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THE INTERACTION OF ROLES, RESOURCES, AND ORGANIZATIONAL STRUCTURES IN CREATIVE WORK

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Abstract:
Creativity is known to be located at both the individual and group levels. We look at the case of videogame development, as an instance of project level creativity. We focus in particular on the design of the artifact. By examining the loci of creativity at the individual and group levels, we shed light on the roles and tasks of the designer, and on the organizational group structure known as the design cabal. In comparing the two extremes, we discover that the lack of organizational resources (namely, well known designers) leads in certain projects to the adoption of cabals or cabal-like approaches. Secondly, we illustrate the variety of design roles. Designers can be classified into three types (based on their roles): prototyping creators, vision creators, and implementing designers. Thus, the seemingly singular role of the designer is shown to be variable, defined by the capability of the designer and the tasks required. In the model that emerges, these roles ultimately interact with the resource requirements of the artifact to produce organizational structures.

JEL - codes: M10, -, -

The Interaction of Roles, Resources and Organizational Structures in Creative Work

1. Introduction

With recent emerging creative industries like animation and video games have come seemingly complex forms of production characterized by advanced technologies like software as well as creative processes. The methods of creative work and the production process in some long standing creative sectors are well understood by now. Some activities like book writing and music composition are essentially the products of individual minds, while others like film-making require the director to have a clear vision and dominant control over the production. Indeed, many creative industries have been studied as the products of individual efforts, rather than as the collaborations of a group. In earlier research, a few game designers with film industry experience also noted that one of the main differences that the game industry has with the film industry (being the other major content-based entertainment industry) is that video games had more bottom-up opportunities for creative input, and the designers who ostensibly have the strongest control over the artifact's structure, have to depend heavily on the rest of the team for their creative inputs and eventual success in developing the game.[1] It is also known that both individual talent and teamwork are needed in many modern creative enterprises, including film, and in our case, the video game production process. The role of lead creators and teams alike are highlighted within the video game industry.

Video games are now a multibillion dollar industry, and a successful game requires not only creative effort but also commercial mass market viability. Ultimately, video games need to be 'fun' to play, but this may be a deceptively simple objective, as their development embeds a considerable amount of effort and complex thought. Video games emphasize highly creative

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[1] Based in particular on interviews with LL of Oddworld and KL of Irga Games.

"designs", imaginative content, and the fusion of technology with all of these (computer and video games are usually played on different platforms and referred to in the industry as separate products, but we will refer to them jointly as *video games* or *games* for short[2]).

The dream of many game development teams has been to make the big successful game, but many factors can confound this process. Game development is generally a very messy process, and there is high uncertainty with regards to players' responses to the products (Tschang, 2005). Games are usually developed by studios in the form of a project with a team of developers including game designers, content specialists (artists) and programmers. Games themselves are made up of the three kinds of components or systems that these three types of developers create: the game design itself, the art and other content, and the programming code that enables the design and "displays" the art.

This paper will focus on the case of video game design as an essential creative part of the development process. Taking our start from these anecdotal observations about where the creativity might lie, our research question is then: what is the locus of creativity within game development projects - the individual, or the group - and what guides the decisions of a project to center its creative work within particular loci? In doing so, we explicitly recognize that studios may organize their projects and tasks to be either more lead creator-driven (i.e., top-down), or team-based (i.e., bottom-up). Our observations are grounded in multiple types of qualitative data and their analysis. We will focus on the creative aspect of game design, and how it drives other activities creatively.

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[2] The games industry tends to define computer games as those that are run on personal computers, and console video games as those running on consoles connected to television sets. In this paper, we take the term *video games* to include *computer games* and console video games (and may sometimes also refer to both as *games*). Most of our interview data was on computer game companies, but much of the other data we have accumulated is on both computer game and console video game development.

Our results suggest that both top down and bottom up models, as well as other models that blend aspects of both, have emerged, and for good reason: studios need to exploit the creative strengths of their existing teams and creative resources. While the roles of team members are important to the coordinated development of creative products (Bechky 2006), we illustrate how the nature of the product and creative resource dictates how a particular role is undertaken.

The Literature on Creative Work and Product Development

Understanding the creative organization of projects in the video game industry may help us think better about the importance of organizational design to new product development processes, in both the creative and other industries. It could help understand how creativity can be better managed – something that could be of use to the game industry itself. Thinking about structuring organizations for high performance or creative output, the issue arises as to whether there may actually be multiple "routes" (i.e. organizational structures) to get to a creative output. To begin to understand this, we will look at the relevant parts of the literatures on product development and creativity.

While we are interested in the creative aspects of new product development, a large body of the work on new product development tends to look at rational processes of organizing, with some related exceptions being the studies of how teams are organized and how they communicate (see Krishnan and Ulrich (2001) and Brown and Eisenhardt (1995) for reviews). There are a few studies that look at new idea creation (or ideation), where creativity is typically considered to occur at the front end of the product development process (Dahl and Moreau 2002, Goldernberg, et al 2001).

Thinking of creative work in its broader organizational context, we can consider it to have two main loci – the individual and the team. There is a large body of literature on individual creativity, much of it addressing general creative thinking skills, or focusing on individual pursuit within the arts and sciences (see for example, Sternberg (1999) for various theories). There are also historical discussions of inventions (see for example, Weber and Perkins (1992) for case studies of this), which tend to focus on individuals' research and their moments of insight. Within this literature, it is rarer to find works that systematically address how individuals think creatively about industrial products, let alone as they work within a group.

Collectives and Groups as Loci of Creativity: Taking the perspective of the group as the loci of creativity, we can appeal to not only the few case studies of creativity in product development, but also the broader literature on organizational creativity. A number of studies have examined the means by which creativity can be better fostered at the group level (Amabile 1996, Leonard and Sensiper 1998, Leonard and Swap 2005, Nonaka and Takeuchi, 1995). Studies on the creative organizational forms occurring in new products or industries and their specific contexts appear more limited. Studies that did look at the creative process within actual industrial design firms' new product development practices focused on the brainstorming process (e.g. Hargadon and Sutton 1997, Sutton and Hargadon 1996). In the firms studied, brainstorming groups of loosely assembled employees were organized at the front end of projects to help one another (Sutton and Hargadon, 1996).[3] As a consequence of this temporary nature of the brainstorming team, the creative work studied appeared to require less in the way of coordination. More recently, studies have cast their eye on how patterns of creative work emerge from the

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[3] It would also appear from other anecdotal evidence that front-end brainstorming is also a part of the standard operations of many other project-oriented creative firms, such as advertising firms.

interactions within collectives and networks (Cattani and Ferriani, 2008; Hargadon and Bechky, 2006).

Organizing creative work: The literature on creative industries also pertains to project organization, although their focus on the industry or geographic level of analysis precludes insights into groups' internal organization or operation.[4] In an important departure, the hitherto common notion of temporary organizations as "ephemeral and unstable" was found to be less than accurate; instead, "role systems whose nuances are negotiated in situ" were found to be important for organizing work and maintaining continuity across projects (Bechky, 2009).

