out the chips, 25¢ pieces included.

The irony in all this is that the smart-ass player was actually doing me a favor: All the calculating got me to question the necessity of even *having* a commission in the game.

The next morning, I set out to repair Pai Gow Poker, to make it a no-muss, no-fuss, commission-free game. I didn't take out a deck of cards. I didn't *need* to, as I damn well knew what the even-money payout looked like. I also knew it would

be optimal for the game if the house-edge-replacement mechanism could be made milder than paying the commission itself. I turned on the computer, opened an Excel spreadsheet, and got onto Internet Explorer.

First, I wanted to know exactly how much house edge was needed to be replaced. This was the easy part: I went to the Pai Gow Poker page at wizardofodds.com. A spreadsheet of this easy math is on the next page. The return column is actually just the payouts times their probabilities, summed between the player wins and the house wins.

In a second calculation, I replaced the 95% player payout (represented by the highlighted 0.95 figure) with 1, representing a full 100% non-commission payout.

Multiplying the probability by 1 instead of 0.95 in the return column told me how much house edge I had to recover via some very easy and gentle game mechanism that I'd have to create.

The basic math presented in the charts is straightforward. It's worthwhile to introduce you to it now; similar examples appear throughout the book.

- The "Pays" column represents what the player's bet will win or lose, either a -1 bet for a loss, a 0 for a push (tie), or +0.95 for a win (a win returns only 95% of a winning bet after commission).
- The "All Hand Combinations" column shows the number of possible hands that can occur, broken out by result.
- "Probability" is the player's frequency of winning, pushing, or losing, expressed as a percentage. It's derived by dividing the total of win, push, or lose combinations by the total hand combinations and displayed in its appropriate win/push/lose row.
- The "Return" column expresses the value to the player or the house of the win-tie-loss results for the game in fractions of the bet unit, where the

win return is your probability of winning the hand times the amount you win (0.95 of your bet after a 5% commission), and the loss is the loss probability multiplied by the amount you'd lose (a 1-unit full bet lost is -1, or minus 1).

Pai Gow Poker with 5% Commission on Wins

Result	Pays	All Hand Combinations	Probability	Return	Comm. Effect
Win	0.95	2,402,491,783,820,750	0.291195	0.27663518	1.456%
Push	0	3,341,087,256,920,520	0.404958	0	
Loss	-1	2,506,879,990,473,120	0.303847	-0.3038473	
Total		8,250,459,031,214,390	1.000000	-0.0272122	

At Full Pay/No Commission, No Mechanism

Result	Pays	All Hand Combinations	Probability	Return	Comm. Effect
Win	1	2,402,491,783,820,750	0.291195	0.29119492	0.0%
Push	0	3,341,087,256,920,520	0.404958	0	
Loss	-1	2,506,879,990,473,120	0.303847	-0.3038473	
Total		8,250,459,031,214,390	1.000000	-0.0126524	

In Pai Gow Poker, changing the payout doesn't affect the playing strategy, as you never fold; you just set your hand the best you can and hope for the best against the dealer. You should see that paying a 5% commission on the 29.12% of the hands that win comes to an effective commission of 1.46% for the house, meaning about 1.5% in house edge needed to be replaced. (There's also a slight house edge as the dealer wins the rare "copies," which are hands that tie.) At such a low casino advantage and on such a slow game, it's more profitable and efficient just to charge a 5% commission. My goal was to remove that commission, to make the game full even-money pay, but I had to find a way to replace that 1.46% to do so.

Next, I tackled the problem of *improving* Pai Gow Poker with this change. Does this sound subjective? Actually, it's tangible if you can specify the reasons why a gambler would appreciate it. For example, you might write down, "The gambler now gets full-pay wins, instead of getting stuck with paying a commission, which feels like he's being punished for winning." Can you see how much better that sounds and feels to a gambler and, therefore, to a game distributor and casino, than, for example, "Well, I can make the layout a pretty blue color and they'll really appreciate that!"

This humdinger that provides benefits from a change was more than just closing off an avenue where some drunk (or ego-maniac) could bog down a game or take shots at a dealer from time to time. When given a sniff test, the benefits were legitimate:

- A commission-free game is much easier to deal and operate. Just pay what's bet and won. Fewer dealer errors are also a huge plus.
- Players should prefer it. In standard Pai Gow Poker, the commission short-changes the player on every win he ekes out. Players now get full pay on every win. The benefit will be added in exchange for a barred hand (a rare hand that pushes all main bets) of some sort, to be determined after this step.
- The game moves faster and with more purpose. No more time is wasted calculating and cutting out commission-based payouts. More hands per hour for the casino increases action and profits.
- There's no increase, decrease, or change to the house edge from the standard game if the mechanism is designed properly.

Figuring out, selecting, and then implementing the *right* game mechanism to compensate the house for its loss of mathematical advantage was the more challenging part.

I made a list of the possible play and dealing changes that would work mathematically. A mechanism to cover this amount didn't have to kick in too often, as that figure would represent a swing of either a win to a push or a push to a loss once every 50 or 60 hands, not enough to notice when you're now getting full pay on every winning hand. But over the countless hands dealt by a casino, losing the money from a 1.5% advantage is a lot to recover for operations, and in order to offer the game in the first place.

The game mechanisms I examined for effecting a commission-free Pai Gow game are listed here.

- A player winning half his bet (instead of a full unit) on a full house, which occurs 2.1% of the time, so half of that (1.05%) is close to my 1.5%. Mathematically good, but problematic, as it punishes a full house with a 50% short pay.
- A player pushing his Pai Gow hand instead of winning against a dealer's lower Pai Gow hand, but tying or losing against a dealer's better hand as always. Since a player gets a Pai Gow hand 16% of the time, as does the dealer, this faceoff happens about 2.5% of the time, with the player winning a third of them for a 0.83% swing; this was mathematically too small, and messy in game play.
- I also tried pushing various levels of dealer Pai Gow hands (king-high, queen-high, jack-high, etc.), hands on which the house typically loses, converting them to barred hands. An exact queen-high occurs about 1.7% of the time (or once in every 58 dealer hands) — pretty rare. Stripping out the relatively few player hands that would have pushed anyway, this added a total house edge of about 1.3%, approximately the same as the other two mechanisms above. Very good and closer mathematically.

Next I tried out these ideas with cards to see how they played. While one can't fully appreciate the juice effect of some game-play mechanism without real money in action, having a card-play session gives a sense of the specific mechanism's impact, advantage for the player, and playability if you start with game ideas to bench-test. In reviewing the three solutions, I concluded that:

- The half-pay on a player's full house would be punitive to gamblers, punishing them for great hands. And the half-pay shortfall of 50% on a great hand could be considered another commission, a big 50% commission.
- The face-off of Pai Gow hands as a house-edge mechanism would be rough; 16% of the time, or one in every six hands, the player would have a Pai Gow with no way to win. A Pai Gow doesn't often win, but it sometimes does, and now one in six winning player hands would be branded with an official "No win for you!" Telling a player that his hand can't possibly win is bad. If it happens often, it's very bad.
- The dealer Pai Gow push mechanism worked very well, though, and it was relatively rare and gentle. The fact that this was a dealer-qualification method meant that there were also no bad initial omens for a player's hand when he received it. The queen-high occurrence also made for a very good side-bet trigger on this push hand, paying a whopping 50-1: You'd wager \$1 on this side bet to win \$50 or \$5 to win \$250. Nice. This was added, initially as the funny-sounding Dragon Queen, later renamed the Queen's Dragon. This game ultimately became EZ Pai Gow; later in parallel, a variation was Shuffle Master's/SG's commission-free Fortune Pai Gow Poker.

Below is the summary from the math report provided in May 2009 by Charles Raymond Mousseau¹, a prominent gaming mathematician. Mousseau did a computer simulation of 5,000,000 rounds of play and determined the characteristics of the new game.

EZ Pai Gow/Fortune Pai Gow Using Queen-High Push

Result	Pays	Combinations	Probability	Return
Win	1	1,372,984	0.2745968	0.2745968
Queen-high	0	87,717	0.0175434	0
Natural push	0	2,042,843	0.4085686	0
Loss	-1	1,496,456	0.2992912	-0.2992912
Total		5,000,000	1	-0.0246944

The Importance of the House Edge and Table Hold

Whether it applies to table games or slot and video poker machines, the house edge, also known as the house advantage, is the profit that the casino builds into every wager. Casinos don't beat players by getting lucky; they beat players by dealing games with a small edge in their favor. This is how the casino, if it's managed properly, thrives. The house edge is (usually) not usurious. It's expected to be reasonable and fair; if it isn't fair, a game would get no action and die in any case. In a sense, it's fully analogous to admission fees to entertainment venues; people don't reasonably expect to attend movies, concerts, the theater, or ballgames for free.

For our purposes, the house edge is the basic metric of casino games.

For each percentage point of house edge, on average there's about a 10% swing (increase or decrease) in the table's "hold," or the portion of the player's buy-in money retained by the house.

¹ Charles Mousseau is an experienced and well-known commercial gaming mathematician with whom I've worked on a number of projects.

This is because players re-bet (recycle or churn) their betting chips many times over, giving a small house edge a chance to assert itself. If a player makes a single bet in the casino, then leaves, that's just a coin flip and the casino edge, though it's still mathematically present, can't be counted on in this one trial. Over the "long run," though, the house advantage will fulfill the mathematical expectation.

Thus, the house edge not only has to be built in, but in the exactly right size to a "Goldilocks" level of accuracy. The importance of providing the correct house edge (and mechanisms) cannot be understated: A swing of 1.5% in a game's house edge represents a hold percentage of 10 times that amount, or 15%. Assuming a table-game buy-in of \$100,000 a month, a 1.5% house edge translates to an expected \$15,000 profit. Each table in the casino pit should hold \$30,000 or more per month on average, to cover the payroll, overhead, player comps, and the proverbial lights and the like.

The house edge is automatically self-scaling, based on its declared static or nominal figure. As such, the house edge will charge proportionally to the play amount for the most part: Higher gambling action is a bigger risk to both the house and player, and the house will take a larger dollar amount at that same percentage. Certain games (particularly baccarat) often have lower house edges to compensate somewhat for bigger play as casinos offer more liberal rules at high-limit tables, essentially advertising house-edge discounts for this bigger play. Single-zero roulette is another case in point (half the house advantage of the typical double-zero wheel) for high-rolling.

There are a number of ways to replace a certain percentage that's taken away from the house edge by a game feature you add, in order to give something extra to the player. In the case of my EZ Pai Gow game (and various commission-free versions under other names), I created a Pai Gow push qualifier. This barred hand or tied hand is very clean, flexible, and uncomplicated, and can be applied to a specific player high hand or a dealer low hand.

It's important for the game designer to look at the effect the math has on various scenarios. For example, a player who buys in for \$100, plays \$10 a hand, wins 10 hands, and loses 10 hands would pay \$5 in commissions (or 50¢ for each 5% commission on 10 wins). Correspondingly, if the Pai Gow push kicks in once in 50 hands on average for a hand that the dealer would have lost, the same 20 hands of play would have a 20-out-of-50 chance to nullify a \$10 win, so it's worth \$4 (40% of \$10) in a 20-hand session. But without the commission, the game is also faster, perhaps by 25%, and that would make the \$4 recouped worth the same \$5 in commission it replaces.

As mentioned earlier, numerous methods can affect and resolve a house-edge alteration, including²:

- Having an ante and raise bet structure, where the player makes an ante bet and plays or folds on the raise bet, and isn't paid on one bet unless a hand (player or dealer) meets a predetermined level. It may pay a bonus on a strong hand to "balance-reward." All these elements are configurable or adjustable.
- Mandatory equal side bets (an extra and mandatory bonus or blind bet that covers the needed house edge), often seen with a third play/raise bet. The blind bet pays less than the optimal amount in order to cover the player advantage of raising his bet with a statistically winning hand.
- Dealer can get one more card than the player to form his hand, which has an exact advantage over the player for the game's payable structure and can be balance-rewarded by additional payouts on the

² Some table-game mechanisms you might come across in the casino are patented and unavailable for use, depending on how close your final game comes to these other products. Always review your game creations, particularly with qualified personnel like patent attorneys. Your goal is to be creative and invent something novel and better, not to copy.

players' strong hands. Shuffle Master's Four Card Poker uses this mechanism.

- Game-rule changes can be used, particularly in blackjack, where increasing or decreasing the allowance of play options has an effect. For example, hitting soft 17, doubling on any two cards versus doubling on 9-11 only, re-splitting aces, and adjusting blackjack payouts all manipulate the house edge. I recommend staying very close to common rules (hit soft 17, double on any two cards, double after split, no surrender) to conform to expectation and for standardization, keeping the strategy uniform and avoiding dealer and operational errors from too many changes.

Absolutely avoid the temptation to get fancy on game rules that don't really matter. Instead, develop or use clear, simple, and efficient mechanisms that have a clean game effect. You'll see shortly how Geoff Hall carried this out beautifully by creating a new and critical blackjack mechanism used to power some remarkable blackjack games.

Your game will —*must*— offer a choice of house-edge options, so that the most appropriate amount can be selected when real play indicates what that should be. Typical house-edge ranges are consistently 0.5% to 3.5% for main-game even-money bets and 2% to 9% for side or "prop" bets. Additionally, different casinos and card rooms have different requirements, so flexibility in adjusting the house advantage will be much more attractive to them.

