Designing Player Interdependence to Enhance Players’ Social Experience in Multiplayer Games

Katharina Emmerich

CONTENTS

2.1 The Social Player Experience 19
2.2 Player Interdependence 21
2.3 Approaches to Design for Player Interdependence 22
  2.3.1 Complementarity and Coupled Interactions 22
  2.3.2 Level Design 25
  2.3.3 Interface Design 27
2.4 Challenges Regarding Player Interdependence 29
2.5 Conclusion 31
References 32

2.1 THE SOCIAL PLAYER EXPERIENCE

The appeal of multiplayer games lies in the rich opportunities for social interaction that they offer. People play such games to spend time with friends and family, as well as to establish new relationships (ESA—Entertainment Software Association, 2018; Kaye & Bryce, 2012). Players appreciate the social interaction and the feeling of being socially connected.
Many current games feature multiplayer modes or are completely focused on social play to enable social experiences. The additional social layer is a strong motivation for players and an important aspect of the overall experience of playing (de Kort & Ijsselsteijn, 2008; Stenros, Paavilainen, & Mayra, 2011). Apart from the commercial success of multiplayer games, research confirms the positive impact of the presence of co-players: studies indicate that players experience higher positive affect and enjoyment when they play a game with other players compared with playing the same game alone (Gajadhar, Kort, & Ijsselsteijn, 2008; Lee, Wyeth, Johnson, & Hall, 2015; Mandryk, Inkpen, & Calvert, 2006; Peng & Crouse, 2013; Tamborini, Bowman, Eden, Grizzard, & Organ, 2010; Weibel, Wissmath, Habegger, Steiner, & Groner, 2008).

According to different theories, the positive experience in multiplayer games results from the satisfaction of social needs (Kaye & Bryce, 2012; Tamborini et al., 2010) and socio-psychological effects such as emotional contagion, which can intensify the experience (de Kort & Ijsselsteijn, 2008; Isbister, 2010; Kaye & Bryce, 2012; Stenros et al., 2011). One well-established theory of motivation, which is often referred to in digital games research, is the self-determination theory (Ryan, Rigby, & Przybylski, 2006). This theory states that a person’s intrinsic motivation is determined by basic psychological needs. Based on the self-determination theory, game enjoyment can be defined as the satisfaction of the needs for autonomy, competence, and relatedness (Tamborini et al., 2010). More precisely, Ryan et al. (2006) define five aspects that influence the motivation to play: (1) perceived autonomy; (2) perceived competence; (3) perceived relatedness; (4) perceived presence; and (5) intuitive controls. The third aspect, perceived relatedness, describes the feeling of being connected with others, and is particularly relevant for multiplayer games. Results of a large online survey by Vella, Johnson, and Hides (2015) indicate that players perceive higher autonomy for solitary play sessions, whereas relatedness is mostly associated with social play.

Another concept that accounts for the social experience in digital games is social presence. In general, social presence describes the “sense of being with another” (Biocca, Harms, & Burgoon, 2003, p. 456). It is associated with the awareness that another social entity—such as a co-player or an in-game character—is part of the gaming situation (de Kort & Ijsselsteijn, 2008). Social presence can be used to describe the social richness and quality of a play setting and the extent to which the experience of players is influenced by it (de Kort & Ijsselsteijn, 2008; de Kort,
Ijsselsteijn, & Poels, 2007; Hudson & Cairns, 2014a, 2014b). High social presence is related to a sense of deep psychological and behavioral involvement with the other players (Hudson & Cairns, 2014b) and supposed to contribute to a positive player experience.

Considering the aspects mentioned above, we can conclude that a high perceived social presence and a high feeling of relatedness is beneficial for players’ enjoyment and, consequently, the success of a multiplayer game. Hence, game designers may strive for fostering the social aspects of the player experience. One way to do that is to create interdependence between players.