Structuring creative work organization: A second perspective that we rely on for guidance is the manner by which creative work organizations (and hence, the work) is structured. Various popular accounts have been written of creative work, and in particular, the creativity of individual lead creators within various industries. For instance, anecdotal evidence suggests that creative work in film ensues in a more or less top-down fashion, with the director providing much of the creative interpretation, although some directors also take a collaborative approach (Lumet, 1996). In animation, Pixar's development effort was characterized as top-down driven, yet also reflective of the bottom-up approach (empowering line members of the team), as well as of a top-level "brain trust" of peers (Catmull, 2008). This suggests that creativity or creative work is located in many centers or loci – at times, it is the individual director, at times, the braintrust of other directors, and at still others, the broader team itself. This may simply be an artifact of Pixar organizing itself the best way that it can with the resources it has at hand, but it does not lend sufficient credibility to a generalized theory of creative organization.

In fact, as we compare across these different studies, it appears that organizations and projects tend to be viewed as being organized *either* as a top down process *or* a bottom up

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[4] See DeFillipi and Arthur (1998), Grabher (2001) and Grabher (2002) for examples.

process, but generally not as *both*, at least, not within the same project, or even the same industry. This may be due to the necessity of taking the view from one perspective (the individual) or the other (the group). Burt (2004) and Cattani and Ferriani (2008) show for example how the individual benefits from network ties. Studies that try to related the two levels of creativity would tend to focus on generalized relationships, such as Pirola-Merlo and Mann's (2004) study of the relationship between individual and team creativity in R&D teams, and do not focus on when creativity is chosen to be located in a given loci. This latter is the purview of organizational design. Again, we emphasize that by incorporating an understanding of the actual artifact under production, and how the creative work impacts on a particular aspect of the artifact, our study helps us to arrive at a better understanding of when and where creative loci are operationalized.

These two dimensions of organizational structure (top down or bottom-up) and "organizing work" (i.e. roles in coordination) may not only be relevant to the game development process, but also help us to confirm that our questions can be of theoretical import.[5] The nature of creativity within the product development process is yet to be widely examined, and how this ties into the nature of organizational structure (in terms of top down and than bottom up structures), is an even more open question.

Reasoning from both these, our research approach is to then understand how it is that a creative context such as an artifact and/or its development process, and its resource requirements, rationally guides the adoption of particular individual roles, and hence, the loci of creativity.

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[5] It is worth noting of the parallel with the earlier tradition in the organizational and strategy literature which considered organizations as top-down or bottom-up where top-down referred to hierarchic and constructed organizations and bottom-up to flexible and self-organized ones (Burns and Stalker, 1961).

The Organization of the Paper

       The remainder of this section discusses the framework and its fundamental dimensions we will use to organize the data. Section 2 discusses the data and qualitative methodology used, particularly in relation to the three types of qualitative data we relied on. Section 3 discusses our observations on the nexus between creative loci, organizational structure and product development as they emerge from the data. Section 4 discusses the findings in the context of the literature, and the implications for theory. To simplify things, we will lay out our data according to one perspective: the extremes of the top-down (creativity is creator-resident) and bottom-up (creativity is team-resident) perspectives, and will analyze the nature of role systems as it comes up in the data.

2. Data and Methodology

       To address our research question, we made use of three different types of data collected in a broad study of the video games industry. The data consisted of a set of semi-structured interviews with developers from about 20 video game studios and one publisher (including about 30 video game designers and about 30 other developers)[6]; detailed case studies we conducted on three studios using ethnographic methods, and industry sources of information, namely the postmortems (i.e., post-project reports) done on about 65 projects[7] [8]. The postmortems were written self-analyses of what different groups did well (or wrongly) in retrospect, published in an

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[6] The interviews with designers lasted anywhere from 1 to 2 hours at a time, and several designers were interviewed multiple times. Several other designers and many other developers were also interviewed much more informally but are not listed in this set.

[7] Published in the main industry association publication, *Game Developer*.

[8] Information obtained on designers included their creative thinking processes (particularly within the product development cycle and the team), and background information on them and on the companies they work for.

industry periodical. The ethnographic cases were of three sites: Timi Games, Niso Games, and Irga Games.[9]

All three sets of data were used to explore for phenomena specific to game development processes and organizations as well as ones more general to other product development processes and organizations.[10] Our methods followed standard qualitative data collection, analysis and reasoning methods for the employment of multiple cases (Eisenhardt, 1989; Miles and Huberman 1994, Yin, 1994).

3. Unpacking the Loci of Creativity in Video Game Development

We develop an understanding of creativity in terms of its loci – being at the individual or at the group level. Through the comparison of the two loci, we will discover the nuances in the nature of designer's roles as well as the relationship of these roles to project structure. This contextualized by two means: in relation to the artifact itself, as well to the flow of the product development process.

Creativity in Service of the Needs of the Artifact

Fundamentally, the organization of creativity within the games industry (as is common to many other industries) involves 'lead creators' (usually a visionary or lead designer) and 'implementers' (all other developers in the team). However, while it is the well-known lead

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[9] These consisted of about six weeks of field study (spaced out over four separate visits and multiple years) at Timi Games near Boston, three weeks (spaced out over four visits), at Niso Games near San Francisco, and about one week (spaced out over three visits) at Irga Games in Boston (each of these is labeled by a pseudonym). The ethnographic cases cover the entire production cycle in substantial detail. A large proportion of the staff in each of the three studios was also interviewed, and meetings were attended across all three studios.

[10] We will adopt a convention of citing first use of direct quotations from postmortems in the footnotes, and not citing succeeding quotations from the same postmortems (but providing implicit information to link them to the earlier postmortems). All other data, including author interviews and information from the ethnographies, are fully cited.

creator and his vision who usually garners the attention of the mainstream press, it is really the team that implements and creates the product.[11] Some nuances that this throws on our research question are: what amount of creative influence do lead creators actually have over the project; to what degree can the other project team members exert their creative efforts; and, how does organizational structure relate to this?

Our viewpoint is somewhat informed by the above observations that creative activity may locate itself in various levels of a project team's structure (i.e., at the level of the design head or in the broader team). This has implications for a different understanding of how creativity is "situated" in the production of the artifact – namely, in a given product and in its primary underlying structure. This also calls into question the issue of how (creative) resources are managed, and the fungibility of those resources. This perspective sheds a different light on the "situated cognition" perspective, which either sees cognition as being situated in particular codified or organizational constructs (e.g. Hutchins, 1995), where organizational contexts may be defined by self-organized activity, or by cognitive schemas such as rules, events and persons operating in contexts (e.g. Elsbach et al, 2005).