The house should typically hold (retain from the players) 22% to 38% of its buy-in money (called "drop," because the dealer drops the new money through a slot into the table's safe) and 18% or so on blackjack games. Leagues of advantage players/card counters affect blackjack's hold, but its buy-ins are also higher, so an 18% hold is adequate; the larger drop results

in more money held (as 18% of a \$400,000 drop beats 29% of a \$150,000 drop). Table hold percentage is higher, about 29% on poker-derived and Pai Gow games, where the play is slower and a higher house edge is needed and used.

The Blackjack-Specific Stuff

We'll launch into blackjack with Geoff Hall's excellent work, starting with Blackjack Switch. As far as blackjack variants go, it's a smash hit.

If you've ever played two hands of blackjack during a session, you might have noticed that all too often, you'll get two bad hands, a 15 and a 16, let's say, against a dealer's upcard of 9. You hit both hands, as you must, only to bust both and lose twice as much. You might have also noticed that, quite often, if you could exchange one card between the two hands, you'd turn that 15 and 16 into an 11 and a 20—two *great* hands just from swapping one card between two lousy hands.

Of course, switching cards in and out of blackjack hands is out of the question, unless you want to wake up in a police holding cell; it's a blackjack cheating technique called "mucking," short for "hand-mucking." Countless gamblers, playing two hands of blackjack at a time, have no doubt wished they could muck a card, but discarded the idea as a fleeting and futile dream.

Enter Geoff Hall. This successful game designer not only recognized this card-switch fantasy, but also had the creativity, audacity, and tenacity to think that it could—and really should—be possible: *the mission*. He said, "Okay, I now know what *I* want to see in blackjack for two-handed play, so presumably countless other blackjack players will want to see it as well. I shall find a way to set this idea free and bring it into the world, come hell or high water."

Actually, he didn't say it in such a go-tell-it-on-the-mountain fist-in-the-air proclamation (he's not the type), but he did, absolutely, in spirit and action. He knew exactly what he want-

ed going in — no fishing expedition or messing around here. His mission was to create an improved “switch-and-muck” version of blackjack.

The idea played well, as many dual bad hands could now produce one decent hand, or two decent hands, or even two great hands. In fact, it worked too well initially: The house edge disappeared! Needless to say, this was a problem. The optimal blackjack house edge (from 0.5% up to 2.1% for some 6-5 blackjack games) was now about a 6% *player* advantage! If this game were indeed set free, players would be laughing all the way to the bank. So now, the bigger consideration emerged to get his baby going: locking down house-edge math and dealing procedures.

But instead of being obstacles for Geoff, they were just other items to be addressed, also with great care and as part and parcel of the project. As a game designer, you’ll get slammed with curveballs, and the ability to make contact with them and recover your momentum is critical. The attitude to take is that any issues that pop up are mere to-do items on the checklist of getting to the finish line.

To make up for the lost house edge, it came time to pay the piper. He had to add the right house-edge mechanism that balanced this great gambling tactic, so it wouldn’t put casinos out of business, but most of the existing compensating techniques were off-putting. For example, if he made the player lose all ties with hands of 17 to 20, it was worth approximately 8% to the casino — a 2% edge when coupled with the Switch idea. However, mixing in any poor-playing mechanisms, even if they provided the needed house edge, was unacceptable. For legions of blackjack players, losing on a hand they were accustomed to pushing would be a sharp poke in the eye. For a game designer to use such a poor mechanism is like a fashion designer deliberately putting a ketchup stain on a ballroom gown. Every new game has to be as seamless as possible, essentially perfect, in hopes of going up against existing and proven casino games, some of which have been refined over the eons.

Geoff knew better than to be content with shoddy work-arounds, so he took the bull by the horns and created his very own new (and better) house-edge mechanism: the remarkable “push 22.”

Talk about gumption! Geoff dared to change the game of 21 to a “sort of 22.” Geoff’s push-22³ mechanism simply pushed (tied) all player hands left standing when the dealer’s hand totaled 22, ordinarily a bust and a player win. He converted one relatively rare dealer loss/player win in blackjack into a “no-action” tie event.

And talk about a soft change. A dealer 22 is not only relatively rare, but the penalty is relatively painless—as the player occasionally pushing on a hand otherwise won is like getting a Mulligan rather than a loss.

Geoff patented both the switch and push-22 mechanisms, thereby enabling and protecting the full game of Blackjack Switch. The game took off quickly to hundreds of installs in several years between his own sales efforts and later an agreement with Shuffle Master, the table-games manufacturer and distributor. (In the casino business, a “distributor” is a gaming company authorized to market and sell table games in multiple jurisdictions.) Geoff made it—there’s no better way to describe it.

What Geoff pulled off was remarkable, but it was also eminently doable. Like Geoff, all you have to do is be resourceful, steadfast, and absolutely oblivious to the fact that what you’re attempting is supposed to be impossible.

Geoff continued to play blackjack and get ideas on how to improve the game. Like all players, he experienced the frustration of splitting or doubling down to get five or so bets out that he thought he should win, only to have the damn-blasted dealer pull off a four-card 21, hitting past a stiff he should have busted,

³ Sorry, guys: Mr. Hall patented Push-22 [#7,435,171], issued October 2008 with Muskin and Associates. I totally understand the feelings of “wish I had thought of it/wish I had patented it/wish I could use it.” There are times we all slap our foreheads thinking, “If I’d only.” That can be remedied as described herein with an effective game-creation process that we seek to apply to our own gems.

to take it all. I can see Geoff saying, "You know, Mr. Dealer, that was just bloody (Geoff's a Brit) wrong of you, taking all my extra split and double-down bets! How unsporting, one-sided, and un-American! You should at least have the decency to take only my original bet if you were going to do *that*! If this is going to be the case, we should be able to split and double down for free in this bloody game!"

And ... another "Aha!" moment hit him in the head, leading to Free Bet Blackjack.

Geoff again declared, "You know, that's exactly what I wish to see at blackjack: splits and double downs are on the house! If you win, you get paid, but if you lose, you lose only your original bet. I know what I want to happen here."

Again, this is key: creating or improving a game by knowing exactly what needs to be offered going in. You'll seldom find it by deliberately searching for it, as inspiration often comes during play or away time, in a fashion that usually cannot be forced or brainstormed. Insight isn't easily summoned; it comes when you're not looking for it, but by just being open to the calling and by maintaining a game-design consciousness in your life. By being experienced at table games, a humdinger is allowed to be captured or to drop into your lap, as long as you don't kick it out by saying, "Nah, that'll never work," or, "That's not in the rules," or even, "That's cheating!" Remember, as a game designer, you're writing *new* rules. Most game designers are either players or dealers as a result of the opportunity that being one or the other (or both) bestows; you can reflect through personal experience on the quirks and game shortfalls you've witnessed and see a better way to do things.

Geoff used lammers (brass tokens) inscribed with the word "FREEBET" to indicate the value of your original bet on splits or double downs. When they win, players are paid even money. When they lose, the dealer takes back the free-bet lammers at no cost to player. Brilliant! A winner, and another Geoff Hall blackjack vision that became a casino reality.

The way Michael Shackleford describes Free Bet Blackjack

at wizardofodds.com illustrates that when a new game is good enough, a plain description is essentially the same as its pitch: “Free Bet Blackjack is a blackjack variant by game inventor Geoff Hall. The twist to this one is the player doesn’t have to risk his own money when splitting or doubling (most of the time). It is like playing with a generous boyfriend at the table who makes all the supplemental bets for you and lets you keep the winnings. What is the catch? Like in Geoff’s other game, Blackjack Switch, if the dealer gets a 22, all bets left standing push.”

Free Bet Blackjack and Geoff’s later projects were easier for him, because he knew the ropes after Blackjack Switch. This is true for all designers who’ve been down the path and through the gate. But now he had in his arsenal the push-22 mechanism, which allowed him to pursue his various other blackjack-related insights.

For example, Geoff also created Burn-20 Blackjack, addressing the frustration of the dealer flipping over a pat 2-card 20 after the players had worked to hit out their hands. Here the dealer has to draw a new hand. In his Zap It Blackjack, if the player gets a particularly weak 2-card hand (15, 16, or 17), he can discard it and draw a fresh hand. All four of his games provide insightful answers that address game problems and drawbacks, solutions that gamblers found they wanted offered in new games. If a new game addresses a gambler’s wishes and its compensating house-edge mechanism is milder than the humdinger’s apparent generosity, you’ve pretty much got it.

Model Game Characteristics

The innovation really helps gamblers. The humdinger that comes into sight is a previously unknown or unconscious gambler wish-list item recognized as marvelous and welcomed upon its introduction into a game. The humdinger will generally do its goodness in one of three ways:

- Introduce a new and better feature, such as card switching.
- Remove a negative from a game, such as the commission from Pai Gow Poker.
- Add a saving break, such as the no-cost bad-beat in Heads Up Hold 'em. If you lose at this poker derivative with a straight or better, your loss is converted to a win and for free, with no extra bet required. That's a real gift.

There's no detracting cost for it. Implementing the humdinger seems free; it either doesn't affect the house edge or uses a discreet house-edge mechanism where the combination is a great overall improvement.

It doesn't introduce new problems. No game-protection issues of counting or collusion or dealing difficulties are introduced. A side bet called 40X Blackjack from Big Bet Gaming is a great idea, but it might accelerate the involvement of advantage players.

Simple, sensible, and elegant. The concept is so clear, straightforward, and natural that it's an easy sell. You can explain it in one sentence: "Pai Gow Poker is now full-pay commission-free." "All your splits and doubles are free, on the house." "Lose with a straight or higher and we'll pay you back, and then some, automatically."

Many, if not most, successful game designers are one-hit wonders. The typical designer comes across a winning idea by some ad-hoc process that in itself isn't very selective or reproducible, whereby a mix of wheat and chaff is produced by a one-off lucky session. In this scenario, the wheat makes its appearance into the world in the same way a lucky player stumbles onto a royal. I heard this expressed by a slot manager when he said, "Well, with all these people playing tonight, some player will hit a royal flush just by luck." Even subsequent efforts by successful one-hit game designers can fall into the hack-at-it

trap, especially when they're under pressure to follow up with another humdinger. A failing second effort is similar to a failing first effort, except with new money and reputation behind it and at risk.

Your Assignment: The Productive-Session Summary Technique

If you find that you just spent an hour or two dealing cards to look for an idea, you should write a paragraph to explain what you've accomplished and why that session wasn't a waste of your time. Every screenwriter has to write a synopsis of his script to see if he has a good start; so do you. You use card-play sessions to test ideas, not as a search tool. *You* tell the cards (they're just paper, so they can't tell you). If there's nothing in your head, then there's nothing in the cards (unless it's a Tarot deck—even then, you're the Oracle).

Your Field Work

Arm yourself with a pocket-sized note pad, give yourself a week for this homework assignment, then play a handful of times at a card room or casino. Afterwards, write down anything that felt off-base, or wrong, or great, then compare your game complaints and praises to generate a wish list of mechanisms that satisfy the following four criteria: 1) how they help gamblers; 2) how they can appear to be free of cost; 3) why they don't introduce problems; and 4) why they're clean, short, and elegant.

Note that I recommend you actually gamble some. Let me explain why I feel this is important. I've noticed, both in actual casino play and in game run-throughs at work, that the humdinger is very hard to detect in a no-money scenario. In dry-run play, the best game with the juiciest mechanisms will still appear to be mechanical dealer movements with cards and chips of no (or considerably less) psychic impact than in true

gambling. As such, you can't gauge a game's real juice. It's the difference between hearing about someone's hot-date night versus *having* a hot-date night yourself, as it's the experience of real action that makes a teaching difference. You play at a casino to actually participate in a field of game-design excellence with its teaching potential. In the same way, every serious musician attends shows and concerts and listens to records, and every serious artist attends exhibits and visits museums and art galleries. A game designer has to be hooked into the casino proving ground more than his own nursery. Gambling is much more meaningful when it's done for real. You can't evaluate your own game designs in this fashion until they're installed somewhere, but you can play various related real games. Do so.

Grabbing at Straws

The following are typically uninspired techniques. Keep your guard up against these hacks.

- Adding a joker to an existing stock game, instead of incorporating a joker into a new and inspired game.
- Taking an existing single-deck game like Three Card Poker and creating a trivial alternate version of it, such as a 6-deck-shoe version.
- Crunching down an existing game, e.g., Mini-Tex or Mini-Pai Gow.
- Slapping two dissimilar games together, like combining gin and Kahlua, i.e., "Blackjackarrat." (Where this worked as a side bet: Pai Gow Mania, 21+3.)
- Turning up one community card on an otherwise bland poker game.
- Adding back-betting spots onto an existing game.
- Making the dealer's single-hand game into a two-hand game, and playing "A" or "B" (or Player and Banker).

In isolating and testing a new-game premise or humdinger, think in terms of the gift it provides and if the compensating house-edge mechanism is mild or rough, then write an honest assessment or summary on its merits or drawbacks. The following merit grid evaluates several games in this fashion.