2.2 PLAYER INTERDEPENDENCE

In this chapter, we define player interdependence as the degree to which players are influenced by and dependent on another player’s actions to reach the game’s goal. Usually, there is at least some degree of interdependence between players in multiplayer games due to the general goal structure, which defines the main interaction pattern between players (Adams, 2010). Basically, players either have opposed goals, resulting in competition, or they work together towards a shared goal, fostering cooperation (with hybrid forms such as team competition being common, as well) (Adams, 2010; Fullerton, Swain, Hoffman, & Isbister, 2008; Waddell & Peng, 2014). Hence, the behavior and the performance of co-players always influence a player’s own actions. In games with cooperative elements, the experience of interdependence is particularly important and more complex than in straight competitive games, because players must coordinate their actions, build common strategies, and help each other.

A high player interdependence fosters players’ interaction and group forming (Ducheneaut & Moore, 2004). Moreover, it can contribute to the emergence of group flow: players engaging in the same activity experience a comparable level of flow (Kaye & Bryce, 2012). The concept of flow was coined by Csikszentmihalyi (2009) and describes a desirable mental state of total engagement that can be achieved if an activity is challenging and at the same time intrinsically motivating. Based on focus groups, Kaye and Bryce (2012) identified several factors that can support group flow, one of which is interdependence.

Interdependence is also related to the experience of social presence. In common questionnaires that assess social presence, such as the Social Presence in Gaming Questionnaire (SPGQ) (de Kort et al., 2007), the Competitive and Cooperative Presence in Gaming questionnaire (CCPIG)
(Hudson & Cairns, 2014a, 2014b), and the Networked Minds Questionnaire (NMQ) (Harms & Biocca, 2004), the interdependence between players is taken into account on certain subscales. For instance, the third subscale of the SPGQ, *behavioral engagement*, refers to the experience that one’s actions are dependent on the actions of the co-player(s). The NMQ contains the subscale *perceived behavioral interdependence* and the CCPIG includes similar items regarding the behavioral interdependence of players in the subscales *team involvement* and *attention*. Hence, researchers consider interdependence as an important aspect contributing to perceived social presence and a positive social experience.

In the following, we will discuss different ways to design for interdependence to increase players’ social interaction in multiplayer games.

### 2.3 APPROACHES TO DESIGN FOR PLAYER INTERDEPENDENCE

There are several ways to increase the interdependence between players by design. We categorize different approaches into three main groups: complementarity, level design, and interface design.

#### 2.3.1 Complementarity and Coupled Interactions

As stated above, a certain degree of player interdependence is created by the general goal structure of a game. Besides, the level of interdependence is further shaped by the roles and abilities that are assigned to each player by the game. In general, player roles and abilities can either be symmetric or asymmetric (Fullerton et al., 2008; Harris, Hancock, & Scott, 2016; Schell, 2010). In many classic games (e.g., chess), all players have the same roles and abilities, providing a symmetric game design. In this case, all players have the same opportunities and can perform the same actions, inducing no direct interdependence. In contrast, asymmetric games assign different player roles, so that each player has unique characteristics and capabilities, which complement each other. This kind of complementarity is a commonly used pattern in cooperative games (Rocha, Mascarenhas, & Prada, 2008). By providing complementary roles, games can create high interdependence between players. For instance, in most roleplaying games there are healers who can restore health but cause little damage, whereas warriors are strong damage dealers but cannot restore health by themselves. Hence, players must work together to be able to defeat the enemies.

Depping and Mandryk (2017) evaluated the difference between high and low interdependence in a custom two-player game using either
complementary player roles with different abilities or the same role for both players. The results of the study indicate that high interdependence induced by complementary abilities of players leads to higher experienced relatedness and increased game enjoyment compared with the game version with low interdependence. The authors conclude that this form of interdependence can foster team building among player groups and a positive player experience.

Apart from the enhancement of interdependence between players, complementary roles and abilities can make the game more interesting and enjoyable for all players, as they avoid one player taking the lead and making decisions for the entire team (Zagal, Rick, & Hsi, 2006). Decision-making processes and the coordination of actions become more important. Moreover, with different roles, a game also supports different playing styles, thereby satisfying several player preferences.