The Stylized Game Product Development Process

A second means for situating creativity is that of the actual game development process. We begin by developing a better understanding of the game development process, as a means of providing a context for how the creative loci are situated. We have found through our research (and a broad understanding of the industry can show) that the project lifecycle outlines a clear trajectory for teams and their work to ensue, with deadlines for particular features of the artifact, consisting of the design, the content (mainly art and animation), and the code that both of these

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[11] We refer to designers as male, only because our entire data set only happened to involve male designers.

are embedded in. In games, the creative work starts at the beginning of the product development process and continues on through to a point near the product's completion. This is because content creation is a continual process, and as new content and features are added to the design or implemented, they have to be interpreted or reinterpreted in creative ways. As understood within the game industry, product development is often stylized as occurring in roughly three or more stages (Bethke, 2003): Idea conceptualization, preproduction (involving prototyping, and full production.[12]

Creative processes may differ at different stages of the product development process. For instance, the idea conceptualization stage may involve one or more designers or team members "riffing" or working off of one another's ideas. The core design is then developed with one or more core team members working together. This is often followed up by a proposal document ranging from one to a few dozen pages long, and possibly some prototyped code and artistic assets (sometimes developed into a "playable sequence"), that can be used to help market the game to publishers.

In the first two stages, there is considerable scope for broad types of creativity such as the definition or refinement of the type of game, and its implementation. That is, there is a substantial amount of creative work for designers to do, as well as considerable leeway for them to influence the structure of the game. However, in a conventional team, during the prototyping stage, the design work could become a more interactive process with the designers articulating

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[12] Idea conceptualization typically involves more creative effort, from the first generation of the idea to the fleshing out of a larger picture or vision, including some core concepts such as the game play and background context (e.g. story) which differentiate the game from others. The second stage is the pre-production or prototyping stage (which sometimes overlaps with the first stage, and will run seamlessly into the third stage). The prototyping of the game engine code (i.e. the core code that runs the on screen graphics and that enables other key game features) may take place here, along with the start of content like art. The third stage is the production or implementation stage – this involves bringing on the full team of programmers, artists and other team members to implement the design document's specifications, levels, and other game content and game play.

their original vision game design and exchanging views with the implementing programmers, artists and other content specialists, and level designers.

If the design is stabilized, the complete design (detailing the whole game) is usually fleshed out, resulting in a design document of anywhere from one hundred to a few hundred pages in length; this is essentially a detailed road map for how the rest of the team is to develop the game. The design document codifies most of what was tacitly known before at the idea inception phase, as well as the complete details of the game, including the game systems, mechanics, objects, possible scenarios that are played out etc. As the game's development progresses into implementation (i.e. prototyping in the second stage and full production in the third stage), implementation of the design document will by nature make the work more defined.[13]

As shown by the above three stylized stages, the creative work varies naturally over the course of the project's lifecycle, with the level of creative engagement of different team members varying across the stages. There is also an overall ramp up in (human) resources taking place as the project moves from one stage of development to the next. Thus, these stages can provide an "idealized" setting which we can use to locate our data on creative and implementation activities.

Three other observations form important starting points which will help us situate game development against the product development process and organization of the project:

Firstly, time and again, designers that we interviewed noted that ideas (of beginning concepts) are "cheap" or "plentiful", and that "implementation" was the key to a game's eventual

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[13]However, changes to design details can still occur, and creativity is still inherent in the implementation of the design, as in when programmers have to face technical challenges in coding, or when they have to make decisions on how the code will make some on-screen actions aesthetically or otherwise appealing to players (e.g. the programming of explosions to make objects fly realistically on the screen) (this example is based on an interview with KL of Irga Games).

success (or successful completion), i.e. the hard work of detailed design, technical problem-solving, and programming, art and other work.[14]

Secondly, game development is intensely complex, with each team dealing with new technologies and features to be implemented in a highly interactive product, making for a great deal of uncertainty.

Thirdly, game developers are passionate about their work, and many studios, especially the good ones, do tap into this passion, especially when under intense pressure to make deadlines. As noted by developers at the studio Bioware: *"There is also very little value in having people work on a game that they aren't enthusiastic about. At the best of times, making a game is challenging and a lot of hard work.[15]*

The Different Ways of Organizing Creativity in Game Development

We now turn to the primary perspectives on how creative work is organized, and where in the organizational structure the most creative parts of the work are resident. Our data confirms that the creative work of game development is essentially centered on two loci:

- One locus is centered on the individual designers who have roles as creative people in their own right as well as influences on the rest of the team's work. In these roles, the designers can have a very formative influence on either the "high concept" or innovative core of the game, and/or on detailing the design for the group to work on. This locus lends itself to top-down approaches to characterizing organization and the organization of work.

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[14] This is based in particular on interviews with Chris Beatrice, Jeff Fiske, and Wayne Imlach.
[15] Bioware's Baldur's Gate II, postmortem, *Game Developer*, March 2001..

- A second locus is centered on a subgroup (or the group itself), because of: their need to work in their own creative area (e.g. an artist providing different looks to a game's characters), to contribute directly to game design issues, and to interpret game design as they work (the latter two being our main considerations). This locus lends itself to bottom-up approaches to organization.

As we will show later, these two loci and approaches are related to three prototypical models seen in game development studios:

- One extreme that emerges from the top-down, designer-centered approach is that of the dominant creator. That is, designers who control so much of the design and its implementation that there is little room for other team members' interpretation of the overall design or key components. This model usually results in a codified (design) document that serves as a reference if not "bible" for the rest of the team to implement. Continued social interactions and meetings serve to coordinate activities around the design document(s), to make changes to it, or to "enforce" rules of implementation.

- Another extreme that emerges from the bottom-up, group-oriented approach is the "cabal" or design team composed of non-designer team members. These manage to creatively work together as a group without visionary creators or lead designers. Each member participates in the design process as necessary (in addition to their own work as an "implementer" of the design (in code or art). This model relies as much on a codified design.

Mixed models: These two extremes form our cases for comparison across developmental practices. In comparing these, we will discover the integral nature of capabilities and resource

requirements of projects. For further illumination, we note that a third model would be the combined model which results from a combination of aspects from the two extremes. Many studios have models that lie on the 'continuum' of organizational structures anchored by the two extremes, as they try to take into account the advantages of both individual creators and groups.

Figure 1 illustrates how our data on the two loci for creativity (designers and groups) help us understand the two approaches (top down and bottom-up respectively) involved in game development. The three models nested under these two approaches emerge from our consideration of the data and mediating factors within it, including the advantages of coordination/control and empowerment/motivation that the top-down and bottom-up approaches possess respectively.