Game Name	Game Premise	Gift?	Mild?	Gifts and Drawbacks
Free Bet	Split or double for free	Yes	Yes	Easy strategy; frequent use of great feature
Switch	Two-handed BJ swap	Yes	Yes	Harder strategy; frequent use of great feature
Zap It	Ditch bad hand 15-17	Some	Yes	15-17 hands aren't that bad or much of a problem
Burn-20	Dealer ditches pat 20	Yes	Yes	Helps, but dealer may still nail good hand
Mini-Pai Gow	6-Card PG; one card top	No	No	No—players get lousier high-card Pai Gow hands
EZ Bacc/EZ PG	Full pay no commission	Yes	Yes	Full pay and easier to deal/play
Wild 5 Poker	Wild joker, raise ability	Yes	Yes	Dealer house way gives the player an extra break
3 Card Poker	Easy hands, raise or fold	Yes	Yes	Fun and easy, can't mess up—look for a queen
Double Draw	Re-draw cards to hand	No	No	No—brutal strategy, frustrating play; bad breaks
UTH	Super raise feature	Yes	Yes	Excellent, smooth play, can raise or check to end
High Card Flush	Variable-length flush	Yes	Yes	Very easy and fun; forgiving
Heads Up Hold 'em	Free bad beat in game	Yes	Yes	Free bad beat occurs frequently
Super 3-Card	Shoe game 3-card	No	Yes	Same old Three Card, from a 6-deck shoe
3-Card D. Play	2-hand 3-card, easy	Yes	Yes	Two-handed action and strategy w/low-hand bonus
40X Blackjack	Super double-down raise	Yes	Yes	Hot game, but rough game-protection issues
Superfun-21	Gazillion-feature BJ	No	Yes	Too many unmanageable features, players hang

A dinner table full of successful game inventors at Main Street Station, January 2015.



Clockwise from front left:

Geoff Hall, game inventor and blackjack guru.

Minorka Snow, lovely wife of Roger Snow.

Roger Snow, Senior Vice President of the Shuffle Master Division of Scientific Games, the table-game master of that conglomerate and inventor of Ultimate Texas Hold 'em, Dragon Bonus for baccarat, and other hits.

Barbara Walton, inventor of Ultimate Casino War, distributed by Shuffle Master.

Behind Barbara Walton (and partially obscured by Barbara, hunched over a burrito) is the distinguished Michael Shackelford, gaming mathematician and author, and founder of the wizardofodds.com site, which is essentially the mathematical game repository site for the industry.

At the far right head of the table is Michael Templeman, of Paradigm gaming, co-inventor of Half Back Blackjack and Lucky Stiff.

Mrs. Templeman.

Me (Dan Lubin).

My wife, Prapaisri.

The Side Bet as a Standalone Product

In this chapter, we're ready to move onto side bets that are developed and attached to existing casino games. This product is added to a non-proprietary "open" game; the side-bet developer didn't create the primary game. In essence, these side bets are "after-market" add-ons for public games.

There are many advantages to developing a side bet as its own product. First and foremost, it's much easier to create an add-on bet than an entire game system. This is akin to an interior-decoration project, as opposed to designing, constructing, and then furnishing a house. You're sprucing up an old war horse. As a result:

- A side bet takes far less resources, as you're merely building a paytable bet that wins or loses by some trigger from another game's normal course of play.
- It's generally strategy-free; the player simply makes the wager on a game event over which he has no strategy control. It's a "set-it-and-forget-it" wager. In different game scenarios, making the bet or not is a decision (such as taking insurance on a larger than normal blackjack bet), but from the side-bet's placement to its resolution, it's on auto-pilot—generally, no input is required from the player.
- Because no game owner is involved, the add-on is automatically allowed. (The difference is similar to camping out on public land, as opposed to someone's private property.)
- If done right, the side bet offers benefits to the play-

er that the main game doesn't, while not adversely affecting main-game play. Actually, this is the definition and the goal of a good side bet.

The disadvantages are also numerous. Side bets are limited to games in the public domain (which casinos use without any vendor licensing fees). They have much lower lease prices, in comparison to full-blown main-game designs. Even so, the bet has to add real benefits above and beyond what the base game already offers, to justify your new license fee.

Unless it's put onto a game that you invented and patented, side bets are restricted to the following non-proprietary games¹:

- blackjack
- baccarat
- craps
- roulette
- Pai Gow Poker

Blackjack Side Bets

Blackjack is an obvious choice for an add-on side bet, with tens of thousands of tables spread across countless casinos. So it's not surprising that the game of 21 claims the most popular and crowded side-bet arena.

The early side products have installs in the thousands: Both Galaxy Gaming's Lucky Ladies and 21+3 each have more than 1,000. There are also some independently distributed blackjack side bets: A New Jersey floorman and dealer, Joe Centrone, developed Bust it! Blackjack, got it approved in several jurisdictions (Nevada, Missouri, Indiana, New Jersey, and Ontario, Canada), and now has scores of installs spread among these places.

¹ You'll notice I don't include public-domain games such as Sic Bo, Big-6, Asian Pai Gow tiles, faro, and other very small-market games. Your goal is to hitch your side-bet product to a locomotive, not a jitney cab.

Keep in mind that a blackjack side bet needs only about 50 installs at a monthly \$200 per to generate \$10,000 a month (and yes, I can hear the wheels turning in your head reading that—we all want to be like Joe). Assuming 10,000 operating blackjack tables, you'd need to get your invention on only one-half of one percent of them (one out of every 200 tables) to make that monthly target.

Below is Joe Centrone's Bust It! side bet's mathematical design, courtesy of Mike Shackleford's blackjack side-bet appendix (which, sadly is also a bit crowded—with corpses). The Bust It! side bet is available for many deck configurations, but here's the math for an 8-deck shoe.

Bust It! (8 Decks) Dealer Bust

Event	Pays	Combos	Probability	Return
Suited 8,8,8	200	672	0.000019	0.0037610
Colored 8,8,8	50	2,688	0.000075	0.0037610
Bust on 6	15	175,616	0.004914	0.0737130
Bust on 7	9	374,272	0.010473	0.0942580
Bust on 8	7	582,400	0.016297	0.1140800
Bust on 9	5	814,080	0.022780	0.1139000
Bust on 10	3	4,233,216	0.118456	0.3553690
Loss	-1	29,553,536	0.826985	-0.8269850
Total		35,736,480	1.000000	-0.0681430

The types of game-triggering events on which a blackjack side bet can be built are various card combinations, generally based on the point values (a 20) or numerical combinations (a 6,7,8, or a 7,7,7 twenty-one as in Lucky Lucky) of the player's first two cards or the player's two cards plus the dealer's up-card. They're also based on a 2- or 3-card poker hand, a dealer bust or blackjack natural, or an extended payable triggered by a player natural blackjack. Some examples:

- A dealer's busted hand, where the payable is based on the value of the dealer's bust total, the number of dealer cards forming that busted hand, or betting on a dealer to bust after seeing the upcard, as in Galaxy's Bust Bonus (a good impulse bet), etc.;
- A bad-beat loss (e.g., Bad Beat Blackjack);
- A dealer blackjack with various paytables (countless);
- A player's 2-card 20 (Lucky Ladies/King's Bounty);
- A player betting on a 2-card poker hand that can be parlayed to the main bet (House Money by Shuffle Master);
- A player betting on a 3-card poker hand based on his first two cards with the dealer's upcard (Galaxy Gaming's 21+3);
- A player betting on a 4-card hand: player's first two and dealer's up and hole cards;
- Player gets a pair in first two cards (Pair the Square);
- Player ties with the dealer (Push Your Luck);
- First two cards are over/under 13;
- Dealer's upcard falls between player's first two cards (the "In Between" Bet);
- Red Flex: Dealer hand is only red cards;
- Blackjack War, where the player and dealer go to war on the first card dealt, then resume the game. The player may parlay his war winnings onto the main blackjack bet.

Getting a blackjack side bet to catch on is easier said than done in such a crowded market. You're years past getting in on the ground floor here. It's a lot like investing in a resource-rich frontier, sight unseen, then once you get there, it's a barren landscape and you're received by a man in a top hat who tells you, "I'm sorry you came so late, but we've already stripped this frontier of its gold, minerals, oil, and crops, and left it a shit-house for you. Here, have a cigar. Welcome to blackjack side-

bet country." You'd have to come up with some startlingly novel concept, and I doubt there are too many left that'll squeeze into blackjack.

Indeed, two very fine near-breakthrough blackjack side bets that didn't launch due to the designer's limited resources and one success story are discussed in the following sections.

Bust-up Blackjack

In 2009, I came across this relatively novel blackjack side-bet idea. It would have been the first parlay-type blackjack side bet the world had seen at the time. The struggling game inventor, Tess Krantz, knowing I was the inventor of EZ Pai Gow, came to my empty blackjack table late one night while I was dealing and described her game. It was straightforward, sharp, and worked as follows.

1. Player makes a "Bust-up" bet and a blackjack main bet and play begins; the Bust-up bet pays immediate even money if the dealer has an upcard of 2 through 6; otherwise it loses.
2. If the Bust-up bet wins, the player has the option to parlay it, betting that the dealer will bust, and if he does, the parlay pays 2-1.
3. So, a \$5 bet becomes \$10 if the dealer has a 6 or less, which is about 38.5% of the time, from five ranks (2 through 6) out of 13. The player may take down the bet and winnings at that point, or he may let it ride to win another 2-1 if the dealer busts. If he does, the parlayed Bust-up bet pays \$20, for a \$25 total win, including the winning regular \$5 blackjack bet, a 5-1 (or 6-for-1) return on a full win.
4. The Bust-up bet loses if the dealer starts with a 7 upcard or higher, though the original blackjack bet can still beat the dealer.

The math for the parlay is based on the probability of:

2-6 being dealer upcard at start	0.384615	(5/13)
Bust with 2-6 upcard	0.398196	(avg. 2-6)
Bust any hand from start	0.285760	
Prob. of dealer busts 2-6 from start	0.153152	

So, the Bust-up bet pays an effective 5-1 when the player presses *and* the dealer busts his 2 to 6 upcard; it has a house edge of 8.1%, very standard.

Dealer Upcard 2-6 to Bust	2-6 is Up	And It Busts	Tot. Prob.	Pays	Return
2-6 upcard and it also busts	0.384615	0.398196	0.153152	5	0.765762
Not a 2-6 or it doesn't bust	0.615385	0.601804	0.846848	-1	-0.846848
Total	1.000000	1.000000	1.000000		-0.08109

You will have a whopping house edge of 23% if you just take the even-money payout on the first step of the Bust-up bet, so you'd pretty much have to parlay it if it won. If it did, you'd think the parlay option was an absolute bargain. Not only can you double up your bet for "free," you'd reason something like, "The friggin' dealer's showing a bust card! I almost can't lose! And on a bet that got parlayed for free!"

I thought Tess' side-bet design was impressive.

By contrast, Galaxy Gaming's Bust Bonus side bet, which also allows you to make a bust decision *after* the dealer's upcard is shown, pays out only even money on a 2 through 6 bust, not 2-1, though with a bonus of 3-1 or better on a suited-hand dealer bust. The odds of a 2 through 6 dealer upcard busting after seeing it are about 3-2, yet with the Bust-up parlay, you get paid at 2-1. This 2-1 final payout takes its seeming generosity by parlaying the lower-value even-money initial side-bet win, bucking a house advantage of 23%, so you're essentially parlaying a bet that was earlier shorted, then getting the generous payout on the back end.

All good; a final 8% edge on an exciting blackjack side bet

is fine. On Galaxy's Bust Bonus, their 6-deck aggregate house edge is 8.85%, similar but slightly higher.

Sadly, Tess never got Bust-up going. The obstacles—time, money, contacts, and extreme perseverance—were just too much for her. This is often the case; it's like being a rock climber approaching the summit and just slipping down.

Next Card 21

I saw another good blackjack side-bet idea when I was at Galaxy. Mark Richards, a former television game-show host², called us about one of his ideas. Mr. Richards' casino games are usually based on game-show-type mechanisms; his game called Greed was installed at Harrah's in 2011, only to be removed for "tweaking and adjustment" after 36 days of great activity and one bad losing night. (You can view this game on YouTube; search for "Greed table game at Harrah's.")

Mark showed us his idea: With a hand of 10 to 16, you bet on whether or not the next card will give you a 21, sort of an impulse bet. It paid 11-1 on a ten or less total and 2-1 from an 11 total, due to the preponderance of 10-value cards, similar to the blackjack insurance bet. A 7.7% house edge for an infinite deck.

Next Card 21 Math

Result on 11 Total	Probability	Pay	Return
Win	0.307692	2	0.61538
Lose	0.692308	-1	-0.69231
Total for 11			-0.07692
Result on 10, 12-16			
Win	0.076923	11	0.84615
Lose	0.923077	-1	-0.92308
Total for 10, 12-16			-0.07692

² Mark Richards was the host for "Place Your Bets" (how appropriate), broadcast from Nashville, among others. He has a radio game show in Las Vegas.

The Galaxy salesmen and I liked it, believing it would be a good companion bet to Bust Bonus. So we tasked Mark with getting a legal opinion that the bet wasn't blocked, along with an independent math report, so we could move forward. Game distributors often expect inventors to invest in their games and they rely on external opinions and reports before they sink their own money into an inventor's product. In this case, the legal and math reports set Mark back only a few hundred dollars—lucky for him, since he got some bad legal news: Another company did have intellectual property rights on the side bet, making this project a no-go. More and more each day, we see that any “new” game or even side-bet idea isn't new at all, but a duplication of someone's earlier efforts.

Lucky Stiff

Now for a happy-ending side-bet story.

Two inventors, Michael Templeman and Harry Morris, formed a small company called Lucky Paradigm Gaming in 2013, with which they set out to invent and distribute the casino games that they designed³. They came out with a blackjack side bet called Lucky Stiff, a wager that an initial stiff hand (hard 12-16) will beat the dealer, paying 5-1 on wins.

1. Players make the Lucky Stiff wager before play begins, along with a mandatory main wager.
2. The Lucky Stiff wager may be for any amount, with limits dictated by the house.
3. After dealing the first two cards to the player, the player's hand is evaluated:

- If the player has a blackjack, the Lucky Stiff

³ I suspect their wives, upon hearing of their plan, said something like, “Well, that sounds like a *great* idea, honey. I'm sure no one thought of *that* before ... and I bet it's a breeze to do Now how much money do you guys need to spend?” Anyway, Michael and Harry soldiered on and did well.

wager wins even money, regardless of the dealer's hand. (This was a good idea, as the side bet won't sour a player's blackjack with a side-bet loss; furthermore, it wins for the player on a blackjack-to-blackjack push.)