A design pattern that is closely related to complementary player roles is the creation of synergies between abilities (Rocha et al., 2008). This means that one player can have a direct effect on the abilities of another player. For instance, one player might increase an enemy’s vulnerability to another player’s attacks. To create such synergies, players do not necessarily have to have complementary roles, but both patterns are often combined to enhance interdependence. Reuter, Wendel, Göbel, and Steinmetz (2014) discuss game design patterns for collaboration in digital games and summarize them in three categories: general, gates, and support. All patterns in the support category describe player properties or abilities that provide benefits for co-players, for instance, by preventing or removing negative effects or by restoring capabilities.

On a more general level, Beznosyk, Quax, Lamotte, and Coninx (2012) differentiate between closely coupled and loosely coupled collaboration of players: a close coupling between players means that their actions and decisions directly influence each other, whereas loosely coupled players are more independent. Based on this concept of coupling, the authors investigated the influence of interdependence on players’ experience in casual games. The results of their study indicate that players prefer games that include closely coupled interactions, that is to say a high interdependence. The participants reported higher perceived excitement, engagement, replayability, and challenge in the closely coupled condition. This finding is supported by the work of Harris et al. (2016), who compared players’ ratings of different degrees of asymmetry and interdependence in a custom collaborative game. Participants in their study reported that
they preferred being dependent on each other, because they did not like the feeling of being useless in the case of low interdependence: players want each players’ actions to be significant and necessary to succeed as a team, rather than being self-sufficient. In two subsequent studies, Harris and Hancock (2019) further investigated players’ experiences regarding varying degrees of asymmetry and interdependence. In line with previous results, both asymmetry and high interdependence were preferred by participants and led to higher ratings of social presence, connectedness, immersion, and behavioral engagement, confirming the potential of designed interdependence.

At the same time, high interdependence in terms of complementary player roles and closely coupled interactions increases the complexity of game balancing. It is important that each combination of roles and abilities is fair and offers interesting choices and experiences for all players. If one role is perceived as superior or inferior, this lack of proper balancing may result in demotivation and frustration. Besides, the requirement to coordinate actions can increase the level of challenge and may cause frustration if players fail to coordinate themselves properly (Beznosyk et al., 2012; Harris et al., 2016).

Apart from complementary roles and abilities, interdependence can also be created by means of game resources in several ways (Björk & Holopainen, 2005). Players can be forced to interact with each other, if required resources, such as certain items, are unequally distributed. For instance, one player may have access to a locked chest, whereas the other player possesses the key. If players need the content of the chest to proceed, they must work together to open it. Moreover, Seif El-Nasr et al. (2010) define “limited resources” as a cooperative game design pattern that can encourage players to get in contact and share or exchange resources. By generally shortening the supplies, players are more likely to trade and think about the best ways to use them. Finally, if players have access to a shared pool of resources, this also increases interdependence. In such a case, a player must consider the needs of the co-players and coordinate the usage of shared resources.

Information can be considered as a special kind of resource, which can have a significant influence on players’ communication and interaction (Björk & Holopainen, 2005). An asymmetric distribution of information among players leads to an imbalance of knowledge. In competitive games, players can try to obtain an advantage and preempt the others by gathering important exclusive information. For instance, if the goal of the game
is to find a treasure chest first, the player who finds a treasure map has an advantage and might try to keep this information as a secret or even start bluffing and disseminating misinformation. In contrast, in collaborative games, asymmetric information can foster players’ communication, because they must create a common knowledge base needed for coordinating their actions. The process of sharing information while adhering to certain rules can even be the core challenge of a collaborative game.

The distribution of information can be combined with different player roles and perspectives. For instance, one player can take the role of a navigator, having access to maps and world information, while another player can walk through the world and interact with objects. In such a case, both players have complementary roles, perspectives, and information, resulting in high interdependence.

2.3.2 Level Design

Another way to increase players’ interdependence is to create specific level structures that force players to interact with each other or to coordinate their actions. There are two main level design approaches in this context: first, using shared objects and obstacles that players must use or overcome together (Seif El-Nasr et al., 2010) and, second, introducing distinct areas for each player (Reuter et al., 2014).