[INSERT Figure 1. Data, Concepts and Models Induced From the Analysis]

3.1. The Individual as the Loci of Creativity in Projects

An exploratory analysis of our data uncovered a distinction between design tasks and roles that illustrates their uses in the development process. We arrived at this first through an exploratory analysis of individual designers, partly focused on understanding their creative contributions in terms of specific design thoughts and activities, and their work in relation to the team and project. For reasons of space, we summarize the 15 interviews as follows: two interviews described the prototyping creator role (CC and WW), two interviews described the vision creator/implementing designer roles (CB and KL), four interviews described the vision creator role (CT, AG, LL and AM), six interviews described implementing designer role (BA, JR, JS, IF, WI and AR), and one interview was unclassifiable (OM).

Design Tasks

From the interviews, game designers appear to have at least two key tasks.

(a) Vision creation or the high level concept for a game, often consisting of the core game play (as shown by the examples in the "prototyping creators"), and the contextual background (such as the storyline) and its visual style (roughly mapped as onto the "vision creators").

(b) Detailed design or the detailed game system design. As shown by the "implementing designers" rows of the table), this helps to coordinate the team members' tasks and in their implementation of the design. The task of the detailed game design is usually a single individual's responsibility, and involves "designing", i.e., defining the game's logical systems (i.e. objects and their relations) and mechanics (how the systems interact and function over time, and how the systems react in response to the player's decisions). All of these are codified in the design document.

Both types of task are in effect used to coordinate the rest of the team in their implementation.

Design Roles

Roles are known as means for coordinating organizational activity. In temporary projects, roles are seen to be enacted, socially negotiated and promulgated (Bechky, 2006). As in film, one primary view of roles in the game industry is that they are defined by professions and the specific expertise contained within them essential to the making of components of the game. The type of design role that is permitted or allowed of a designer by an organization depends on the designer's abilities, but as we will show, also depends on which particular aspects of the design

are being emphasized, and the needs of the project and design team, including "coordination", and/or "control" of the project. In relation to this, the first of the design tasks (vision creation) is typically enacted in the performance of the first two design roles (the prototyping and vision creator roles) while the second is predominantly found in the third design role (the implementing designer role):

The Prototyping Creator Role: The prototyping creator role tends to be adopted by an individual somewhat in isolation who personally executes and dominates the entire game's development - up through the first stage when the core concept is refined, followed by the "hard" (i.e. decision-making) or "soft" (i.e., guiding) control of the group's implementation process, through to the project's completion. This role tends to exert dominance over the project's outcome by ensuing conformity to a structure. Very typically, this role is enacted in order to develop a particular (innovative or otherwise) kind of game mechanic (defined as the core actions that the player will undertake in the game to achieve the game's objectives, e.g. shuffling running, jumping, or aiming). This role was observed in at least three of our interviews with designers of innovative or highly innovative games - WW, the creator of the first of a simulation genre (or definitive game of the genre); CC, a designer of early games, including the first of a genre of game (involving story-telling that occurs through the player's interactions); and CB, a designer of early city-building games (CB's studio - labeled with the pseudonym of Timi Games - was ethnographically studied).[16] In pointing out his work pattern, WW shed light on why he has to work this way: *"So, I come up with an idea so I have to talk to these people in my company, managers around me and other people and I have to wave my arms and explain why is*

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[16] Secondary information that we had on other leading designers such as Masaya Matsuura, designer of *Parappa the Rapper*, and Sid Meier, designer of many successful strategy games like *Silent Service*, *Railroad Tycoon* and *Civilization*, also corroborated this model. This type of designer influences much of the core game play, although he may not necessarily take care of all the details of the entire game's design. This role is particularly relevant to games where innovation in game play is an essential part of the game's overall innovativeness.

it is a good idea and if I can get that model to work in their head and they think it is fun then I

can start getting more motivation, so you are continually selling the product the whole time."

(author's interview).

This designer often also prototypes the code in order to convince others of the new and

unique game playing experience.[17] [18] Even today, WW and another well known designer Sid

Meier are known for working alone; in the case of Sid Meier, for a few months (as when he

worked on a prototype of *Simgolf*), and in the case of WW, for up to two years (as when he

researched various ideas before prototyping them) – before being in position to show their

prototypes to the rest of their teams and their publishers.[19] Ultimately, this designer or an

implementing design will be called on later to develop the full design, including the design

details, the full list of features, and even the balancing of the game (i.e., ensuring that one side

does not have an unequal advantage in all situations).

Vision Creators (including Core Game Concepts and Key Component Creation):

Several of our interviews suggest that certain designers engage in a 'vision creator' role, in that

they set the overall concept, style or direction of the game (i.e. the vision), and may even provide

the details of one or more of the components (e.g. the story). They tend to do this at the

conceptualization stage, but will more readily devolve control early on, particularly on the design

or on the other components, to other designers or team members. This role is usually not

associated with a breakthrough type of game mechanic or a new genre, but the game may be

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[17] This form of prototyping may be necessary because of the need for learning-by-doing. Even conventional development teams also prototype, and design iteratively and test to a great degree (Tschang, 2005). This point about the need to prototype and to have others test the product is also made in postmortems, such as the one written by Warren Spector for *Deus Ex*.
[18] Because of this prototyping activity, this role may be more particular to designers who got their start in the earlier 'golden age of innovation' in video games, circa 1980s, when they worked alone for the most part. This was a time when games were simpler, and where they could keep control over their work and vision. In fact, many innovative games appear to have been made in the past when certain individuals could maintain a solitary vision and control over a project, often one where they could work alone or with a very small team to do everything.
[19] Based on personal interviews (both conducted in May 2003).

significantly distinguished from others by its style, look or component such as background

setting and story. It is possible that an implementing designer may be engaged later to provide

the core mechanics, and to detail all the design details.

Examples of designers we interviewed who paid especial attention to the visual or other

style of the game included LL who created a fantastical (and heavily story based) platform game,

AM who created a rendition of *Alice in Wonderland* (labeled 'Alice'), and AG who (with his

studio) conceptualized the game concept for 'Home' (pseudonym), the first real time strategy

game set in outer space.[20] While this category could overlap somewhat with the prototyping

creator, it does not require as strong an exertion of effort and vision from the top to prove out

game play or the game concept, perhaps because many of these creators are not programmers,

and had found that they could contribute to the design by using their non-technical or general

creative thinking skills to develop other more unique (non-game play) elements.

Implementing Designers: The implementing designer role involves taking the vision or

core concept as defined by himself or other parties (including group members), and details the

(more or less finalized) design (consisting of the game systems, mechanics, and objects like

characters), sometimes with the aid of other team members or the original creator and "vision

holder". The designer writes up the detailed design as a "design document", which is used for the

team's reference, and to coordinate the team's efforts at implementation. In effect, these

designers engage in the second of the design task type.