- If the player has a pair of 6s, 7s, or 8s ("stiff pairs"), the Lucky Stiff wager pays 10-1, regardless of the dealer's hand.
 - If the player has a hard unpaired total of 12-16, the Lucky Stiff wager remains in play.
4. If the player doesn't have one of the hands listed above, the Lucky Stiff wager loses immediately.
 5. After the initial player-hand evaluation, the blackjack hand resumes in the normal manner. Remaining Lucky Stiff wagers win, lose, or push, also in the normal manner. A win results in a payout of 5-1.

Lucky Stiff Event	Pays	Probability	Return
Player Pair of 6s, 7s, or 8s	10	0.0170650	0.1706500
Player 12-16 Win	5	0.1104470	0.5522350
Player Blackjack	1	0.0474490	0.0474490
Player 12-16 Push	0	0.0113420	0.0000000
All Other	-1	0.8136970	-0.8136970
Total		1.0000000	-0.0433630

The side-bet trigger in this game is both novel and useful, based on the first two cards of the player's hand being stiff, providing a concrete reward for the player's ability to recover from bad starting hands, a matter of pride for good blackjack players. This isn't just "new or different," which isn't better by itself; it's *game-action* better, an optional upside advantage to the player. This is what it takes to succeed in offering a new side bet or game design.

The hit frequency is 1 in 5.4 hands, a satisfyingly high hit

rate. It's difficult to balance a payable when the hit frequency nearly matches a starting payline item, right after the blackjack even-money payout. Templeman did it by having a relatively modest top award of 10-1, having a short payable item-wise, and pegging the stiff-hand final win to the main-game's win-loss result.

Notice in particular that when a player gets a blackjack (certainly not a stiff hand), the side bet still wins; by description, it should lose. This is a very good insertion into the design, as the last thing Michael and Harry wanted was for the player not to win with a natural, a golden hand; also, the side bet wins on a blackjack *tie* (when the main bet is a push). On any game with this bet, old-school insurance is obsolete.

Players win immediately on a blackjack and stiff pairs, and then are allowed to split stiff pairs (6s, 7s, and 8s) and play out their hands normally in the main game. Immediately paying stiff pairs before a split keeps the win for the player, who might otherwise later lose the Lucky Stiff bet after splitting 7s and 8s out to 2-card 17s and 18s (non-stiff starting hands after splitting).

After the even-money blackjack win, you want the minimum payouts to start at 5-1 — a “color-up” level in chip denominations: \$1 white wins a \$5 red, \$5 red pays out a \$25 green, etc.

The side-bet's strategy effects on the main game have to be either extremely mild or non-existent, and they're mild in this game. Players are required to win the main bet in order to win on the side bet, so they're pretty much compelled to play basic strategy well. The few changes to basic strategy are very minor (and would account for an insignificant fraction of a percent if not followed in any case):

- Stand on hard 12 vs. 3.
- Stand on hard 15 vs. 10.
- Stand on hard 16 vs. 9 and 10.
- Hit hard 17 vs. ace.

There's nothing here for a player to object to. This is very sharp design.

As for the casino, paying 9-1 instead of 10-1 on a stiff pair increases the house edge to 6.0%, a good option for bosses wanting a touch more return.

To put things into perspective, in the seven years since I originally saw Bust-up Blackjack, I came across very few fresh blackjack side bets in a sea of duplication, from which Lucky Stiff made it to the big leagues. To have a shot, you have to get the design as right as possible, especially in the very crowded blackjack side-bet arena. Baccarat, craps, and roulette are a bit more open to side-bet ideas.

Baccarat

Baccarat was the second area to be colonized with side bets feeding off the base game. Baccarat's base game is composed of two community sides of two cards each; these are hit out by drawing rules to three cards if it can improve a side closer to the value of 9. Currently offered side bets include:

- betting that either the banker or player side will get a 9-value hand, or an 8-value hand as in Lucky 8;
- the occurrence of a particular card, such as in Power 8s;
- betting on the value separation between the player and banker hands; player may win by five points over the banker, 8 to 3 for example, to be paid 2-1, with greater payouts on greatly separated wins, up to 30-1 for a 9 over a 0. This is used by Shuffle Master/SG's Dragon Bonus, a popular side bet (detailed on the following page);
- a pair on either or both the banker and player side;
- "4,5,6," a side bet on the number of cards needed to be played by baccarat drawing rules;
- an exact winning-hand side value (player or bank-

er), such as winning with a banker 6, which can also be supplemented by specifying the number of cards in that win, such as a 3-card winning banker 7 paying 40-1, as in the Dragon-7 side bet in DEQ's EZ Baccarat. Note that since this trigger is also the commission-free mechanism of the game, this side bet reinforces its prominence by paying out large when the winning banker 7 converts to a push on the main bet;

- poker hands formed by the two sides, although poker requires a change of game mindset (baccarat to poker), and poker hands are alien to many baccarat players;
- a low-hand win gives the bettor a bonus payout on a surprisingly lucky win, as in Lucky Win Baccarat;
- color in majority, all one color, first two cards dealt are suited, total points form even- or odd-number totals, royal match (KQ suited), and being over/under 9.5 points.

The inner workings of the Dragon Bonus bet for both player and banker are shown here.

Dragon Bonus—Player

Event	Pays	Combinations	Probability	Return
Win by 9	30	18,409,431,764,992	0.0036831	0.1104920
Win by 8	10	34,097,645,543,424	0.0068217	0.0682171
Win by 7	6	89,590,261,473,280	0.0179238	0.1075428
Win by 6	4	141,238,897,317,888	0.0282568	0.1130273
Win by 5	2	166,169,165,987,840	0.0332445	0.0664890
Win by 4	1	186,780,352,174,080	0.0373680	0.0373680
Natural Win	1	812,685,054,124,032	0.1625891	0.1625891
Natural Tie	0	89,325,908,267,520	0.0178709	0.0000000
Loss	-1	3,460,101,558,850,300	0.6922421	-0.6922421
Totals		4,998,398,275,503,350	1.0000000	-0.0265167

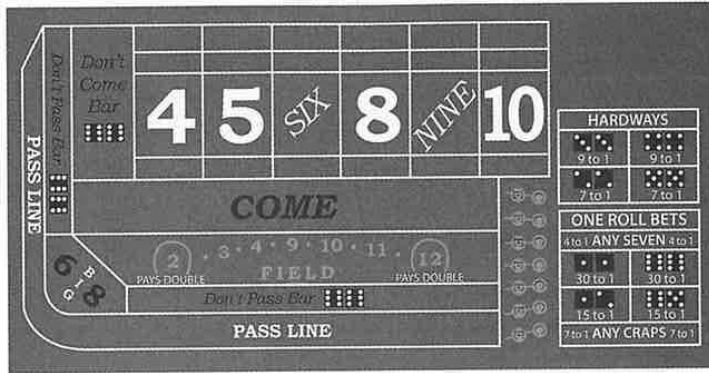
Dragon Bonus—Banker

Event	Pays	Combinations	Probability	Return
Win by 9	30	15,390,342,909,952	0.0030791	0.0923716
Win by 8	10	28,305,092,784,128	0.0056628	0.0566283
Win by 7	6	79,517,099,278,336	0.0159085	0.0954511
Win by 6	4	119,200,072,366,080	0.0238477	0.0953906
Win by 5	2	157,275,882,332,160	0.0314653	0.0629305
Win by 4	1	201,147,167,287,296	0.0402423	0.0402423
Natural Win	1	812,685,054,124,032	0.1625891	0.1625891
Natural Tie	0	89,325,908,267,520	0.0178709	0.0000000
Loss	-1	3,495,551,656,153,850	0.6993344	-0.6993344
Totals		4,998,398,275,503,350	1.0000000	-0.0937307

You might have noticed that the player side has a considerably lower house edge at 2.66% than banker at 9.37%. Using the same payable regardless of side (for uniformity, a valid reason), player generally wins the more widely separated hands, whereas banker wins the closer-together decisions for more hands in general. If the player's payable had the 4-point win-margin push instead of paying even money, its house edge would rise to 6.4%, closer to the banker's side. Also, the banker winning by 4 points could pay 2-1 instead of even money, which would reduce the banker's payable to 5.4%, all viable options. However, there's something to be said about having uniform paytables in play for both sides, which I discuss in the upcoming sections on craps and roulette.

Craps

Aside from craps' base game, which has a variety of side or "prop" bets, not too much can be added to craps at first glance. It's so thorough in its offerings that many people are intimidated by it. This shouldn't be the case, as to learn craps is to love craps, truly, and a good bit can be done. Following is a generic image of a crap-table layout showing its bet offerings.



The prop box at the lower right is actually in the center of a two-sided table, and offers as basic side-bet options: The hardway bets (or the pairs 2-2, 3-3, 4-4, 5-5); any craps (2, 3, 12); the “yo ‘leven” (11); one-roll bets (2, 3, 7, 11, or 12); horn bets (2, 3, 11, 12), hop bets of specific combinations, and horn “high” on a 2, 3, 11, or 12. They work as follows:

The basic “come-out” bets made on a new hand include “E” for eleven, to pay 15-1, along with “C” for “Crap check” or “Any crap” to pay 7-1 on a 2, 3 or 12; they’re usually bet together as a “C & E” bet.

The hardways are pairs, such as 2-2, called a hard-4, 3-3 called a hard-6, 4-4 called a hard-8, and 5-5 called a hard-10. Note that the hardways describe only the pairs that can be point numbers of 4, 6, 8, or 10, and not 2 or 12, which are crap-distinct numbers. These bets can be made at any time and are *not* one-roll bets, but stay up to win on the hard “picture” thrown, and lose on a 7 or if an easyway picture of that number is thrown, such as eight formed by a 5-3 or 6-2. The stickman (the dealer in the center of the table who’s handling the dice play with a flexible wooden stick) will announce the call as “Eight, *easy* way, hard-eight is down,” for example.

One-roll bets are on the separate natural numbers of craps:

The three crap numbers (2, 3, and 12) are often bet together with the 11 as a four-unit bet, called a horn bet, sometimes with an extra unit on one of the numbers, called a "horn high 3," for two units bet on a 3, with one unit each on the 2, 11, and 12 for an easy five-unit bet.

Hop bets (less common and not shown on the layout) are special bets that a roll will occur with a particular picture formed, such as "Hop the five and one" or "five-one hopping."

Also note that by ancient and mystical crap conventions, odds are expressed as "for 1," instead of the more common "to 1," meaning a 5-to-1 bet is described as "6-for-1," to pay 6 units *in exchange* for your 1 unit bet. It's the same thing, just a different convention is used in the game.

If you don't know the math of the different possible combinations and side bets, the discussion in Appendix A will give you enough skills on how to calculate the house edge of your dice side bet yourself, without requiring a mathematician or his expense; the math for craps can all be done in Excel as shown there. I guarantee you, your mathematician will also do it in Excel and charge you a pretty penny for it, and you'll palm-slap yourself hard for it, saying, "Sheesh! That was all there was to it?!" Yes. It's imperative to learn dice math if you want to be a game designer.

To be honest, the side-bet market for craps is crowded with extended hot-roll bets like the Fire Bet (where you win if you make three or more *different* point numbers on your hand), Bonus Craps (hitting all numbers above or below 7 before a 7, or *all* non-7 numbers for a jackpot 175-1 payout), and Sharpshooter (to win on the number of points made, up to 10); these "hot-roll-jackpot" bets are pretty much closed off. The good news is, there's room in the prop-bet department and I'll describe two here.

The first is called Hard Pass by Olympian Gaming, which combines coming-out hardways to start a dice hand and making that same point also the hardway. The player bets one unit

(\$1) that the point established on the come-out roll will be made the hardway (as you can see in the layout below); it wins 80-1, or \$80. A trouble-free and automatic parlay for just one unit.

When I play craps, I generally parlay my come-out bet on the pass line with hardway bets, as a lot of crap players do. But we have to bet four units (\$4), plus an extra dollar to cover a come-out 7 from knocking out all the hardways bets in action. If a hardway number is thrown, let's say a hard 8, not only do I lose my 7 bet (which costs me a unit), my hard 8 is now \$10 or higher, so my *risk* is ten times as much, not one unit now. I'm nagged by the thought, "Should I take it down, because I'm risking ten times as much?" And if I let it ride, I'd be mad at myself on a 7-out or an easy 8. Hard Pass solves both these problems.

4 to 1 Any Seven 4 to 1	
80 to 1 HARD PASS 80 to 1	
  9 to 1	  7 to 1
  9 to 1	  7 to 1
  30 to 1	  30 to 1
  15 to 1	  15 to 1
7 to 1 Any Craps 7 to 1	

Here are the game procedures.

1. Before a come-out roll, the player makes a Hard Pass wager in the appropriate wagering area.
2. The shooter rolls the dice.
3. If the shooter does not roll a 2-2, 3-3, 4-4, or 5-5, the dealer takes the Hard Pass wager. Otherwise, the wager remains in the Hard Pass area.
4. The shooter continues to roll until either (a) the point is made or (b) the shooter sevens-out.
5. If the shooter sevens-out or makes the point the easyway, the dealer takes the Hard Pass wager.
6. If the shooter makes the point with the hardway number, the dealer pays the Hard Pass wager.