Cooperation-oriented obstacles can be created by designing shared puzzles (Seif El-Nasr et al., 2010). Such puzzles include tasks that can best be solved if players work together. The interdependence between players is highest if it is not possible to overcome the obstacle alone. A classic example is a cooperative switch puzzle: a door can only be opened if two distant levers are pulled at the same time. This way, a single player cannot proceed alone. Instead, two players must synchronize their actions and are, thus, dependent on each other. Similarly, interdependence can be induced by having players interact with the same object simultaneously (Seif El-Nasr et al., 2010). A box blocking the way can be too heavy for one single player, whereas a group of players is able to push it away. Reuter et al. (2014) call this design pattern concurrency.

A less obvious type of shared obstacle that induces cooperation is a sharply increased difficulty in certain game areas so that a single player cannot (or only hardly) pass them. This approach is common in massively multiplayer online games: whereas players can explore large parts of the game world alone, other parts (e.g., dungeons or raids) require the formation of player groups due to a high number of strong enemies.
(Ducheneaut & Moore, 2004). This way, players are strongly encouraged to cooperate without the inclusion of specific cooperative game mechanics or obstacles.

It is also possible to increase players’ interdependence by separating levels into distinct player areas with limited access and unique possibilities of actions. Though being separated, such a setting can lead to high interdependence if all players must perform certain actions on their path to make the game proceed for the entire group. For instance, one player may activate a mechanism that opens a door on another player’s path. Due to the distinct areas that players “control” on their own, players may experience high autonomy in addition to the feeling of relatedness to the others. However, it should be considered that such a level design can result in unfavorable waiting times for players who are quicker than their co-players. Hence, during the design process downtimes should be evaluated and balanced carefully.

Such a separation of player areas can either be continuous—for instance, if players have different roles and related perspectives on the game world during the entire game—or temporary. In this context, Reuter et al. (2014) introduce the concept of gates: they define points in the game where players must split up (separation gate) or reunite (gathering gate) before they can continue. Using these patterns enables the design of temporary distinct player areas inside a level to increase interdependence while at the same time emphasizing that each player’s individual contribution is significant to proceed.

In an empirical study, Emmerich and Masuch (2017) investigated the impact of high and low player interdependence on the player experience. They created two versions of a custom two-player platformer game and varied the degree of interdependence by using separated player areas. In the first version, each player had to overcome obstacles and was able to manipulate certain objects, such as moving platforms, in their own area to do so (low interdependence). In the other version, players could not control their own area but only the objects in the other player’s area, so that they must help each other (high interdependence). A comparison of both game versions shows that players communicated differently and had different social experiences. In the high interdependence group, there were less utterances of frustration and more communication regarding the coordination of common strategies. Perceived social presence was also significantly higher. The results indicate that player interdependence induced by the level design can change the way players communicate and pay attention to each other.
2.3.3 Interface Design

Finally, player interdependence can also be induced by specific interface configurations. This concerns both the input and the output side; hence both will be discussed in this section. Regarding the output interface, it can make a huge difference in terms of player interdependence whether players share a single screen or have their own screens. If players have their own displays, they can have different views on the game world and see information the other players have not, for instance, regarding their characters’ stats. This way, players are rather independent with respect to the interface. However, individual screens can support interdependence-inducing game design patterns such as asymmetric information distribution. A shared screen, in contrast, discloses all information to all players, so that they can retrace each other’s perspectives and actions. Seif El-Nasr et al. (2010) differentiate three camera settings: split screen, one character in focus, and all characters in focus. Whereas split-screen settings simulate several displays and thereby provide independence and autonomy regarding players’ navigation, a shared camera setting demands players to agree upon the direction of movement.

Apart from classic display settings with either one shared screen for a co-located group of players or individual screens for each players, modern games and systems offer innovative design spaces with new interface opportunities. One example is the use of virtual reality headsets. Such head-mounted displays provide a high level of sensory immersion, but also separate the players from each other (Liszio & Masuch, 2016). Hence, their representation inside the game world must be considered carefully, so that they are still aware of their social presence. Another innovative approach is second screen gaming, which refers to the idea of adding additional devices to the gaming scenario to display game content (Emmerich, Liszio, & Masuch, 2014). Equipping players with additional displays can offer a range of design possibilities, which can support the establishment of interdependence between the players. For instance, a mix of private and public displays facilitate the asymmetric distribution of information. Moreover, different devices can be linked to distinct player roles and perspectives.