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[20] The first two games were very much art or conceptual art-driven (and their designers also had art backgrounds), while 'Home' was based on a vision of how to enable the visual effect of a three-dimensional movie-like space flight simulation. To a certain extent, KL of Irga Games (a pseudonym) also operated this way: he had the idea for both the kind of game (i.e., the core concept) and the visual style – creating all of the story and some of the characters – for a mixed genre game based on superheroes. AM brought in darker influences from his side interests in order to foster a dark look to his game. In a similar way to AG, CT focused more on his vision for the type of game rather than just its visual style; he also "controlled" much of the innovation and gameplay as the game's development proceeded. In KL's case, it might be argued that he was much more dominant in his role than the others, given the depth of his involvement in defining both the overall concept and more than one important component.

As noted by a few designers that we interviewed, this type of work tends to involve logical thinking more than "lateral" (or "normal creative") thinking. Designers whom we interviewed that illustrate this type of role include BA at Insomniac Games, IF at Ensemble, WI at Rockstar Games, and JS at Niso Games (the latter a pseudonym). It is important to recognize that implementing designers may not necessarily be responsible for coming up with the initial vision or core game concept, instead, taking the core game concept and vision as a given. However, they must "guard it" through the implementation process by designing the full game and coordinating its implementation by the group [21].

Of the three, the first two roles tend to be felt more strongly during the first two stages of the product development process, while the third role may start at the first (idea conceptualization) stage and carry through to the full production stage.[22] While these roles appear to be mutually exclusive of one another, individual designers can assume multiple roles, possibly in tandem with one another.

How Design Roles Define the Rest of the Project

We will now turn to a more detailed description of how each design role embeds the means for coordinating and guiding the team's work in some manner, i.e., exerts a particular *degree of control* over the creativity of the group and the project. All three types of role can be

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[21] The first seed of the idea may have been created by someone from either inside the group or from outside of it. For instance, the designers of the game Thief were the first to think of having a character sneaking around like a thief, involving different weapons and tactics than a frontal attack type of character would have had. This came about from two or three leads in the company brainstorming for ideas, with the original seed for the idea coming from one person (author's interview with the head of Irga Games).

[22] Having said that, the first concept could also be arrived at through other means, as noted earlier. It could also be that a small team will help brainstorm the first concept, or the concept could be "handed" to the team by an external party such as a publisher needing to fill a gap in its product lineup with a particular type of game. Many developers we interviewed noted that publishers had approached them directly on the game that they had wanted made, sometimes with a particular intellectual property that they had the license on. A number of postmortems also cite publishers as key drivers of their games' concept.

aligned with top-down approaches (with the first two being needed to ensure that the vision or idea of the prototype more than anything).

The Dominant Creator: We term creators who exercise considerable control over the core of the game and how it takes shape *dominant creators*. This is a somewhat loose definition, as we only try to define it with a few cases; this with the intention of illustrating the higher degree of control that certain designers had over the flow of the project. In this way, they represent an extreme of the top-down approach. Dominant creators could hold the roles of vision creators or prototyping creators, but they may also become involved in design implementation as implementing designers. In the cases that follow, it appears that they hold such reins either because of: the need to implement the vision (the first and second examples), external reasons (the third example), or personality (the fifth example).

The first example of a dominant creator was Masaya Matsuura, a musician who came up with the innovative game play concept for the Japanese game *Parappa the Rapper*, the first game to incorporate music into its game play, and which started the "music game" genre (Baba and Tschang 2001). Matsuura was termed a "benevolent dictator" in part because he had full control up to the concept creation and initial prototyping stage, and continued to exercise decision-making authority over the product until its final completion, even as he involved expert character designers and musicians, and empowered the team members to make suggestions.

A second example of a seeming dominant creator was observed in our ethnography of Timi Games, a studio with a progressive work environment and which was making an innovative (three-dimensional) city-building strategy game. We observed a strong design team composed of a "vision creator" with a role as "partial implementing designer" (CB) and another implementing designer who was in charge of detailing the game systems, but whose ideas were usually vetted

by CB and a broader "design" team. In part, CB undertook this role because he had expertise in the type of game, but also because he had the initial vision of the new product. The broader group was occasionally allowed inputs to the design process, although these ended up being very limited in nature. This situation may also partly be due to the nature of strategy games, as designers have to think through the logic in the game systems extremely carefully and in a most detailed manner, caring all the time about the consistency within the logic.

Our third example is that of CB's experience while working previously in an implementing designer role for a publisher's in-house studio. Extreme time pressures exerted by the publisher forced him to exercise total control over the design, so much so that for one particular game, he single-handedly came up with all the design specifications and wrote the design document, before "handing it off" to the rest of the team to implement. This could be more easily done because their games were mostly incremental sequels to successful franchise lines. In this particular case, the dominant creator role was not even associated with an innovative game.

It is important to recognize that a dominant designer role could still be associated with a bottom-up approach. For instance, the vision creator model used for *Alice* permitted group creativity: *"While the actual work was being done, we encouraged experimentation and creative input so that the entire team could share every aspect of ALICE, not just the individuals responsible for the original ideas."*[23]

Finally, we note that top-down approaches can also cause problems, such as when a vision creator/designer has a singular creative vision, but over controls the project, or has the

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[23] Rogue Entertainment's American McGee's Alice, postmortem, *Game Developer*, April 2001. Confirmed to an extent by the author's interview with the vision creator.

inability to rein in his or her creativity or to acknowledge problems in the product.[24] The original "benevolent dictator" approach worked well for the first *Parappa* game, but it was acknowledged that it also ultimately led to a somewhat less successful sequel because Matsuura reportedly vetoed the character designer's concerns over the main character, which was innovative, but not as appealing as the Parappa character in the first game.[25] Other instances of similar events occurred in our interviews of various developers. A developer who was a former tester at one studio noted of the studio head/lead designer *"(the design was by) someone entirely in charge… he didn't realize that it was out of control. It needed to be designed by committee. Not a single decision maker."* This was manifested in the poor management of the group's creativity: *"It was never a fault of the design or design document.[26] It was always the fault of the way we (quality assurance/testers) were playing it or that the programmers coded it…When you could find an exploit in the game (which is an easily repeatable way to succeed in the game without doing much work), they were very reluctant to patch it up."* While the product eventually became fairly successful, this and the example of Matsuura appear to show that a strong personality can confound the outcomes from the dominant creator model. This can cause problems in the design and a decrease in the group's creative contributions and its overall motivation.

The dominant nature of a designer can also come about in a less than radically innovative product. In reprising their roles, CB's and WI's roles in former studios were both of this sort. WI

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[24] In our interviews with developers, we learnt of at least four studios run in a top-down or even dictatorial, but flawed (at least by the account of the interviewee), way, one of which was an eventual success, and two of which were innovative titles still in production. All of the developers that we interviewed noted that the poor organizational structure and tendency for design leadership to "not listen" caused low morale in those projects, and three noted that the hubris of the lead designer or creator might eventually even lead to poor overall designs or design flaws (at least two projects were highly innovative, but had not been completed yet as of the time of the interview).

[25] Based on secondary information on an interview with the lead creator.