Here's the beauty of the game: For a dollar on the come-out roll, if a hardway number is thrown as the new point, you're automatically parlayed to win \$80 on \$1, or \$400 on a nickel (\$5) bet, making the point the hardway. What could be easier? What's more, the bet resolves itself in one point, with that number, and not four or more points, waiting for the crap cows to come home. I consider this bet to be a humdinger.

Believe it or not, the math isn't hard. The probability of any hard number on one roll is $1/36$ for each hardway, or $4/36$ (1-in-9) to roll any hard point on the come-out roll. We then separate the hard 4 and 10 probabilities from the hard 6 and 8 as the 6 and 8 have more ways to lose on an easyway number after the come-out roll, which is to be tracked. Here's the math.

Come-Out	1 st Odds	2 nd Odds	Hit Hard	Pays	Total Return
Hard 4 or 10	0.0555556	0.1111111	0.0061728	80	0.493827
Hard 6 or 8	0.0555556	0.0909091	0.0050505	80	0.404040
Other, Loss	0.8888889	Cumulative =	0.9887767	-1	-0.988777
Total	1.0000000				-0.090909

- The “1st Odds” column represents the possible hardway come-out throws, either a hard point or a loss (such as an easy number or some natural number: 2, 3, 7, 11, or 12). A hard point is thrown 11% of the time (4 hardways out of 36 dice combinations). Player continues with the Hard Pass bet if a hard point is thrown on the come-out. Hard 4 and 10 are broken out from hard 6 and 8, because they have different odds on the subsequent going-for-the-point rolls; while both lose on a 7, the 6 and 8 have more ways to lose the easyway than the 4 and 10.
- The “2nd Odds” column shows the odds to hit the point hardways a second time (after the point is established hardways). With a hard point, the odds are 11.1% (or 1 to win divided by 9 to lose) to hit a hard 4 or 10, and 9.09% (or 1 to win divided by 11 to lose) to hit a hard 6 or 8.
- The “Hit Hard” column shows the final odds through the end of the second roll to re-hit the point hardways. This is simply the first come-out odds times the second odds to hit. The second-stage losing odds are one minus the sum of the cumulative win odds. Since the second-stage win odds are cumulative, subtracting the cumulative win odds from 1 will give you the cumulative odds to lose by the end of the second stage at the end of the point.
- The “Pays” column is what the bet pays when you end up hitting the point hardways.
- “Tot Return” is the sum of the win returns plus the loss returns, to give you the house edge.

The game can be offered with various house-edge options or with different payouts for 4 and 10 versus 6 and 8 hardways, etc. Quite a flexible product.

Payout	House Edge
70	20.32%
75	14.71%
80	9.09%
85	3.48%

After looking at Olympian Gaming's Hard Pass game, I was eager to develop a different proposition bet, and I did, with a mix of good and bad news. I set my sights on a bet where you win instantly when the point is made on a second roll, that is, throwing the point right back. Instead of the hassle of making a multi-unit hop bet or getting paid a smaller amount from it, the player can make a simple point-right-back bet. If the point is thrown on the second roll, you win about 12-1, so a \$3 bet will get you \$36 instead of \$13, or less often \$29, by hopping it. It beats making hop bets, pays a lot better, and you can bet one unit every time if you want. Looks good!

I set forth to write a basic Rules of Play:

1. Make a Point Right Back (PRB) bet during the come-out roll only.
2. Dealer moves your bet to the PRB betting box, indicating your position.
3. If a natural number (2, 3, 7, 11, or 12) is thrown, the bet loses, but this is only one-third of the time. Two out of three come-out rolls get a point in action, compared to one out of nine come-out rolls with Hard Pass.
4. If a point is thrown, your PRB bet is in action to win 12-1. Dealer marks the point.
5. If the second throw of the game hits the PRB, the bet wins 12-1 if a point of 4, 5, 9, or 10 is established, and 10-1 for a 6 and 8, else the bet loses.
6. The rest of the game continues normally.

That's it. PRB has some great advantages. The first is the elimination of the multiple-unit hop bet. You'd have to hop the 4 and 10 or 5 and 9 for two units, and the 6 or 8 for three units, as it takes multiple betting units to cover the ways these numbers can be formed.

Point Right Back also pays more, a lot more. At 12-1, a \$2 bet on PRB wins \$24 on a point of 4 or 10, compared to \$14 hopping the 4 or 10 at 15-1 (easy hop) and \$29 at 30-1 (hard hop); the weighted average is \$21.50 for the 4 or 10, so PRB pays \$3.50 more here. At 12-1 for the 5 or 9, you get \$24 instead of only \$14 hopping it, a \$10 difference! For the 6 or 8 with three units, you win \$13 hopping it easyways and \$28 the hard way, with a weighted average return of \$16.20 with hop bets (with four ways to make easyway and one to make it hard). The \$3 PRB bet returns \$30 for a difference of \$13.80, almost double the return of hopping the 6 or 8.

Finally, it's easy to deal. Hop bets require the dealer to pay based on how the dice number is formed, a "high-side payout" on a hard way or "low-side payout" on an easyway, then subtract the one or two other losing units in that multi-unit hop bet.

The math is done in a similar two-stage fashion and is highly tailorable. It takes only six columns get to each number's final return.

Point Number	Come-Out	Point Odds	2 nd Roll Prob.	Pays	Total Return
Any 4 or 10	0.166667	0.083333	0.013889	12	0.166667
Any 5 or 9	0.222222	0.111111	0.024691	12	0.296296
Any 6 or 8	0.277778	0.138889	0.038580	10	0.385802
Other, Loss	0.333333		0.922840	-1	-0.922840
Total	1.000000				-0.074074

The spreadsheet works as follows:

- The "Come-Out" column represents the odds of rolling a 4 or 10, a 5 or 9, or a 6 or 8 on the come-out

roll. The pairs 4 and 10, 5 and 9, and 6 and 8 behave in the same mathematical fashion⁴.

- The “Point Odds” column contains the odds of making an established point, and is half the come-out odds, as only one exact point occurs to establish that point.
- The “2nd Roll Prob” is the probability of hitting that point “right back” on the second roll. It’s the cumulative odds of coming out on a particular number, then making that point. It’s calculated by multiplying the first-roll come-out odds by the second-roll point odds. The cumulative loss is simply 1 minus the cumulative win, as you can only have a win or lose result.
- The “Pays” column is the winning payout for each point.
- “Total Return” is the winning or losing payout times its odds to hit, summed to the house edge.

Point Right Back is quite different from Hard Pass in the sense that it doesn’t use or care about hardway numbers, as any point returned on the second roll wins. Point Right Back is also roll-count dependent—it’s a two-roll bet. It has different hit rates and play behavior, but because it tracks a repeating event from the come-out roll into the point phase, I didn’t know if Olympian Gaming’s patent for Hard Pass covered this game idea or not.

It didn’t cost much in time or money to examine or flesh out PRB. In time, it required only some math work. Once we determined that the game idea was viable, we had an attorney

⁴ These sets form certain counterparts called “running mates,” sets of dice totals that mathematically behave in the same way in the number of ways that they can make a total. They’re always on the opposite side of their respective counterpart number, so if a 5 is shown on the dice, the bottom of the dice will have a 9 there. The running mates are 2 and 12, 3 and 11, 4 and 10, 5 and 9, and 6 and 8. The number 7 is the orphaned “death number” of craps, and its running mate is the twin-image number 7. This is why there are mirrors on the insides of crap tables, to check dice.

review the IP and do a search to see if we were clear to move forward. As it turned out, Olympian's IP portfolio did cover Point Right Back. Aside from a small let-down, there were no upsets involved. It's routine to come up with a new game idea and examine it for viability, only to find you're blocked in one form or another.

Other Bets and Mechanisms for Craps

At this point in time, only the jackpot-type side bets have made any serious market penetration, although a smattering of smaller side bets have had some installs.

The popularity of the jackpot bets can be explained by their ability to provide a progressive-type windfall to players. They also accelerate the characteristic of the "hot session," highly relevant to the base game as any crap player knows, and so greatly increase volatility. Hard Pass and Point Right Back as one-point bets don't greatly increase volatility and can be re-bet for each new point for increased patronage, something for casino operators to appreciate and for you to mention in your sales literature and game pitches.

Most of the smaller side bets employ mechanisms that are either fairly arbitrary or somewhat irrelevant to the base game, such as adding up the number of doubles made, or the dice being above or below 7, or four rolls with no 7, and the like. What I appreciated about Hard Pass is that it makes the common practice of parlaying the hardways bets easier, cheaper, and more rewarding. Likewise, the Point Right Back bet accelerates action on the point, the whole point of the game. For your crap-game side-bet ideas, look to provide desired dice mechanisms in ways that are easy to bet and play without the need to make multi-unit bets or to assemble assorted hop-bet configurations.

Of note is the emergence of Card Craps, which takes advantage of a California legislative stipulation that gambling is allowed only if it uses cards as the main generator, not dice or

a wheel. Card Craps emulates dice usage on the game by using 24-card decks, ace through six, to emulate dice rolls.

Roulette

The multi-roll concept of craps is also applicable to roulette, which, as far as one-spin bets are concerned, is the only real option. Just about any bet from even money to 35-1 is already covered, with the ability to create various systems using these bets. If any game is thriving as side-bet-free and resistant to add-ons, it's roulette.

Most of the new roulette side bets have been little more than attempts to fix what isn't broken. The following bets (gimmicks, to a great degree) have been dreamed up, installed, and frequently removed.

- Alphabetic Roulette
- Lucky Symbols
- Deal or No Deal (on electronic platforms; uses a bonus-round method)
- Double Action (uses two numbered rings, so a landing ball selects two numbers)
- Double Ball (uses two balls blown out of a gun by compressed air, to also produce two concurrent numbers)
- Roulette-18 (uses 20-sided dice, called icosahedrons, to generate numbers)
- Riverboat Roulette (uses an abundance of different colors by assigning two colors to each number, with associated betting groups – pink and purple bets, orange and blue bets, etc.; this game has gotten some installs via a combination of promotional efforts and the visual flash and appeal).

There really isn't too much to say about any of them, aside

from the math is different than the base game; in some cases, the new features are overlaid on the standard game, where players may intrepidly try out the new bets.

In this environment, I was glad to see a roulette side bet called Poker-for-Roulette (also known as Trio-lette) developed by one Dave Miller. It's a bet that wins when a 3-card poker hand is formed from the three most recent spins, with a zero being wild. It's not so much mixing games as it is creating a new roulette realm of the multi-spin offering, where a good pattern pays. It was picked up by Galaxy Gaming and shown in the U.K.

This game has some advantages and the concept should be interesting to any game designer. The positive features of Poker-for-Roulette are:

- It's transparent to the base game, where the option to play the same old tried and true is unaffected, if so desired. Many games use this approach, and should.
- For players, the side bet counteracts the negative-acting zero of the base game, where it's a loser; here, the zero acts like a powerful wild card for the side bet, producing winners.
- The poker aspect is more closely related to forming patterns, so there really isn't any sort of an understanding of poker required to play it: A straight (three adjacent numbers) is a "run," a 3-of-a-kind is a "trio," etc. This is important, as roulette is an international game that's played in places where poker is much less played than it is in America.
- It's strategy-free: Make the bet and let the wheel work its magic.
- Not much associated equipment is required, basically just three acrylic chip tubes to hold the bets; the dealer slides the tubes over three tracking spots labeled 1st, 2nd, and 3rd. The chip tube that moves off

of the 3rd tracking spot after a spin contains the bets ready to be resolved (having seen their three spins), while the other tubes move up a spot with the new bets entering.

- Can provide a jackpot-type bet, say a “trio” composed of exactly three zeros or three 7s.
- Anticipatory: If a player gets a generally bad result from a spin on the main game, his side bet is still in action to win.

These are tangible points, but like all new games, there may be causes for pushback. Roulette tables are notorious for their resistance to change.

Also, roulette is both a fairly slow game and a busy-in-work game to deal, so adding anything to it might slow it down even further. This is true for any roulette addition, and I think Poker-for-Roulette’s basic merit is that it could overpower stuck-in-the-mud resistance and pushback to it on the game. On this point, electronic roulette games can easily automate Poker-for-Roulette.

Pai Gow Poker

This last major public-domain game is very large, with approximately 2,000 installs. However, aside from removing the commissions and adding jackpot progressives, Pai Gow Poker is resistant to new side bets, as it performs very well and doesn’t seem to need an overhaul in any capacity, although I’ll discuss an attempt.

The two primary side bets are the Bonus bet, which pays on strong hands of a 3-of-a-kind or better, and the protection or insurance bet, which pays on weak hands composed of no paying poker elements (called “Pai Gows”) where the player thankfully recovers when this bet kicks in.

The new side-bet attempt, Jokolor, was dreamed up by Derek Webb, the great inventor of Three Card Poker. The

Jokolor side bet is based on getting a joker hand and/or a hand of one color. The bet has a good hit frequency of 1 in 7 hands and a good payable starting at 5-1. Even so, it wasn't considered compelling and was never adopted. Still, for example purposes, here is its math and structure.

Event	Pays	Combinations	Prob.	Return
Six cards same color plus joker	30	460,460	0.002987	0.089617
Seven cards same color, no joker	10	1,315,600	0.008535	0.085349
Any hand with joker	5	19,898,060	0.129088	0.645441
Loser	-1	132,468,960	0.859390	-0.859390
Total		154,143,080	1.000000	-0.038982

Closing Point

The side bets in this chapter are representative, but by no means exhaustive; there are too many to cover comprehensively. My examples haven't been, in general, the established war horses from the big distributors (although they too were discussed), but instead, were hand-picked as worthy examples from independent game designers that either had a real shot to make it or did make it to the casino floor.