The design of the input interface—the controls of a game—can also have significant impact on players’ interdependence. In common multiplayer settings, each player has their own input device, for instance, a gamepad or mouse and keyboard as well as their own game character. To increase players’ interdependence, their inputs can be coupled closely by
giving them shared control. Shared control can be understood as a special control mode that gives players collective control over game characters, either by giving all players control over all existing game characters or by enabling players to control one single character simultaneously (Seif El-Nasr et al., 2010; Sykownik, Emmerich, & Masuch, 2017). This can lead to seemingly chaotic gameplay but can also induce a lot of fun due to the special challenge of coordinating inputs.

As there are manifold possibilities to implement shared control, Sykownik et al. (2017) introduce a classification of different types of shared control. The authors consider two main dimensions: the locus of manipulation and the timing. Locus of manipulation is a term that refers to the in-game position of a player’s manipulation of the game world. This can, for instance, be an avatar, a cursor, or a game object (such as a block in Tetris). Players can either control a mutual locus of manipulation (e.g., a shared game character) or several distinct ones (e.g., different game characters or different body parts of the same character). Regarding the aspect of timing, Loparev, Lasecki, Murray, and Bigham (2014) differentiate between simultaneous control and control alternation. The traditional passing of a gamepad in co-located couch settings can also be regarded as a form of alternating control: players switch between phases of active game control and passively watching other players.

Any type of shared control increases players’ interdependence compared with traditional control patterns, as the input of one player effects the other players. This effect is probably strongest for simultaneous control over a shared locus of manipulation, because the input of each player is directly combined, and any conflict becomes directly apparent. The differences between shared control modes and traditional control modes in terms of player experience and communication have been evaluated in studies. Emmerich and Masuch (2017) compared two different versions of a custom testbed game, in which players control several blocks and must navigate them to predefined target positions by solving puzzles. In one version, players have control over distinct blocks in the level. They can switch between their blocks anytime, but one player cannot control the blocks of the co-player and vice versa. In the second version, all players can take control over all existing blocks. This means they have shared control over distinct characters. The results of the study show that players perceived less autonomy and competence in the shared control condition, whereas perceived social presence was very high in both game versions. At first glance, the results speak against a positive impact of shared control.
Player Interdependence and Players’ Social Experience ■ 29

on the player experience. However, the study tested only one specific implementation of shared control. Hence, game designers who consider implementing shared control as an interesting feature should carefully account for players’ needs for autonomy and competence (Emmerich & Masuch, 2017).

In another study, Sykownik et al. (2017) compared different implementations of shared control in a custom game with a single avatar that was controlled by four players. All tested shared control modes elicited high levels of fun and provided entertaining experiences. This positive effect can be mainly attributed to the high interdependence between players, as players’ cooperation was the core game mechanic of the game. Perceived autonomy and competence were also satisfactorily high. An evaluation of the perceived social presence of the players indicates that the forced collaboration between them can foster team cohesion between co-players and thereby enhancing their relationship. In sum, the results of the study underline the potential of shared control for developing innovative, highly social experiences. At first glance, the results of both studies reported above seem to partly contradict each other. It has to be noted that the games used in both studies differed regarding the locus of manipulation: in the study by Emmerich and Masuch (2017) players had control over four distinct characters, whereas the second study focused on the use of a single mutual avatar. The latter type of shared control might be more favorable in terms of players’ need satisfaction.

2.4 CHALLENGES REGARDING PLAYER INTERDEPENDENCE

In the previous sections, we have learned about the potential of player interdependence in terms of the enhancement of the social player experience and discussed different ways how the interdependence between players can be fostered by design. Though the results of related studies indicate that a high player interdependence, particularly in collaborative games, can increase players’ perceived social presence and enjoyment, there are also challenges that game designers have to consider before relying on related design patterns.