[26] Ironically, this interviewee went on to talk about the current project he was producer on, where design by committee also did not work as there was no central designer with enough authority (and also because the lead designer did not have enough experience on console games, which is what they were designing for the first time).

noted that for one project, once his design was created, it was mostly locked-in and used to direct the team on what to do.[27]

3.2. The Group as a Locus for Creativity

Our interviews suggest that the glorified popular picture of the lead designer as the "dominant creator" behind games is an incomplete depiction, perhaps needed to show role models for other developers, or to "advertise" a face behind the game to players. CT, the well-known designer of real time strategy (RTS) games and role-playing games (RPGs), summed up the sentiments of a number of other designers we had interviewed by noting, *"I don't propose that I design everything. I have to depend upon the creativity of others."* He notes that at least for his recent games, *"I certainly come up with a lot of stuff, say 50-60% of it (i.e., what makes up the core design or design document), but it's a team effort to take those ideas and do something with it"* (author's interview).

In our interview data, we have shown how the designer's role within the team ranges from a more coordinative role played by the implementing designer at one end of the spectrum to, at the other end, a dominant designer who drives the game's development. This suggests that the rest of the team's work could range from having creative expectations and design responsibility all the way down to being less creative and mainly being involved in the logical work and implementation that follows from the design process.

In fact, no matter how detailed a lead designer makes his design, the implementation of the design still needs interpretation, which offers many lower level creative opportunities. *"On a day-to-day basis, the level of detail in even a 200-page design document is vague at best. It*

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[27] Startopia, postmortem, *Game Developer*, October 2001.

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doesn't answer… the countless creative details that are part of everyday development."[28] While this perspective is that of a cabal's (discussed next), it was also mirrored by our ethnographies on studios that adopted other forms of organization (e.g. mixed models such as Niso Games' or top-down ones such as Timi Games').

The Cabal Approach (or the group as sole locus of creativity)

"The Workers Control the Means of Production" (Valve)

The extreme form of bottom-up project organization is the model known as the cabal. This is emerges significantly from the postmortems and secondary data sources, with several occurrences of cabals or cabal-like organizations being observed. Our study of the cabal illustrates that project design roles are reallocated "downwards" to a selected team when: (a) there is no highly qualified designer on staff, and/or (b) when the team is able to handle coordinating and partitioning tasks effectively, with the aid of codified and uncodified means.

Cabals are epitomized by the studio Valve's "Cabal" team that designed Half-Life.[29] The Cabal process at Valve is unusual in that regular team members were involved, and there no lead designer involved: *"We set up a small group of people…The initial Cabal group consisted of three engineers, a level designer, a writer, and an animator. This represented all the major groups at Valve and all aspects of the project and was initially weighted towards people with the most product experience (though not necessarily game experience)…there were no dedicated designers. Every member of the Cabal was someone with the responsibility of actually doing the*

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[28] Ken Birdwell, "The Cabal: Valve's Design Process for Creating Half-Life", Dec 10, 1999, http://www.gamasutra.com (accessed Jan 2006).
[29] Half-Life set new standards of quality of experience (but not necessarily innovation) in the first person shooter (FPS) genre. However, there were few serious innovative features in Half-Life, and perhaps the most innovative feature overall was the game's ability to draw the player into the setting through various techniques, e.g. interactive non-player characters.

work that their design specified, or at least had the ability to do it if need be." This cabal worked intensely at the conceptualization stage as well as throughout the development process.

Uses of the Cabal

   Cabal as means to an end: Importantly, Valve's Cabal was not necessarily an alternative to having a structured, singular vision for the game, but rather, was the means to creating one. *"The goal of this group was to create a complete document that detailed all the levels and…was to work out when and how every monster, weapon, and NPC [non player character, typically guided by artificial intelligence] was to be introduced, what skills we expected the player to have, and how we were going to teach them those skills. As daunting as that sounds, this is exactly what we did. We consider the Cabal process to have been wildly successful, and one of the key reasons for Half-Life's success."* In this sense, Valve's Cabal was not an ad hoc organization, and it also needed a means of coordination. They also assigned one person to play a coordinative role, *"to follow the entire story line and to maintain the entire (design) document."*

   A second reason for engaging cabals is to replace the designer with an alternate means of controlling implementation efforts, albeit with a variety of personnel involved in that design process. All of the teams in the postmortem data that had these main characteristics of a cabal approach – Valve (which made *Half-Life*), Bungie (which made *Myth*), and Epic Games (which made *Unreal Tournament*), made successful games. However, there may also be downsides. For instance, in *Unreal Tournament*, the *"open cabal-style design"* process was good, but *"the game's weaker elements would have been much stronger if we had put together some concept art and focus material."* The cabal process can also be more labor-intensive, since it is a form of

work in progress. Valve's Cabal *"met four days a week, six hours a day for five months straight, and then on and off until the end of the project."* [30]

The Rationale for Cabals

      Missing project resources: One major reason that cabals may be formed is the inability to find a lead designer, or even worse, the desire to avoid handing the reins of the project to the "wrong" lead designer. As noted in an article by a Ken Birdwell, Valve formed their design cabal because *"Throughout the first 11 months of the project we searched for an official 'game designer,' — someone who could show up and make it all come together…In the end, we came to the conclusion that this ideal person didn't actually exist. Instead, we would create our own ideal by combining the strengths of a cross section of the company, putting them together in a group we called the 'Cabal'".* [31] The head of Niso Games also noted in an interview that they did not have a designer of "star" quality or reputation (what we term a "star designer"), so they incorporated bottom-up aspects into their project organization in order to substitute for that.

      Empowerment and motivation: A more general organizational benefit that derives from cabals is that of empowerment. Cabals or cabal-like organizations such as Epic's empower their developers: *"Artists work with level designers but are given significant design freedom."* [32] In a more general way, the cabal (or cabal-like feature) is actually important for motivating team members: *"...we let the team tear into it (i.e., contributing to design), creatively speaking. This was also something that has been noted by reviewers as one of ALICE's greatest strengths."* [33][34]

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[30] This practice was also confirmed in an interview we conducted with the studio head, who was also a lead designer on past products.

[31] Ken Birdwell, "The Cabal: Valve's Design Process for Creating Half-Life", Dec 10, 1999, www.gamasutra.com.

[32] Epic Games' Unreal Tournament, postmortem, Game Developer, May 2000

[33] Rogue Entertainment's American McGee's Alice, postmortem, *Game Developer*, April 2001.

[34] Similarly, in Bungie's project, positive feedback and motivation could help create a positive and even cyclic process: "We came to work each day excited about the project…All the great previews and supportive feedback

Clearly, intrinsic motivation plays a key role in game development as it does in other settings (Amabile 1996).

