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Are telecommunication and media converging?
The change in the production and distribution model of audio-video contents

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Résumé

Introduction

Selon l'approche classique du droit d'auteur, un monopole légal est nécessaire pour inciter les artistes à produire des œuvres intellectuelles. Le monopole donnée par le droit d'auteur semble en effet fondamental pour encourager les artistes à créer et les investisseurs à financer de nouveaux œuvres en raison de l'effort que constitue la création et la diffusion des œuvres (Boldrin et Levine 2008 , van Gompel 2012).

Cependant, avec l'avènement des nouvelles technologies, la protection classique du droit d'auteur semble être parfois obsolète. Nous assistons à l'émergence de nouvelles licences qui réduisent la protection du droit d'auteur, tels que les licences du Logiciel Libre et les licences Creative Common (CC).

Les œuvres créées par les artistes sont des biens intangibles et leur valeur est essentiellement liée à l'information qu'ils contiennent, plutôt qu'à leur support. Par exemple, la valeur d'une vidéo ne dépend pas du support sur lequel elle a été enregistrée. Même si les coûts nécessaires pour produire de l'information sont des coûts de capital humain, l'information produite est un bien public pur (Demsets 1970).

Puisque l'information a un caractère de bien public, l'utilisation d'une forte protection, comme dans le cas du droit d'auteur, implique des inefficacités systématiques en matière de provisionnement privés d'information. Cela se produit notamment avec l'émergence d'une production par les communautés d'utilisateurs, facilitées par la révolution numérique (Benkler , 2002).

La révolution numérique a changé la façon dont les œuvres protégées sont produites et consommées : les coûts de production diminuent de façon significative, la collaboration entre les gens est devenu plus facile et les communautés d'utilisateurs émergent. En outre, les supports sur lesquels l'information est stockée deviennent moins importants, la diffusion devient plus efficace et ses coûts deviennent quasi-nuls.

Depuis les années quatre-vingt-dix, les licences des logiciels libres permettent aux communautés d'utilisateurs et aux sociétés de fournir des logiciels sous copyright sans restriction et d'en tirer profit (Benkler , 2002). Depuis décembre 2002, les licences CC permettent aux communautés d'utilisateurs et aux organisations de fournir des œuvres artistiques sous copyright sans restriction et en tirer profit (Lessig 2004).

Les licences CC sont directement inspirées de la culture du monde du logiciel libre. Toutefois, dans le cas des logiciels libres, les développeurs ont eux-mêmes codifié la culture de partage existant en écrivant de nombreuses licences. Au contraire, les licences CC ont une approche top-down et ont été créés par

l'Organisation Creative Commons, fondée spécifiquement pour permettre le partage des œuvres de l'esprit (Välimäki et Hietanen 2004).

Malgré l'énorme quantité de littérature sur le logiciel libre, il y a un manque dans la littérature sur les licences CC. Une grande partie de la littérature sur licence CC se concentre sur la façon dont ces licences fonctionnent comme régime alternatif à la protection classique du droit d'auteur. On sait peu concernant les dynamiques qui sous-tendent l'utilisation des licences CC pour réussir dans une production d'un projet.

Les CC sont des licences fondées sur le droit d'auteur. Contrairement à un contrat, la licence oblige seulement le donneur de licence de tolérer des comportements autrement interdits par le droit d'auteur. Il ne crée aucune obligation nouvelle qui n'est pas déjà prévue dans le régime du droit d'auteur classique (Hietanen 2007). Donc le CC adapte le droit d'auteur dans le cas où un effet sinistre serait produit par la privatisation de la production collective (Ciffolilli 2004).

Les informations contenues dans un travail intellectuel ont au même moment l'aspect de bien public et l'aspect de matières premières pour l'exploitation commerciale. L'équilibre entre l'intérêt collectif de la société et les droits de propriétés individuelles est un défi depuis des siècles (Flew 2005).

L'utilisation des licences Creative Commons est un moyen viable pour résoudre les conflits entre intérêt collectif de la société et les intérêts individuels. Avec l'utilisation des CC les créateurs peuvent décider leur degré optimal d'ouverture / restriction de la protection du droit d'auteur selon leurs intérêts et les intérêts des contributeurs. Pour cette raison, les licences CC peuvent harmoniser les intérêts de la société et des individus (Flew 2005 Broussard 2007).