As stated above, the balancing of the interdependence between players is important, particularly if asymmetry and complementary player roles are used (Harris & Hancock, 2019). Though distinct roles can serve diverse playing styles and preferences (for instance, some players like to take the lead, whereas other players like to be supportive), it must be prevented that some roles are perceived as generally less favorable than others. If
players perceive their specific role or task in a game as less significant than those of other players, they may get frustrated because they feel that they cannot contribute to the team’s success. Similarly, an unbalanced level of difficulty of different player roles can lead to the perception of unfairness. Both too high and too low challenges impede a positive experience. Finally, a high interdependence can lead to situations in which one player has to wait until the other player has performed a certain action or overcome a challenge. Such waiting times must be kept as short as possible. If they are unavoidable, game designers should consider integrating features that prevent boredom while waiting. For instance, if waiting players can observe the other players and provide feedback or help, they are still passively involved in the gameplay.

Apart from a positive effect on perceived social presence, a high level of interdependence between players can also have negative side effects on players’ experience during play. High interdependence may interfere with feelings of autonomy, which is an important need to be satisfied during play according to the self-determination theory (Emmerich & Masuch, 2017; Sykownik et al., 2017). Interdependent players are forced to cooperate, which limits their freedom to explore the game world on their own and to try out their own ideas. Moreover, players are not in full control over their success or failure in the game if their destiny is coupled with other players. If players do not trust their co-players or perceive them as incompetent, they will get frustrated. Consequently, game designers should consider players’ need for autonomy and integrate game features that promote it. Harris and Hancock (2019) point out that in this context the “rhythm of interdependence” is also important. Based on the feedback of participants in their study, the authors report that players would opt for varying degrees of interdependence in a full-fledged game. This can be achieved by alternating game scenes that require close collaboration with scenes that focus on players’ individual contributions. This way, the challenges are more diverse, and players can experience both individual success and high sociability.

Another important aspect regarding the implementation of player interdependence is player communication, because there is a higher need for discussing strategies. If players are forced to coordinate their actions due to high interdependence, then they should have the opportunity to communicate properly. Hence, game designers must consider which communication channels are necessary to promote players’ interaction. Results of a study by Gajadhar, de Kort, and Ijsselsteijn (2009) indicate that in online
play settings, verbal communication with co-players can significantly enhance the social player experience and players’ enjoyment. Moreover, the participants reported less perceived challenge and frustration if they were able to talk to each other during play, showing that audio cues facilitate coordination. Apart from verbal communication, game designers can consider integrating additional communication channels such as visual cues (e.g., video chat) and in-game communication mechanics. So-called cooperative communication mechanics (CCMs) enable players to share information or to direct attention to a specific part of the game world by using in-game features. A simple example is a ping system: players can create a visual and/or audio cues in the game world in order to highlight points of interest for another player. Vaddi, Toups, Dolgov, Wehbe, and Nacke (2016) studied CCMs and compared them with voice communication using the cooperative mode of the game Portal 2 (Valve, 2011). The authors found that players preferred direct verbal communication and that their performance was better if they were able to discuss strategies and puzzle solutions. However, players also appreciated the availability of CCMs and used them a lot to further specify what they were planning. Hence, in-game mechanics are valuable as they can enhance players’ communication and should be considered by game designers.

2.5 CONCLUSION

In this chapter, we have discussed the potentials and challenges of the design of player interdependence in digital games. A high interdependence between players fosters communication and interaction and, thus, is a means of increasing players’ social experience in terms of social presence, connectedness, and enjoyment. However, a close coupling between players also entails several challenges. As pointed out, game designers should consider issues of balancing, self-determination, and communication mechanics, which are particularly important in the context of interdependence design.

There are diverse possibilities to constitute player interdependence, which we have clustered in three main categories: complementarity, level design, and interface design. Different player roles and abilities, specific level structures, joint puzzles, player screens, and shared control are exemplary game design patterns, which add to the connection between players. Using such game patterns to create player interdependence can contribute to a game’s appeal, if the challenges and issues mentioned above are carefully considered during the design process.
REFERENCES


Player Interdependence and Players’ Social Experience