Necessary Ingredients

While cabals work to fill in missing resources, making the cabal work is another matter requiring of other critical ingredients that help with the creation and management of the cabal's knowledge:

Coordination in the cabal: It is critical for us to understand that cabals can operate not only because of the collective, but perhaps, more accurately, *despite* the collective. One clear characteristic of cabals is that they usually do not have lead designers, and members often come from outside of the professional designer occupational category. While there is no clear hierarchy in the cabal, one member is usually tasked to coordinate the cabal's work as well as any inputs from the broader teams. In this regard, the coordinator serves the role that an implementing designer may generally possess. As an interviewee noted: "*But really the designer's job in [our studio] is to go communicate with everybody else on the team. To give and to get feedback from those guys and then to figure out what to do with that feedback… you take that information and you make the decisions…its like being able to take this giant ball of information and say good lord what are we gonna do with this, what does it mean?*"[35]

Coordination takes two forms: to clarify the vision for every team member, and to ensure that they work in support of one another. In *Deus Ex*, *"A clear high-level vision"* was deemed

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from beta testers kept us excited and made us realize that we really did have something special on our hands. Nobody wanted to slack off and allow competing products to beat us to the shelves."

[35] Our other interviews with designers who also played implementing roles (e.g. studios such as Niso Games and Insomniac Games) also provide support for this view. Niso Games' lead designer noted how he served to communicate with team members on implementation as much as anything else in his role.

necessary, because it allowed the team to *"assess every design decision and every game system specification in light of our ultimate goals".*[36]

The cabal is coordinated around several tacit and codified forms of knowledge. The codified form is centrally the design document, and tacit forms include regular meetings and even line reporting requirements (e.g. in a typical non-cabal studio, artists typically respond to the lead artist, programmers to the lead programmer etc.). Finally, coordination of implementation is eased by specific "spines" that help guide the eventual development of the finished product. These may or may not be socially agreed upon or decided at the outset. Even Valve's success in reconstituting itself as a cabal is partly due to fact that a strong story was commissioned from a professional storywriter on the second version of product.

Choosing the right personalities: It was also clear that cabals are not for every team. Relating to Valve's Cabal, *"People with strong personalities, people with poor verbal skills, or people who just don't like creating in a group setting shouldn't be forced into it. We weighted our groups heavily toward people with a lot of group design experience, well ahead of game design experience."* Alice's producer also noted that *"We waited and chose people we were right for the team… During the development of ALICE, people were not interested in who got credit for what, or whose great idea something was, but simply that everyone was working to make the game stronger."*[37] He further noted *"There are industry horror stories of teams that are ruined by egomaniacal people".*

Other Projects with Cabal-like Characteristics

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[36]On the other hand, the team that made *Tropico*, an eventually successful game, *"failed to realize at the time that everybody was carrying a slightly different picture in his head of what the final game would be."* (Poptop Software's Tropico, postmortem, *Game Developer*, September 2001.)
[37] Note that this was not a cabal.

As unusual as it was, Valve's was not the only instance of a cabal. Other teams with project organizations that were cabal-like or that possessed selected strong features of cabals included the studios Bungie, Irrational Games, Blizzard, Rogue Entertainment, Crystal Dynamics, and Ensemble.[38] All of these were also successful games. For instance, at Blizzard, *"Design was a largely open process, with members of all teams contributing."*[39] In Ensemble, the "cabal" quality arose with the involvement of the entire team in play-testing the game, as well as in getting ideas from team members.[40]

In fact, our ethnographic work and interviews suggest that actual practices in many studios tend to fall in-between the extreme top-down and bottom-up approaches described earlier in sections 3.1 and 3.2. The projects that had self-described cabal-like characteristics, but that were not fully cabals in their own regard, reflected some of this.

3.3. The Adaptive Quality of Creative Organizations

The literature suggests that creative industry projects might have self-organizing characteristics (Jeffcutt and Pratt 2002, Girard and Stark 2002). Certainly, the formation of a cabal is one such event, and in fact, the pitching in of teams and even the creating of teams out of teams seen in cabal-like groups suggests a fluid nature to the work. Changes and adaptations that can take place afterwards within the organizational structure include the smaller breakout groups formed by Crystal Dynamics and Valve on an ad hoc basis and in rolling, adaptive fashion. *"(At*

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[38] Rogue Entertainment is now defunct, and Ensemble was eventually acquired by Microsoft.

[39] It is worth noting that this does not mean that all team members contribute to design directly, but simply, that team members help to work on design, or can resolve design issues as part of their other specialized work. In *Pandemonium 2*, there was a design team of specialized designers, but multi-functional teams were created to assist in implementing each part of the design. Similarly, in the Irrational Games development model, *"everyone participates in design,"* but this could simply mean, for instance, that *"programmers were able to resolve design issues without having to stick to a design spec"* (Irrational Games' System Shock 2, postmortem, *Game Developer,* November 1998).

[40] Based on Age of Empires postmortem and on author's interview with Ensemble lead designer, Ian Fischer.

Crystal Dynamics) we created 'micro teams', built around designers and artists with a similar vision… to guide the creation of each "game zone," or chapter of the game. Decisions on game play, specific mechanics, and the graphical style were made within these micro teams" which in turn facilitated *"creative freedom and efficiency"*.[41]

As Valve notes, *"Internally, once the success of the Cabal process was obvious, mini-Cabals were formed to come up with answers to a variety of design problems. These mini-Cabals would typically include people most affected by the decision, as well as try to include people completely outside the problem being addressed in order to keep a fresh perspective on things. We also kept membership in the initial Cabal somewhat flexible and we quickly started to rotate people through the process every month or so,"* Other examples of this kind of shift in project organization include the teams that worked on *Alice* and *Deus Ex*. These project organizations may be so adaptive because of the inherent complexity of managing a team with disparate capabilities (e.g. some with more design or development experience than others), combined with the inherent uncertainties of game development. Indeed, many teams try to work on new genres that they have little experience on. As a result of this, it is not easy to reliably and consistently form effective teams. Warren Spector, a highly respected designer in the developer community, wrote: *"You'd think after 17 years of making games and building teams, I'd have a clue about team structures that work and those that don't."*[42]

Another characteristic that is unusual to some cabal or cabal-like teams is that they evolve their designs, or they 'design-on-the-fly'. At one extreme is Blizzard, whose *"Diablo II never had an official, complete design document. Of course, we had a rough plan, but for the most part we just started off making up new stuff…"* Epic Games' model offers an interesting

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[41] Pandemonium 2, postmortem, *Game Developer*, November 1997.
[42] Ion Storm's Deus Ex, postmortem, *Game Developer*, November 2000.

insight into why certain types of games may be easier to design on an ad hoc, rolling basis, and may even allow for even more unstructured bottom-up group organization. Epic used a *"hodgepodge design approach"* for making *Unreal Tournament*. That this was even possible was because of the type of game it was: a multiplayer *"deathmatch-focused first-person shooter"* which *"doesn't need a story, dialogue, or scripted sequences, which are all features that more or less require an organized design"*[43]. Some teams note that they evolve their design in a more controlled, rational manner. Bioware (not listed as a cabal) notes that the design principles laid out initially for *Baldur's Gate II* were left open to modification as the development proceeded.