Les CC peuvent aller vers l'intérêt privé des créateurs et au même moment vers les intérêts publics des utilisateurs, car ils reflètent la façon dont les gens produisent des œuvres intellectuelles (Kim 2008). En effet, le gain financier sur leurs œuvres et les contributions ne sont pas les buts directs ni des créateurs, ni des utilisateurs. Comme dans le cas du logiciel libre, il y a des motivations sociales différentes qui conduisent à la production de bien sous une licence CC (Lerner et Tirole 2005). Les créateurs produisent et distribuent sous CC leurs œuvres pour construire leur réputation et / ou parce qu'ils aiment créer des biens artistiques et / ou parce qu'ils croient dans le partage (Kim 2008).

Dans le monde des créations sous CC le créateur est le produit. En effet, en utilisant les licences CC, la rareté artificielle de l'œuvre artistique n'est pas imposée par une contrainte juridique (le droit d'auteur). Dans ce monde, la demande est à la recherche de quelque chose qui est rare : le lien entre l'artiste et l'utilisateur qui bénéficient de ses œuvres (Foong 2010). Comme dans le cas des logiciels libres, des communautés d'utilisateurs apparaissent pour soutenir des projets en CC. Dans le cas du logiciel libre, les communautés d'utilisateurs soutiennent la production donnant surtout une contribution directe au développement et à l'innovation du logiciel. Au contraire, les communautés autour de projets de CC sont consacrées principalement au soutien financier du projet, à sa diffusion et au remix des travaux.

Les créateurs qui utilisent des licences CC produisent aussi des œuvres commercialement viables (Kim 2008). Certains modèles d'affaires commencent à émerger (Foong 2010):

- *Connexion avec les fans* : le fait que les fans utilisent (remix , modifient, etc.) l'œuvre crée une relation avec le créateur original . Donc, les fans achètent les autres ouvrages vendus par le créateur. (exemple : l'album de Radiohead « Into the Sky »).
- *Vendre le Créateur* : Les fans ne paient pas pour l'œuvre parce qu'ils veulent simplement un produit, mais parce qu'ils apprécient le créateur et veulent affficher leur soutien. (exemple : l'album de Radiohead « Into the Sky »).
- *Diviser le marché* : L'utilisation de la clause « non commerciale » rend l'œuvre légalement libre pour les fans et coûteux pour les autres entreprises qui veulent utiliser les œuvres à des finalités commerciales. Donc le créateur profite de la commercialisation provoquée par les fans qui légalement et gratuitement partagent ses œuvres. (exemple : les albums de Nine Inch Nails « Ghosts I –IV » et « The Slip ».

Les licences CC sont jeunes et il ne sera pas surprenant que d'autres modèles d'affaires surgissent dans l'avenir.

Cette thèse vise à comprendre les dynamiques qui sous-tendent la production d'œuvres sous licences CC. Plus précisemment, nous nous sommes concentrés sur la production de vidéo en ligne sous licences CC. Mettre l'accent sur une catégorie particulière de travaux était utile pour avoir des données réelles. Nous décidons de mettre l'accent sur les vidéos en ligne sous licences CC essentiellement pour deux raisons : d'abord, parce que, à notre connaissance, personne n'a jamais fait des recherches dans ce sens, et ensuite, parce que pendant les dernières années, il y a eu un intérêt croissant autour de la production et de la distribution des vidéos en ligne.

Cette thèse se concentre sur trois aspects de la production de vidéo en ligne sous licences CC : (1) le choix judicieux du degré d'ouverture de la licence, (2) la stratégie de financer et d'assimiler l'innovation, (3) les chemins qui déterminent la réussite des projets.

Afin de mieux étudier les différents aspects de la production de la vidéo en ligne sous licences CC, nous avons adopté trois approches différentes, une pour chaque aspect.

Approche 1

Tout d'abord, nous avons utilisé une approche quantitative pour enquêter sur le choix judicieux entre les différents degrés d'ouverture dans les licences CC. Cette approche consiste en une analyse économétrique des vidéos sous licences CC stockées sur une plateforme en ligne, l'Internet Archive (IA). Les résultats de cette étude suggèrent que, dans le but d'attirer la contribution des utilisateurs, les producteurs utilisent différents degrés d'ouverture de licences en fonction de leur statut organisationnel.