Like main-game innovations, side-bet products often succumb to what I call the Gin and Kahlua Syndrome (imagining such an unlikely combination of liquors in a cocktail). Blowing two balls onto a roulette wheel from an air gun isn't particularly inventive, in my opinion, and mixing poker, blackjack, and baccarat and calling it "PoJackarrat" wouldn't be either. In this category, I'd include the 20-sided dice cube to replace the roulette wheel. You can make a drink by mixing gin and Kahlua, and yeah, it'll be a new thing. But it won't necessarily be good. It'll be PoJackarrat.

The examples I selected for this chapter – Lucky Stiff blackjack, Poker-for-Roulette, Hard Pass craps, and the others – all represent good game/side-bet design. The focus on why the

gambler would like the bet, the math, and the development processes will all prepare you for the next chapter, where side bets are analyzed more deeply. Read on for such areas as hit frequency in comparison to the main game, the various types of side bets (bad-beat bonus, low-hand bonus, positive-hand bonus, etc.), and structure (bottom-heavy workhorse versus top-heavy jackpot), etc., as they relate and get mated to the main game.

Adding a Side Bet to Your Own Main Game

In the previous chapter, we examined adding side bets to public-domain games. In this chapter, I go into detail about supplying a side bet for a main game that you control.

There are a number of advantages to adding side bets to a game that you own or have access to. Primarily, you can improve it by breaking out an awkward or fancy element or two and turning them into side bets. That way, you provide not only a cleaner main game, but also a complete game package.

It's often easier to reduce a bonus payout on a main-game bet by offering it as a side bet, instead of raising the main game's qualifier level. Most game types have fairly even-up main-bet payouts, so the solution for rewarding big hands is a side-bet option. The Ante or main bet generally pays even-money with a few extra bonuses for rare top hands to adjust the house edge; this is much more effective than trying to pay windfall bonuses entirely from the main-game's bet offerings. This way, you keep the main game more straightforward in its strategy and ease of dealing.

While I don't advise designing the side bet during the development of the main game (you want to finalize the main game to see what works best with it), adding a side bet later might present an opportunity to make needed adjustments to the main game. For example, if you overdesigned it (too many features or scenarios), you have an opportunity to streamline it by offloading a feature or two as side bets.

In this chapter, I show you how to design your side bet

by walking you through the process. You'll definitely need to know this, as players will feel the effects of a well-designed side bet versus a poorly designed side bet as they play your game. The goal as designer is to keep them on your game with bets that feel good, without them necessarily knowing the technical reasons why.

Defining the technical aspects is your job, so you'll be introduced to the following areas:

- the types of side bets and their game-play nature (e.g., bad beats, great-hand bonuses, combining player and dealer hands to form a longer hand);
- the qualities of a good side bet (hit rates, relevance to main game, etc.);
- guidelines for side-bet design and how to build a side bet from an idea;
- adding and designing a progressive.

Types of Side Bets

The main-game accelerator (a.k.a. the great-hand bonus bet): Since your main-game bets will generally pay even money or a small bonus no matter what the player wins with, you might want to offer a bonus bet for particularly good hands. The Three Card Poker pair-plus bet, for example, pays on a fine hand of a pair or better. Players want to be rewarded for "strength," which means getting paid off for receiving a great starting hand. The pair-plus bet works well: If you crush the dealer's hand with a flush, 3-of-a-kind, straight flush, etc., you'd want to be paid extra.

Bad-position save: In blackjack, if the dealer has an ace showing, many players like to take insurance, to counteract being slammed by a dealer's natural. Pai Gow Poker also has an insurance bet, for hands with no pairs or better. In craps, if you throw a crap number (2, 3, or 12) on the come-out and lose, you can recoup your losses via an Any Craps bet. In blackjack, the

previously mentioned Lucky Stiff side bet wins an accelerated payout on a weak ("stiff") hand pulling out a win. All these side bets provide that bad-hand-recovery option.

Bad beat on a great hand: You have a fine hand, but you take a surprise loss to an even better dealer hand. If you want to address this rare event, you can add a bad-beat option as a separate bet. This is particularly useful for community-board games where most cards of a powerhouse hand are present in the shared board, such as two pair or four to a flush in the community board; here, the player and dealer sometimes face off with competing high flushes or full houses. In games where there isn't a community board, bad beats are less likely, so the bet's hit rate can be addressed by expanding the payable down to a relatively low level, such as a pair of kings or better losing.

Combined dealer and player hands on short-hand games: Three Card Poker now has a six-card bet, combining the player's and dealer's 3-card hands to form a 6-card side-bet hand composed of a 5-card poker hand, with a 6-card-long royal for a jackpot. Actually, this has no real disadvantages, as 5-card poker hands are easy to see as part of a poker game. Combined hands are also used in blackjack: Lucky Ladies pays a 1,000-1 bonus if you get a pair of heart queens in conjunction with a dealer's blackjack, and 21+3 uses the dealer's upcard with the player's first two cards to form a 3-card hand.

Distance or "wideness" between player and dealer hands: The Dragon Bonus bet for baccarat wins big if the selected side (player/banker) wins by a large margin. For poker games, an equivalent bet would be a blowout-win bet, where the player beats the dealer by a certain margin, say, two or more hand ranks.

Sub-hand bonus: A sub-hand bonus is a side bet triggered by a special hand type that's not a part of a general hand-ranking scale, such as a bonus on three aces paying more than other 3-of-a-kinds, or a hardways bet at craps, or a bet on a game's non-qualifying hand, such as EZ Baccarat's Dragon-7 bonus bet on an exact 3-card banker-7 winning hand.

For any type of game you design, you have to consider completing it with one or more good side bets that'll fit well, including a progressive option. You can offer several side-bet types, then let the casino decide on its preferred game configuration.

Mathematical and Game-Relevance Guidelines

House edge: This math is unrelated to the game's other characteristics, as it can be adjusted without affecting the nature of your side bet, but is critical in terms of your game's performance. The house edge of a side bet should be higher than the main game's, to reflect the higher payouts. The side-bet's house edge should be in the range of 2%-10% or even higher, with an array of house-edge offerings for tailoring the game's performance.

The number of paytables offered should be three to six, to keep things manageable. Spacing out the paytables from 2% to 10% in increments of approximately 2% (five paytables total) will cover it. If you offer a gazillion paytables for one side bet, you'll be announcing to the customer that you might not know what you're doing, because if you do, you'll accomplish your goals with a reasonable number of paytables. Keep it manageable and straightforward with five or so house-edge options.

The following chart is a standard offering of the optional Wild 5 side-bet paytables for Wild 5 Poker (a bonus bet on the player getting a strong hand in his first five cards). It's a high-hand bonus bet that pays on two pair or better, with each paytable varying the payouts slightly to tailor the house edge in the range of 2.50% to 10%.

Dealt Hand	Wild-5 #1	Wild-5 #2	Wild-5 #3	Wild-5 #4	Wild-5 #5
5-of-a-Kind	500	1,000	1,000	500	500
Royal Flush	400	500	500	500	400
Straight Flush	250	300	250	300	200
4-of-a-Kind	100	75	100	100	100
Full House	50	50	50	50	50
Flush	25	25	25	25	25
Straight	10	10	10	12	15
3-of-a-Kind	5	5	5	5	5
Two Pair	4	5	5	5	5
One Pair and Less	(loss)	(loss)	(loss)	(loss)	(loss)
House Edge	10.07%	7.86%	5.45%	3.93%	2.50%
Win Frequency	9.6 hands	9.6 hands	9.6 hands	9.6 hands	9.6 hands

Balanced increments: Notice in the table above that the payouts are generally in increments divisible by 5 or 10, with an occasional exception of 4 or 12 in the low-payout areas. For payouts above 20-1, this rule must be followed religiously for dealability reasons; below it, there's some reasonable leeway. This is a known practice to make both learning the paytables and the process of paying out as easy as possible for the dealers, as casino-chip levels generally increase in 5-1 ratios (\$1, \$5, \$25, then 4-1 to \$100, but back to 5-1 to \$500, etc.).

Simplification and manageability of the payable: You do this by limiting the number of payline trigger hands to 10 or less. Here, less is more, as you want to represent a reasonable number of great winning hands in a game with as little fuss and muss as possible. A lot of payable paylines are excessive, which break things out too much. Is it really that different to have a hole-card hand of AK suited versus AQ suited? Not really, so it might be advantageous not to break out or over-define hands.

The Texas Hold 'em Bonus hole-card hand has a side bet on the player's first two cards with a payable of eight winning hands.

Event	Pays	Combination	Probability	Return
Player has A,A, Dealer has A,A	1000	6	0.000004	0.003694
Player has A,A	30	7,344	0.004521	0.135636
Player has A,K suited	25	4,900	0.003017	0.075415
Player has A,Q or A,J suited	20	9,800	0.006033	0.120664
Player has A,K unsuited	15	14,700	0.009050	0.135747
Player has K,K, Q,Q, or J,J	10	22,050	0.013575	0.135747
Player has A,Q or A,J unsuited	5	29,400	0.018100	0.090498
Player has pair 2,2 to 10,10	3	66,150	0.040724	0.122172
All other	-1	1,470,000	0.904977	-0.904977
Total		1,624,350	1.000000	-0.080000

It's a little long and busy. A hole-card side bet can more effectively be represented in just four basic strong hands (pocket aces, ace-face suited, ace-face off-suit, and a lower pair), as Heads Up Hold 'em does with its Pocket Bonus side bet — which is so much easier to learn to deal and play.

Event	Pays	Combination	Probability	Return
Player has A,A	30	7,350	0.004525	0.135747
Player has A,J to A,K suited	20	14,700	0.009050	0.180995
Player has A,J to A,K unsuited	10	44,100	0.027149	0.271493
Player has pair 2,2 to K,K	5	88,200	0.054299	0.271493
All other	-1	1,470,000	0.904977	-0.904977
Total		1,624,350	1.000000	-0.045249

The four payoffline items also obey the cardinal “balanced-increment” structure with its 5-10-20-30 payouts. Perfect.

Side-Bet Considerations for a Joker-Based or Wild-Card Game

An important practice in side-bet manageability is to avoid breaking out joker-formed hands from their natural-hand

counterparts as separate payline items below the level of a straight flush if your game uses a joker. What I mean by this is you shouldn't break out natural 3-of-a-kinds from wild 3-of-a-kinds, natural flushes from wild flushes, etc. in your game's paytables. This practice will blow up your elegant and compact paytables into long and cumbersome paytables that'll hurt your game's performance. Just use normal and nominal hand ranks in your game, whether or not formed with a joker. The earlier payable for Wild 5 Poker is a good example of this; only the top hand of 5-of-a-kind is a specific joker-related hand rank, as it *has* to contain the joker to form a 5-of-a-kind.

An exception to this "standard hand rank" rule is when your game uses multiple wild cards to the point that they are the primary gimmick of the game. The new game DJ Wild uses four wild deuces plus a wild joker; while its main game's Blind bet uses just the standard poker-rank paytables, its "Trips Plus" side bet breaks out the wild and natural payouts for *each* hand rank payline. This can be done in a relatively clean way by displaying the natural and wild payout columns side-by-side for all hand ranks, as shown here.

"DJ" Trips Bet - Hand	Natural	Wild
Five Wilds	n/a	2,000
Royal	1,000	100
5-of-a-Kind	n/a	100
Straight Flush	200	30
4-of-a-Kind	90	6
Full House	40	5
Flush	30	4
Straight	20	3
3-of-a-Kind	6	1
Other, lower hand	loss	loss

The dual-column payable technique can also be used for bad beat payouts on a blind-type bet, below, on the "Odds" bet

for Heads Up Hold 'em's Bad Beat.

TRIPS PLUS

POCKET BONUS

ANTE = ODDS

PLAY

PLAY BET

3X on Pocket Cards
2X on Flop
1X on River

TRIPS PLUS
Royal Flush..... 100
Straight Flush..... 40
Quads..... 30
Full House..... 8
Flush..... 7
Straight..... 4
Trips..... 3

POCKET BONUS
Pocket Aces..... 30
Ace-Face Suited..... 20
Ace-Face..... 10
Pair..... 5

ODDS

WIN

BAD

BEAT
Royal Flush..... 500 500
Straight Flush..... 50 50
Quads..... 10 50
Full House..... 3 10
Flush..... 1.5 8
Straight..... 1 5
Other Hands: Push Loss
*Must beat dealer

All Pays Are "to 1" Except "Bonus Jackpot"

GALAXYGAMING.COM / OTC: GLXZ

The rules of thumb on this are if you use one joker, then treat all hand ranks as natural/standard except for joker 5-of-a-kinds; if you use two or more wild cards, then use standard ranks for the main-game's blind or Ante bonus, alongside dual "wild or natural" side-by-side payout columns for the payable items.

Paytable limits: This is easy. As a rule, the largest maximum payout should be 500-1, to provide enough incentive to play the progressive and to protect the casino from a tremendous rack (cash) hit. A 500-1 payout with a typical \$10 wager pays \$5,000, a monthly paycheck for someone making \$60,000. This is enough, and often a game's top hand won't support large payouts in any case. Furthermore, awarding payouts from a progressive would have the players' pool pay for the jackpot,

and some progressive systems, such as those from DEQ Systems, cover all payouts from the players' pool (we'll examine the pool in more detail further along). There's something to be said for protecting your client, the casino, from excessive exposure. Because it's greatly appreciated, it's wise to consider this in your game design.