Similar changes were also observed in our ethnographic data, though space limits us from discussing it in detail.

4. Discussion

Game development studios seek not only to develop their products efficiently, but also to ensure creativity by configuring their organizational structures to ensure a combination of creative efforts at the top and bottom of the organization. In accomplishing their work, the creative work of studios might be resolved as a completely top-down (dominant creator) model, as a bottom-up (cabal) model, or as a mixed model that provides the team with enough creative freedoms but that also allows it to function with top-down direction. That there are "multiple equilibria" for managing creativity within game projects is not that surprising, but the reasons why each type of model occurs might offer insight for product development and organizational knowledge management processes in general. Ultimately, be it a dominant designer or a cabal,

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[43] The game involves multiple players coming online to challenge each other by shooting each other in first person perspective, usually within set scenarios and "maps" of various locations.

the "tension" within the production process is about the tradeoff between providing sufficient group empowerment (not only through bottom-up means but also through providing clear organizational structures) while providing enough direction or control to implement a vision.

Resources and the needs of the project as determinants of roles

Having discussed the types of individual role that a designer may undertake and the nature of cabals (in effect, designer-less teams), we can now return to a more nuanced understanding of roles in the project organizational structure.

Firstly, the designer's role embraces some of what he or she is capable of, as well as to some degree, the project's needs. The visionary creator tends to be a well-known designer associated with a stylistic if not breakthrough sort of product, while the implementing designer tends to be a respectable (though not necessarily well-regarded) designer who fits in with an equally respectable team. Similarly, the prototyping creator may be a well-known individual who is multi-talented and fully capable of making the prototype himself or herself (this typically being innovative).

Secondly, we can say that roles are in effect dictated by the project's and team's circumstances and available resources. As the studio head of Niso noted, they adopted cabal-like characteristics because they did not have a well-regarded designer on staff.

Both of these first two observations lead us to the notion that creative resources can be thought of as being fungible. Said another way, role structures (as determining of an established pattern of work) appear to be embedded in the project and its evolving needs, as well as are reflective of the resources available to the project.

The maintenance of a consistent vision is highly important in complex creative products like games as much as it is in corporate strategy. In this sense, all of the designer roles that we identified provide structure, either in vision-setting terms, or in defining detailed plans (coupled with longer-term guidance over the implementation phase) for the team. It is in addressing the "missing resource" of a well regarded designer that cabals end up supplying much of the same need.

Fluidity of the project

Thirdly, as section 3.3 shows, the fluid and adaptive nature of game development teams suggests that at least some projects have another side that is both complementary to and coexistent with the types of professionalized and institutionalized role structures seen in game and other projects, e.g. those studied by Bechky (2006). While these may or may not be "negotiated", they certainly suggest that "project need" is an important driver of role creation and sustenance. This need relates to the nature of project teams (and what they lack), and even their reconstitution in alternative structures.

5. Conclusions

We have shown that the extremes of the top down designer-driven and bottom-up cabal-based approaches, as well as the mixed model, all present valid approaches to developing products. Each of these approaches embeds particular views of project organization that connect to the artifact's developmental need.

We have also shown how role systems are defined by the capabilities of both designers and the project teams. The individual creator who is capable of prototyping or visionary acts can

become a "dominant resource" as it were. However, in the absence of this, organizations tend to

rely on the extant resources of the team. The analysis of the cabal form sheds light on this link

between design needs and organizational resources: The cabal is vital to the accomplishment of

design details where designers are found lacking. Whether cabals can best supply the more tacit

tasks of vision creating depends on how cabals (or limited versions of them) are constituted, e.g.

as tapping into each team member's abilities to define a separate vision. The organizational

structure of the cabal also requires support by both tacit and codified means in order to be

enacted successfully. Ultimately, this moves us towards a better understanding of how roles arise

in relation to project needs and resources, and how roles are thus defined in different contexts.

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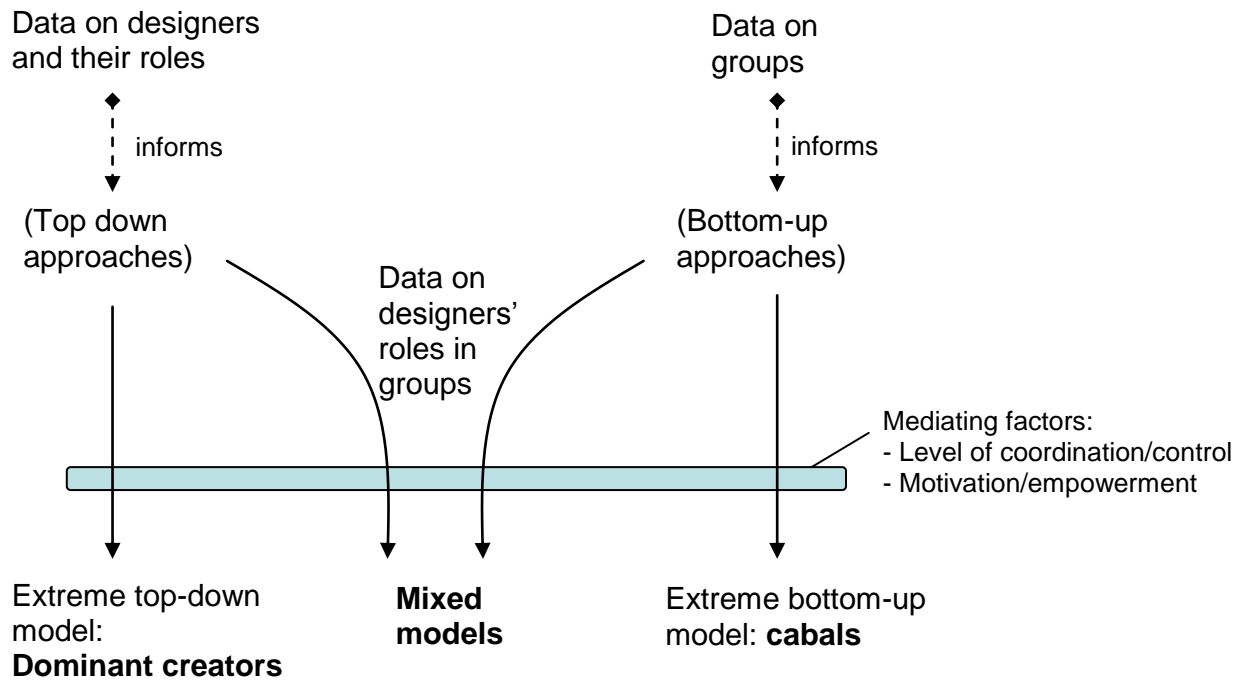
Figure 1. Logical Layout of the Data, and Concepts (approaches and factors) and Models Induced by the Analysis