Afin de mener cette analyse, une base de données de vidéos sous licence CC (plus Public Domain – PD) a été créée. Cette base de données de 999 vidéos a été créée à partir de l'IA, la plus grand archive de vidéos sous licences CC.

Ensuite, les créateurs ont été regroupés dans quatre catégories différentes, qui seront nos variables explicatives, définies en fonction de leur statut organisationnel :

1. À but lucratif : ils opèrent principalement pour gagner de l'argent. Dans cette catégorie, nous avons des professionnels et des entreprises de différents secteurs, avec différents modèles commerciaux et stratégies qui poussent à créer une vidéo.
2. À but non lucratif : ils se concentrent principalement sur des objectifs sociaux, culturels ou politiques plutôt que de faire des profits. Dans cette catégorie, nous avons des associations, des partis politiques, etc., qui pour différentes raisons décident de créer une vidéo.
3. Informel : ils ne déclarent aucun statut juridique. Dans cette catégorie, nous avons amateurs qui décident de créer une vidéo, parfois "just for fun".
4. Public : les administrations publiques, à l'exemple du Congrès américain.

Selon le degré d'ouverture de la licence, les différentes vidéos ont été ordonnées en fonction du degré d'ouverture de la production et de la distribution (Table 3 du chapitre 2). Ils représentent nos variables expliquées.

Nos hypothèses sont les suivantes :

(H1) Les créateurs ayant un statut juridique à but lucratif ont besoin d'utiliser un degré plus élevé d'ouverture dans la licence CC dans les deux aspects de la production et de la diffusion, afin de bénéficier de la contribution des utilisateurs. D'une part, parce que leur statut juridique n'est pas en mesure d'attirer les contributions des utilisateurs d'autre part, parce que leur modèle d'affaires est déconnecté avec la vente des œuvres

(H2) Les créateurs ayant un statut juridique à but non lucratif ont besoin d'utiliser un degré plus élevé d'ouverture dans les licences CC seulement dans l'aspect de diffusion, afin d'accroître la diffusion de l'œuvre et du nombre de contributeurs potentiels. Parce que leur statut juridique est déjà en mesure d'attirer la contribution des utilisateurs.

(H3) Le créateur ayant un statut juridique informel va utiliser un faible degré d'ouverture seulement dans le processus de diffusion, pour accroître la possibilité d'avoir des contributions par des utilisateurs. Mais ils garderont la possibilité de vendre le droit de commercialiser l'œuvre. D'une part, parce-que ils ne sont pas vraiment organisés avec certains modèles d'affaires déconnectées de la vente de l'œuvre, d'autre part, parce qu'ils n'ont pas un statut juridique suffisamment en mesure d'attirer les contributions par des utilisateurs.

Les résultats de nos analyses économétriques (table 6 et 7 du chapitre 2) confirment notre hypothèse et montrent que lorsque les créateurs à but lucratif décident d'utiliser les licences CC, ils sont davantage susceptibles d'adopter un degré élevé d'ouverture dans la production et dans la distribution (H1).

Cela peut s'expliquer par le fait que les créateurs à but lucratif ont besoin d'ouvrir la licence pour :

- partager le droit du contrôle du processus de production afin d'attirer les contributions des utilisateurs motivés par des motivations non monétaires extrinsèques et intrinsèques ;
- maximiser la diffusion afin d'augmenter les contributions potentielles des utilisateurs et de leurs clients potentiels. En effet, comme dans le cas des logiciels libres, ils ont des modèles d'affaires caractérisées par la vente de services ou autres avantages indirects.

En outre, les résultats de cette étude montrent que les créateurs à but non lucratif sont plus susceptibles d'adopter un faible degré d'ouverture de la production et un haut degré d'ouverture de la diffusion (H2).

Cela peut s'expliquer par le fait que les créateurs à but non lucratif :

- n'ont pas besoin de partager le contrôle du processus de production afin d'attirer les contributeurs. En effet, ils sont déjà en mesure d'attirer l'intérêt des utilisateurs et des contributions en raison de leur statut juridique;
- n'ont pas besoin de garder la possibilité de vendre le produit. En effet, ils ont produit l'œuvre à but non lucratif, mais ils ont besoin d'augmenter le nombre de contributeurs potentiels et d'accroître la diffusion de l'œuvre.