Relevance to the base game: It's important to keep your side bets relevant to the main game. Often, designers try to offer variety by mixing fundamentally different games or modes. Notwithstanding an occasional exception like 21+3, which mixes blackjack and Three Card Poker's Pair Plus side bet¹, this is not recommended. The group of side-bet triggers discussed earlier provides the designer game-related options: bad beat for the game in use, big hand bonus bets for the main game's hand rankings, distance of hand strength between player and dealer/banker for the base-game's hand rankings, etc. Some simple and arbitrary hand rank or trigger might not be bad, but using hand rankings for different games could very well be counter-productive, such as mixing baccarat and poker, which requires players and dealers to change gears in terms of game orientation within a single game.

Uniformity: In a two-sided game with similar hand lengths and rankings, such as baccarat, providing a similar side bet to win on either side of the hand can produce paytables with slightly different house edges for the same payable used on both sides. This occurs because baccarat's drawing rules slightly favor the banker's side, while producing the marginally less-common player wins of a wider margin. This isn't major, but you can use some tricks to provide a closer house edge between the two, if house-edge divergence is an issue.

One method is to use a push instead of a low-end payout on one side to increase the house edge on the low-house-edge payable, keeping all other payouts the same. Another is to ad-

¹ Three Card Poker hands are the easiest to read of all poker hands, so the mix is no major issue here. Problems occur when the player or dealer is looking for a 5-card poker hand in a baccarat game, for example, which would really be changing gears.

just one mid-table payout, from 25-1 to 20-1, let's say, keeping all other payouts the same.

No strategy repercussions: A side bet shouldn't negatively affect the primary game's play or strategy. Lucky Ladies avoids strategy effects by limiting the triggering event to the player's first two cards being a 20 before the hit-or-stand stage of the game. Pai Gow Poker's bonus bets allow the player to win with a flush or straight regardless of how the hand is set for the main game, thereby removing the quandary of playing the hand for the side-bet versus the main-game win.

The player should always win the side bet whenever the full hand contains a winning trigger. Side bets that add any strategy effects do so with a very quick and easy decision. Tess Krantz's Bust-Up Blackjack bet allows the player to parlay the initial win on the dealer showing a stiff upcard, so the decision is easy: Always parlay for the final dealer bust, while maintaining the sense of having an early-payoff option as a benefit in the game. AGS' game Blackjack War has more complex decisions to make on its parlay, producing some delays through the players' hemming and hawing over the close decisions, thereby slowing down the game. You don't want a side bet that slows down or messes up your main-game's performance.

Appropriate hit frequency: Side bets should have a hit frequency from 1 in 3 hands to about 1 in 10 on the rarer higher side. Once a side bet has a hit frequency of about 5.5-1, it becomes possible to offer payouts that start at 5-1, a casino-chip color-up level. This provides a satisfying payout to the gambler, especially if the starting bet is \$1, where winning, for example, two or three white chips instead of a color-up \$5 chip will make the player think, "This is a better deal." Paytable hit frequencies can generally be adjusted by selecting the lowest rank on which to start the payouts.

Bet correlation versus non-correlation to the main game: This concerns how closely the side bet wins or loses in parallel to the wins of the main bet. Side bets that use the hand-ranking conventions of the main game will generally be positively or

negatively correlated to the main-game's play, depending on whether they're strong-hand or weak-hand bets, like Pai Gow insurance. Side bets that positively correlate to the main bet increase volatility. When the game is hot for the players, it loses more for the house. One of the risks of positively correlating side bets is that a volatile game may wrongfully appear to dump if it gets hot during a short field trial; side bets that negatively correlate to the main game will generally stabilize volatility.

On games with low volatility, like Pai Gow Poker, side bets with high payouts are a good addition, providing something that the player doesn't get with the even-money main-bet wins: a chance at large payouts.

A third category of correlation is the non-correlating bet, which wins or loses without any relationship to the main-game's activity; it's pegged to some unrelated event, such as color. The Prime (or color-based) bet offered by Galaxy Gaming wins when a player's hand is primarily or exclusively of one color regardless of that hand's rank or playing strength: a straight flush that wins, or a ten-high of one color that was folded. In their Three Card Prime game, the Prime bet pays 3-1 on the player's one-color hand and 4-1 if the dealer also has a one-color hand matching the player's color. Here's the math.

3 Card Prime	Occurs	Prob.	Payout	Return
Player Only of One Color	4,329,780	0.2126766	3	0.6380297
Player+Dealer = One Color	460,460	0.0226176	4	0.0904702
Player Two Color (Loss)	15,568,280	0.7647059	-1	-0.764706
Total	20,358,520			-0.036206

The advantage of the non-correlating side bet is that it frequently bails the player out of a bad hand, like a weak folding hand that happens to be composed of one color; the player may fold his hand and lose the one unit on the Ante, while winning three units on the Prime bet, picking up two units overall. It can also win in parallel to the player winning the main bet, such

as on a flush, reinforcing the positive-win effect. Galaxy Gaming has incorporated the Prime-type bet into many games of varying hand lengths, and it's a good side bet, even though it's arbitrary in nature.

Easy Steps to an Effective Side Bet

Now it's time to show how a side bet is built from scratch by following easy steps, using Three Card Poker's bonus-bet Pair Plus as the example. Any game with a mix of hand types or results will provide a hand-ranking win list.

Define the basic winning hands, the strong hands in the upper 20% to 25% percent or so, as follows.

Three Card Hand
Royal (A,K,Q suited)
Straight Flush
3-of-a-Kind
Straight
Flush
Pair
Ace high or less (loser)

You obtain the occurrences or frequencies of the hands out of all the possible hand combinations. The numbers can be obtained from a similar game's math, from a mathematician, or from your own deductive work if you're so inclined. There are four ways to form a royal (A,K,Q in each suit), 48 minus the four royals (which are just the top straight flushes), to form a straight flush (3-high through king-high straight flushes) 52 3-of-a-kinds, four for each rank (3, 3, 3 with four suit variations), etc. The total for all possible 3-card hands is 22,100 as follows.

Hand	Occurs
Royal	4
Straight Flush	44
3-of-a-Kind	52
Straight	720
Flush	1,096
Pair	3,744
Ace high or less	16,440
Total	22,100

For the next step, we determine the *probability of each hand type*, dividing the occurrences by the total possible hand combinations. A royal's four occurrences divided by 22,100 gives 0.000181, or 0.0181%, etc.

Hand	Occurs	Probability
Royal	4	0.00018100
Straight Flush	44	0.00199095
3-of-a-Kind	52	0.00235294
Straight	720	0.03257919
Flush	1,096	0.04959276
Pair	3,744	0.16941176
Ace high or less	16,440	0.74389140
Total	22,100	1.00000000

You get the "1 in x" hit rate or frequency for each hand type, or how many hands it takes for that hand rank to occur on average. This is determined by dividing 1 over the probability in that column.

Hand	Occurs	Probability	Frequency
Royal	4	0.00018100	5,525
Straight Flush	44	0.00199095	502
3-of-a-Kind	52	0.00235294	425
Straight	720	0.03257919	30.7
Flush	1,096	0.04959276	20.2
Pair	3,744	0.16941176	5.9
Ace high or less	16,440	0.74389140	1.3
Total	22,100	1.00000000	1.0

Next, *set up the pays and return columns*, inserting into the pays column 1 for all winning hands and -1 for the losing hands grouped in “ace-high or less,” with the return being the pay column times the probability column.

Hand	Occurs	Probability	Frequency	Pay	Return
Royal	4	0.00018100	5,525	1	0.000136
Straight Flush	44	0.00199095	502	1	0.001991
3-of-a-Kind	52	0.00235294	425	1	0.002353
Straight	720	0.03257919	30.7	1	0.032579
Flush	1,096	0.04959276	20.2	1	0.049593
Pair	3,744	0.16941176	5.9	1	0.169412
Ace high or less	16,440	0.74389140	1.3	-1	-0.74389
Total	22,100	1.00000000	1.0	HE =	-0.48778

Now check the total hit frequency of winning hands. Sum up the probabilities of winning hands (from the royal down to a pair) to get 0.2561, and divide 1 by that number to get 3.904. This means that the hit frequency is approximately in the 1-in-4-hands range, which is fine. If it's out of our 3-to-10 range, you'll select another hand rank for the winning threshold. A quicker way to see this is to check that the losing-hands' probability is between 0.667 and 0.900. With this, you'll know the payable's hit frequency is in the proper 3-to-10 range.

This is where it gets interesting. We now have to insert proper values into the payout column to shape the side-bet payable. We wish to create a bottom-heavy payable where the player gets most of his return on the more commonly occurring hands.

- Take the loss return figure (0.74389) and subtract 6% (for the house edge), to get approximately 68%.
- Subtract 8% from that, to allocate the amount of house edge reserved for high-end payline items not routinely seen during a game session of about 50 hands or so, to get a 60% figure. We wish to have the majority of the return to player, 60% or so, to pay back on the hands that players will typically see in a game session.
- We see a pair, flush, and straight within every 30 hands or so, so we can be confident that these are the hands the player will see commonly.
- Divide 60% by the three lowest winning hands (60%/3) and we can allocate about 20% return to each of the hands for a pair, flush, and straight. Plug in the numbers that'll get 20% for each.

Hand	Occurs	Probability	Frequency	Pay	Return
Royal	4	0.00018100	5,525	1	0.000181
Straight Flush	44	0.00199095	502	1	0.001991
3-of-a-Kind	52	0.00235294	425	1	0.002353
Straight	720	0.03257919	30.7	6	0.195475
Flush	1,096	0.04959276	20.2	4	0.198371
Pair	3,744	0.16941176	5.9	1.2	0.203294
Ace high or less	16,440	0.74389140	1.3	-1	-0.74389
Total	22,100	1.00000000	1.0	HE =	-0.14223

Now, since we can't pay 1.2 units on a pair, we pay 1-1, and we get the following returns.

Hand	Occurs	Probability	Frequency	Pay	Return
Royal	4	0.00018100	5,525	1	0.000181
Straight Flush	44	0.00199095	502	1	0.001991
3-of-a-Kind	52	0.00235294	425	1	0.002353
Straight	720	0.03257919	30.7	6	0.195475
Flush	1,096	0.04959276	20.2	4	0.198371
Pair	3,744	0.16941176	5.9	1	0.169412
Ace high or less	16,440	0.74389140	1.3	-1	-0.74389
Total	22,100	1.00000000	1.0	HE =	-0.17611

We then insert figures for the high-end payouts—3-of-a-kind, straight flush, and royal. We insert 30, 40, and 50 for those payouts (providing about 8% for straight flush and 3-of-a-kind), slightly overshooting the house edge to the low side, and have our payable with a house edge of 2.136%.

Hand	Occurs	Probability	Frequency	Pay	Return
Royal	4	0.00018100	5,525	50	0.009050
Straight Flush	44	0.00199095	502	40	0.079638
3-of-a-Kind	52	0.00235294	425	30	0.070588
Straight	720	0.03257919	30.7	6	0.195475
Flush	1,096	0.04959276	20.2	4	0.198371
Pair	3,744	0.16941176	5.9	1	0.169412
Ace high or less	16,440	0.74389140	1.3	-1	-0.74389
Total	22,100	1.00000000	1.0	HE =	-0.02136

And we provide a higher-edge payable at 7% by reducing the flush payout to 3-1.

Hand	Occurs	Probability	Frequency	Pay	Return
Royal	4	0.00018100	5,525	50	0.00905
Straight Flush	44	0.00199095	502	40	0.079638
3-of-a-Kind	52	0.00235294	425	30	0.070588
Straight	720	0.03257919	30.7	6	0.195475
Flush	1,096	0.04959276	20.2	3	0.148778
Pair	3,744	0.16941176	5.9	1	0.169412
Ace high or less	16,440	0.74389140	1.3	-1	-0.74389
Total	22,100	1.00000000	1.0	HE =	-0.07095

The last step is to provide six or so paytables with various minor options (break out spade royals, for example, or treat all royals as straight flushes), with house edges of 2% and up.

Paytables	#1	#2	#3	#4	#5	#6
Royal in Spades	-	100	-	-	-	-
Royal other suit	50	50	-	-	-	-
Straight Flush	40	40	50	40	35	40
3-of-a-Kind	30	30	30	30	30	30
Straight	6	6	6	7	6	6
Flush	3	3	3	3	4	4
Pair	1	1	1	1	1	1
Ace high or less	Loss	Loss	Loss	Loss	Loss	Loss
House Edge =	7.09%	6.87%	5.29%	4.02%	3.40%	2.41%

Adding a Progressive to Your Game

A progressive is a side bet that gives the players an opportunity to win a *huge* amount of money for a dollar, betting on getting an extremely rare top hand, like a 7-card straight flush (in Pai Gow Poker), flopping a royal, hitting a 6-card Super Royal, and the like. The progressive jackpots generally range from \$15,000 to \$250,000 or more, quite often an amount big enough to pay off a mortgage or the kids' college fund. On some games,

the progressives are heavily patronized, bet by just about every player on the table. If the player *does* get that rare hand and doesn't have a bet on it, he's essentially "ruined for life" by having missed out. The progressive functions like a single-round lottery at a gaming table.

The bet more often wins a secondary or lower award, though still a considerable amount, also justifying the patronage. For example, a player betting the Pai Gow Poker progressive to win the 7-card straight flush for \$150,000 frequently (or often enough) wins lower awards of 4-of-a-kinds or simple straight flushes, paying \$75 or \$100 for a buck in these cases.

There are great incentives for the casino to offer the progressive options. First and foremost are large profit margins: The house generally makes about 24%, or 24¢ on every \$1 bet placed. Also, the jackpots are funded by a player pool, by allocating approximately 22% of the dollar bet to the active meter and about 2% to the reserve fund, so the casino avoids exposure. To look at the basic math as to how progressive jackpots are financed, assume 10,000 one-dollar bets occur in a week, which represents 250 players betting \$40 on the progressives per their sessions each week.