Finalement, les résultats montrent que, du point de vue de la production, les créateurs informels sont plus susceptibles d'adopter un degré d'ouverture moins ouvert que les créateurs à but lucratif, mais plus ouvert que les créateurs à but non lucratif . Les résultats montrent également que, du point de vue de la diffusion, les créateurs informels sont plus susceptibles d'adopter un faible degré d'ouverture, en contraste avec le comportement des créateurs à but lucratif et à but non lucratif (H3).

Cela peut s'expliquer par le fait que les créateurs informels ont :

- besoin de partager une partie du contrôle du processus de production afin d'attirer les contributions des utilisateurs. En effet, contrairement aux créateurs à but non lucratif, le statut organisationnel des créateurs informels n'est pas en mesure d'attirer les contributions des utilisateurs, mais pas si incapable, comme le statut organisationnel des créateurs à but lucratif ;
- besoin de garder le contrôle de la possibilité de vendre l'œuvre, parce que contrairement aux créateurs à but lucratif et à but non lucratif, les créateurs informels ne sont pas structurés et donc ils ne peuvent pas avoir un modèle d'affaires qui permet la vente de services ou toute autre source indirecte de financement.

Approche 2

Nous utilisons une approche qualitative pour étudier la stratégie pour financer et absorber l'innovation générée par les utilisateurs. Cette approche consiste en une étude de cas de la production d'une vidéo

sous licence CC, Big Buck Bunny (BBB). Les résultats suggèrent que les utilisateurs peuvent être utilisés en tant que source de financement de la production et comme partenaires pour innover.

Le but de cette étude est de comprendre comment la Fondation Blender (une organisation qui produit des logiciels) gère les licences du logiciel libre et les licences CC, afin d'assimiler et gérer l'innovation générée par les utilisateurs.

Pour mener cette étude, nous avons recueilli des données issues d'interviews, du site de Blender, des rapports de presse et d'autres sources publiques. Nous analysons également l'évolution du logiciel Blender pour vérifier les mises à jour et les innovations avant et après la création de BBB. Les interviews constituent le point de départ de notre étude. Nous avons effectué une analyse qualitative des données de 15 entrevues (voir tableau 1 chapitre 3).

L'étude de BBB nous permet d'extraire le modèle suivi pour financer et assimiler les innovations générées par les utilisateurs. Le modèle contient trois phases :

Au cours de la première phase, le producteur réduit la protection du droit d'auteur pour obtenir de nouvelles contributions. La réduction de la protection du droit d'auteur pourrait être obtenue de manière illégal (Haefliger et al, 2010 .), ou légale comme dans le cas des logiciels libres (Lerner & Tirole , 2004, 2005 ; San Wong, 2007) et des licences CC (Gambardella , 2011; Lessig, 2001, 2004) :

Dans notre étude de cas, la Fondation Blender a réduit la protection du droit d'auteur du logiciel Blender en utilisant une licence du monde du logiciel libre (la GNU-GPL). De cette façon, il peut bénéficier de la contribution des utilisateurs et il peut récolter des fonds et des expertises pour améliorer le logiciel Blender.

Au cours de la deuxième phase, les utilisateurs intermédiaires se déplacent (horizontal user-innovation) d'un secteur à un autre en innovant dans ce nouveau secteur (Haefliger et al. , 2010). La création d'une équipe composée par des artistes et des développeurs permet de passer d'un secteur (logiciels) à un autre (vidéo) et de créer une nouvelle œuvre, la vidéo BBB. Dans cette phase, les artistes et les développeurs sont utilisés comme source d'innovation dans l'industrie de la vidéo et du logiciel. En effet, l'équipe a réussi à créer une nouvelle œuvre dans l'industrie de la vidéo et à trouver des nouvelles techniques de création. De plus, grâce à l'utilisation de CC-BY, toutes les parties de BBB peuvent être utilisées par d'autres artistes pour de nouvelles créations. Pendant la production de BBB, le logiciel Blender a été amélioré pour résoudre les problèmes liés à la production de la vidéo.

Au cours de la troisième phase, le producteur du logiciel assimile l'innovation générée dans l'industrie de la vidéo par les utilisateurs intermédiaires. Le résultat est une nouvelle version, plus performante du logiciel Blender. La Fondation Blender a pu financer indirectement le développement du logiciel Blender et a pu absorber l'innovation émergée de besoins des utilisateurs du logiciel même.

Approche 3

Enfin, nous avons utilisé une approche de modélisation pour étudier le chemin et les caractéristiques des projets, sous licences CC, qui ont été réalisés. Nous avons développé un modèle multi-agents qui simule le processus de sélection des projets sous licences CC. Le résultat de cette étude a démontré que le modèle est capable de reproduire les faits stylisés de la production de vidéos sous CC stockées sur une plate-forme en ligne, l'IA en l'occurence. Le modèle est capable d'imiter les motivations qui sont impossibles à observer empiriquement et il montre que les caractéristiques du projet de CC (comme l'effort nécessaire pour compléter le projet, la notoriété du producteur et son statut juridique) sont fondamentales pour la réussite d'un projet.

La collecte des contributions des utilisateurs et la façon dont ils atteignent le succès sont un défi. Il est important de comprendre les conditions qui contribuent à la réussite d'un projet sous CC. Le modèle est formulé à partir d'hypothèses concernant les motivations des utilisateurs déjà analysées dans la littérature et calibrées à l'aide de données empiriques issues de l'IA. En cas de projet sous licences ouvertes telles que les licences CC, les utilisateurs préfèrent contribuer au projet célèbre, parce qu'ils sont guidés par des motivations non monétaires telles que la reconnaissance par les pairs, leur carrière, la réputation, etc. Notre modèle prend en compte ces motivations des utilisateurs.

Le modèle permet d'observer la dynamique des variables qui ne sont pas observables sur les bases de données empiriques. En effet, sur bases de données empiriques, nous pouvons seulement recueillir des données provenant de projets qui réussissent, alors que nous n'avons pas de données sur les projets qui échouent. En outre, la perception subjective des efforts de contribution et de ses avantages subjectifs ne sont pas observables dans la base de données empirique.

Notre modèle est capable d'imiter les données non observables et d'imiter le comportement des producteurs et des contributeurs. Comme résultats, nous pouvons observer comment les caractéristiques des projets sont en mesure d'attirer des contributions des usagers et de rendre compte de la façon dont les projets réussissent.

Le principal défi de ce modèle est son calibrage utilisant des données empiriques. Pour cette raison, nous avons utilisé une procédure itérative qui teste différentes combinaisons de valeurs et qui offrent différents scénarii qui sont en mesure de reproduire les résultats de la base de données empiriques.
Le modèle utilise les résultats d'une véritable sélection des projets comme cible et il nous donne différents scénarii pour atteindre cet objectif. Chaque scénario contient les caractéristiques des projets qui réussissent et qui échouent, ainsi que l'importance des attributions dans la fonction d'utilité des utilisateurs qui contribuent ou non. La fonction d'utilité représente les motivations de l'agent pour créer un projet et / ou contribuer à un projet.
Le modèle est capable d'imiter le processus de sélection et de fournir la quantité totale de la production observée sur des données empiriques. Le modèle permet également de simuler l'augmentation de la production et sa diffusion dans le temps (voir figure 1 chapitre 4). En outre, le modèle est capable de distinguer et de reproduire la production par les agents avec ou sans but lucratif (voir figure 2 chapitre

4). Enfin, le modèle permet de reproduire l'impact des caractéristiques du projet sur la réussite de celui-ci (voir table 1). En conclusion, le modèle est utile pour mieux comprendre les conditions nécessaires à la réussite des projets de CC.

Conclusion

Les licences CC ont pour but de contourner les mécanismes d'exclusion imposés par le droit d'auteur classique. Ils préservent les caractéristiques de biens publics typiques de l'information contenues dans chaque œuvre intellectuelle. En effet, même en utilisant un licence CC plus restrictive, une œuvre est à la fois non-exclusive (tout le monde peut l'utiliser) et de non-rivale (l'utilisation d'un individu ne réduit pas la disponibilité pour les autres). Nous montrons comment les producteurs peuvent utiliser les licences CC pour bénéficier de contributions des utilisateurs.

Dans notre analyse, il ressort que pour bénéficier des motivations sociales des usagers, et donc de leur contribution, les producteurs doivent utiliser différents degrés d'ouverture sur les licences en fonction de leur statut organisationnel. Les licences CC peuvent être utilisées pour attirer des fonds et assimiler des innovations. Le succès d'un projet sous licence CC dépend de sa capacité d'attirer des contributeurs.