Allocation	Percentage	Per 10,000 Bets	Yearly
Jackpot Meter Increment \$	23%	\$2,300	\$119,600
Reserve Fund/Re-Seed	2%	\$200	\$10,400
Fixed "Rock" Payouts	51%	\$5,100	\$265,200
House Income	24%	\$2,400	\$124,800
Total	100%	\$10,000	\$520,000

For sure, \$520,000 (over a half-million dollars) is a lot of additional handle for a table game at a casino and, yes, your game isn't a bona fide complete success unless it offers a progressive option.

VARIANCE

Don't worry too much about the hit frequency of your game, *as long as it's in proper range*, meaning that the main bet should win at a steady rate of 30% to 50% of the time (generally closer to one in two hands), and a side bet should win between one in three and one in ten hands, or 10% to 33% of the time. The progressive should hit between one in 25 and one in 75 hands, with a jackpot of \$25,000 or more.

Assuming that you designed your main bet, side bet, and progressive well humdinger-wise and your math is good, then your game is good. The hit frequency and the house edge aren't the game, though as technical items they have to be in proper range. Rather, the game design and its playing strategy define your product.

Building the Progressive

It isn't hard to build a math model for your progressive, as it's on par with building a side bet.

There are general parameters to building a progressive system, starting with eight primary characteristics:

1. Casinos seed the first jackpot cycle with \$2,000 to \$25,000 of their own money. From there, they allocate a small percentage of the bets for a reserve fund, to re-seed subsequent jackpots.
2. The jackpot meter increases incrementally by about 15% to 24% of the dollar amount that the player bets. This is why you see the meter constantly scroll up in value in real time. It's like a mini-version of a Powerball lottery, with the jackpot rising with each bet until it hits. The reserve account is often incremented at about 1% or 2% portion of the dollar bet.

3. Smaller awards for great hands that are below the level of the jackpot trigger are called "fixed pays." These are usually paid by the dealer out of the chip rack, say, \$75 for a 4-of-a-kind on a Pai Gow Poker progressive bet. The combined fixed pays generally return just over half (50%) of the bet's true odds to the player, with the jackpot potential comprising another 25% return through the player pools.
4. The house edge is generally a little less than 25%. Nevada Gaming has a requirement that the house edge on bets on a table-game product must not exceed 25%, ensuring at least a 75% "return-to-player"² value on the bet.
5. Progressive systems don't use a bet spot on the table-game layout, where a chip is bet and kept there during the round of play. Instead, progressives use a sensor that gets locked and lit up during the round, by placing a betting chip on it, so that past-posting (or surreptitiously placing a late bet on a spot to claim a large win) is impossible. Alternatively, a small meter might be fitted into the table near each player position, where the player can press a keypad that's pre-loaded with a minor amount of money, to indicate his progressive bets. Progressive bets are taken in by the dealer at the start of the round (with the indicator light left on instead) and aren't returned on a win or a loss. For this reason, you're actually getting paid 499-1 instead of 500-1 on a \$500 win, for example, as the original dollar bet isn't returned.
6. Most progressives are part of a linked network of the game's tables throughout a casino property or group of related properties. So it's a coordinated

² "Return to player" is an alternate way to view and describe the house edge, by expressing it in terms of the player's expected return from a bet. A bet that has a house edge of 6.5% has a return-to-player value of 93.5%.

single jackpot for all the tables of a particular game. As a result, the meter rise and the jackpot hit are accelerated, representing the wider unified patronage on a single game type.

7. Some progressive systems, like those of DEQ's, allow for multiple-unit bets of up to \$5, so the rack payouts are multiplied by the units bet: a \$3 progressive bet wins \$225, not \$75, on a 4-of-a-kind rack pay, for example.

DEQ's progressives often allow an optional bet on the dealer's hand also, where multiple players may win, sharing the jackpot in ratios of their units bet. If a player bets \$4 on the dealer's hand and another player bets \$1, and the dealer's hand triggers the jackpot, the \$4 player wins 80% of the jackpot and the \$1 player wins 20%. This isn't unfair: Stockholders who own more shares get a bigger share of the dividends as a result of their bigger investment. (For myself, when I was younger, I had a boss who used to send me to buy his lottery tickets. At the store, I secretly bet the same lottery numbers as his, and for larger amounts, too. This way, if my boss hit, I would too, and for a larger share than his, from the same lottery pool. Well, I figured "it's nice to share." While the odds were small, the concept was pleasing to me. I used to wish him luck and mean it.)

Now, to get back to the business of building a progressive, it's often created from the same bet type and methodology as the game's primary side bet. While this sounds counterintuitive, it actually works well in practice, the philosophy being "the only thing better than a big win is a bigger win, and more of it."

As such, you can take the same payable for the primary side bet and just raise the trigger-hand level to a mid-level rank above the fairly common occurring ranks. The example we can use here is Double Blackjack's progressive, built from its Double-21 side bet, to include those very rare top hands composed of three matching 10s with two aces that form the top hands.

Basically, we take the base side-bet payable and “kill off” the low-ranking winning-hand rows. Here’s the original side bet.

Hand	Occurs	Prob.	Pays	Return
A,A,K,K,K Double-21	24	0.000009	500	0.004617
A,A,10,10,10 to A,A,Q,Q,Q	72	0.000028	100	0.002770
Double-21 soft	5,440	0.002093	50	0.104657
Double-21 hard	51,136	0.019676	10	0.196756
20 with 21	135,240	0.052036	5	0.260181
Two 20s	126,368	0.048623	5	0.243113
Other, loss	2,280,680	0.877536	-1	-0.877536
Total	2,598,960	1.000000		-0.065442

To create the initial progressive payable below, we remove the two low hand-rank wins by converting them to loses (“-1” below), and start the wins at the double-21s or better. The shaded data are the low-ranking former winners that are now losers, sacrificed to pay for the larger windfall payouts on the top-hand winners; the top hands will later need to be increased because of the initial 67% edge, below.

Hand	Occurs	Prob.	Pays	Return
A,A,K,K,K	24	0.000009	jackpot	0.000000
A,A,10,10,10 to A,A,Q,Q,Q	72	0.000028	100	0.002770
Double-21 soft	5,440	0.002093	50	0.104 657
Double-21 hard	51,136	0.019676	10	0.196756
20 with 21	135,240	0.052036	-1	-0.052036
Two 20s	126,368	0.048623	-1	-0.048623
Other, loss	2,280,680	0.877536	-1	-0.877536
Total	2,598,960	1.000000		-0.674011

Then we adjust (increase) the new top-level payouts, making the extreme top hand the jackpot trigger, paid by the progressive pool, and not as a rack payout in a fixed amount (like

100-1, etc. for the lower ranking progressive wins.) We want to get the initial house edge for the progressive between 45% and 49.9%, so the player gets back a touch more than 50% from the fixed rack payouts; we'll add 25% to that, which will go to the players' jackpot pool.

Also, the former low-hand winners are now absorbed into the single loss line in the spreadsheet; no need to break out the losers, since they're all "-1." With the loss of the low-hand former winners, the win frequency decreases, but the payouts are larger. We want a hit frequency of 1-in-25 to 1-in-75 hands, so the player sees some activity from the progressive bet during his session.

The payouts, while officially denoted at "500-1, "100-1," and "15-1" (the new payouts we'll use for the progressive), are mathematically noted internally as *one less*, as the original progressive betting unit isn't returned if won. This is because the progressive wagers aren't left on the felt, but are taken by the dealer at the start of a round, leaving the progressive indicator light lit up as the player's active-participation bet. So we have, with the higher payouts of 500, 100, and 15 included, *and* adjusted down one unit, the following.

Hand	Occurs	Prob.	Pays	Return
A,A,K,K,K Double-21	24	0.000009	jackpot	(pool)
A,A,10,10,10 to A,A,Q,Q,Q	72	0.000028	499	0.013824
Double-21 soft	5,440	0.002093	99	0.207221
Double-21 hard	51,136	0.019676	14	0.275458
Other loss	2,542,288	0.978194	-1	-0.978194
Total	2,598,960	1.000000		-0.481691

The house edge of the fixed pays is 48.1%, so the players are returned 51.9% on it.

Since about 25¢ of each dollar bet goes into the player's pool, we include them in the spreadsheet; the player receives that as returned money through the players' win pool. (Well

... one lucky player at a time does, anyway.) We have the final house edge of 23.1691%.

Hand	Occurs	Prob.	Pays	Return
A,A,K,K,K	24	0.000009	Jackpot	(Pool)
A,A,10,10,10 to A,A,Q,Q,Q	72	0.000028	499	0.013824
Double-21 soft	5,440	0.002093	99	0.207221
Double-21 hard	51,136	0.019676	14	0.275458
Other loss	2,542,288	0.978194	-1	-0.978194
Meter Increment				0.230000
Reserve Fund				0.020000
Total	2,598,960	1.000000		-0.231691

We're still missing five data items—jackpot hit frequency, average initial jackpot, average re-seed amount, average subsequent jackpot, and basic hit frequency. These are easily pulled from the above worksheet as follows:

1. The *average jackpot hit frequency* is 1 divided by the top-hand's probability, or $1/0.00000928$, derived by the A,A,K,K,K jackpot hand hitting 24 times in 2,598,960 total hand combinations. This comes to 108,290, or 1 in every 108,290 hands on average.
2. The *average initial jackpot* is the first jackpot seed plus hit frequency *times* the meter-increment percentage, 23% or 23¢ on a dollar. For a \$2,000 initial seed, it's 108,290 times 23¢ (or \$24,906.70) plus the \$2,000 seed money, for \$26,906.70.
3. The *average re-seed amount* in the reserve fund when the jackpot hits is 108,290 times 2¢, or \$2,165.80.
4. The *average subsequent jackpot* is 108,290 times 23¢ (or \$24,906.70) plus the re-seed starting amount of \$2,165.80, for \$27,072.50.
5. The *basic hit frequency* is 1 divided by the sum of the winning hands probabilities, or $1/0.021806$, or

100%/2.18%. This is 1 in every 46 hands. This is near the center of the desired hit frequency of 1-in-25 to 1-in-75 hands for a progressive.

With this, you have the full development procedure for a progressive bet, assuming a game design can offer at least one, or a group of very rare top hands.

In order to offer a progressive jackpot, the top rare hand must have a hit ratio of 1-in-100,000 to 1-in-1,000,000 hands. This is to provide a running jackpot of about \$23,000 or more (as 100,000 times the 23¢ meter contribution provides the meter “bump” or growth). In cases where a game doesn’t have a rare enough top hand, some tricks can produce one, and they always involve using a sub-hand category of the top hand (like a suited-in-diamonds royal) or adding more cards to a short-hand-length game.

In Three Card Poker, where there are only 22,100 hand combinations from three cards, even a highly defined rare hand of a spade mini-royal will occur once in every 22,100 hands, providing a ridiculously small jackpot of a few thousand dollars at best—which did not attract players to it. Shuffle Master/SG solved this problem by adding the dealer’s 3-card hand to the player’s hand to form a six-card hand for a progressive.

A royal flush produced from six cards occurs once in every 110,644 hands, and further limiting it to a specific suit, such as spades, makes the new trigger 1-in-442,573 hands, plenty rare to make it the big jackpot winner when it occurs. Some versions of Shuffle Master’s Millionaire Maker side bet use a 6-card royal in diamonds from a 6-card hand that provides a 1 in 20,385,516 hit rate, softened with many high-paying secondary awards. Indeed, the Millionaire Maker bet is used across many game platforms, adding or subtracting cards to the base-game’s hand-ranking structure, regardless of the particular game’s hand length, to provide a single product for a universal card game.

In blackjack, progressives seem to fare poorly, as it’s such

a direct and fast game, but progressives have been offered. They're usually based on the length of the dealer's hand, whether it busts or doesn't bust, or sometimes without regard to busting. Shuffle Master produced a progressive called Hit and Run based on the dealer getting a blackjack or achieving at least a 5-card hand, triggering the jackpot if the dealer drew to an 8-card hand.

In games such as craps, electronic progressives aren't offered, but jackpot bets such as the Fire or All Tall All Small are created over multiple rolls either by winning most or all of the possible point numbers or hitting all 12 of the possible dice numbers, and hitting all six on "one side of 7" for a secondary and easier award win, before a 7-out is rolled.

In roulette, the only way to produce a jackpot award higher than 35-1 is to use multiple-spin tracking on exact combinations (such as three zeros over three consecutive spins), as done in Dave Miller's Poker-for-Roulette.

But with the exception of blackjack, card games in particular need to offer progressives as part of a complete package.

One Final Caution on Progressives

Some game designers go for progressives that use a two-tiered jackpot award, where the primary jackpot pays 100% and the secondary award pays 10% or 25% of the meter, instead of an easy fixed payout. This is problematical and not recommended. The triggering of a progressive jackpot is a major ordeal for the operator, where surveillance is pulled off of standard duty to verify that the jackpot event occurred properly without cheating and the distributor is notified. A good bit of casino house-keeping also has to be done on a jackpot, and having secondary jackpots (instead of rack pays for the lesser awards) greatly compounds operational problems and expenses for the casino trying to run your game successfully.

Additionally, the secondary awards reduce the top jackpot, making the amount less of a draw to the customers willing to

play your game, and a \$2,000 or so fixed-pay secondary award is much cheaper for the casino to handle than processing a jackpot "reset" for a secondary event adjusted from the jackpot amount.

The less headaches involved in operating your game, the more likely it will be adopted. By all means, add a progressive, but make it clean and easy to run.