Les producteurs ne partagent pas nécessairement avec les contributeurs les mêmes objectifs et intérêts, générant des conflits potentiels. Notre étude suggère que les licences ouvertes telles que les licences CC sont capables de résoudre ces conflits potentiels entre les intérêts des producteurs et des contributeurs.

Dans cette thèse, nous présentons la façon dont les licences ouvertes (licences CC et licence du logiciel libre) sont capables de créer une sorte d'organisation invisible dans lequel les utilisateurs deviennent partie intégrante du processus de production. Le partage de la production avec les utilisateurs a plusieurs avantages : la réduction des risques, la réduction des coûts de production, la possibilité de collecter des fonds et de l'expertise. La réduction des coûts de production ne réduit pas la valeur de l'information contenue dans les œuvres. Cependant, les licences ouvertes permettent aux producteurs et aux utilisateurs de gérer un modèle d'entreprise alternatif qui n'est pas fondées sur la simple vente d'œuvres et le paiement des employés et des investisseurs. En outre, les licences ouvertes permettent aux producteurs de profiter de la contribution des utilisateurs.

Nos résultats montrent que l'utilisation des licences ouvertes n'est pas une sorte de baguette magique qui simplifie la production des œuvres intellectuelles, qui réduit les coûts de production et stimule l'innovation. Il faut savoir gérer ces licences et choisir la meilleure pour encourager les utilisateurs à contribuer à un projet et à harmoniser ses propres objectifs avec les leurs.

Nos résultats proviennent de trois approches différentes qui explorent la dynamique sur la façon dont les licences ouvertes, en particulier les licences CC, peuvent être utilisées pour réussir dans le processus de production. Nos résultats indiquent la manière dont les licences CC peuvent être correctement gérées. Ils peuvent être utilisés pour choisir la licence CC en fonction de l'objectif du producteur, ses caractéristiques, son modèle d'entreprise et le besoin des contributeurs potentiels.

Au final, notre thèse peut être utile pour mieux comprendre les dynamiques qui sous-tendent certains secteurs du marché, pour lesquels l'approche classique du droit d'auteur ne permet pas de maximiser le potentiel de production et d'innovation. Par conséquent, nos résultats sont susceptibles d'améliorer la gestion dans ces secteurs, en aidant à créer des stratégies alternatives dans le but de produire, de diffuser, d'innover et donc de créer de nouveaux modèles d'affaires.

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Chapter 1

Introduction

Classical copyright theorists claim that only a legal monopoly, the copyright, gives sufficient motivation to produce intellectual works. Indeed, considering the great effort required to create and disseminate works, the copyright seems essential to encouraging artists to create and investors to fund new works. This was clearly articulated in 1710 in the preamble of the Statute of Anne[1] (Great Britain) (Boldrin and Levine 2008, van Gompel 2012):

"Whereas Printers, Booksellers, and other Persons, have of late frequently taken the Liberty of Printing, Reprinting, and Publishing, or causing to be Printed, Reprinted, and Published Books, and other Writings, without the Consent of the Authors or Proprietors of such Books and Writings, to their very great Detriment, and too often to the Ruin of them and their Families: For Preventing therefore such Practices for the future, and for the Encouragement of Learned Men to Compose and Write useful Books; May it please Your Majesty, that it may be Enacted [...]"

However, with the advent of new technologies classical copyright protection sometimes seems inadequate. New licenses that reduce copyright protection, such as Free *Libre* Open Source Software (FLOSS) and Creative Common (CC) licenses, have emerged.

Intellectual works are intangible and their value is linked to the information that they contain rather than their medium. For example the value of a video is in its content rather than in the medium on which it was encoded. Despite the fact that the costs of producing information are human capital costs, the information produced is a pure public good (Demsets 1970).

Since information is of a public good nature, the use of strong copyright protection implies systematic inefficiencies in the private provisioning of information. This happens particularly with the emergence of productions by user communities facilitated by the digital revolution (Benkler 2002).

[1] The whole text: http://www.copyrighthistory.com/anne.html - last check: February, 10 2012

The digital revolution changed the way in which copyrighted works are produced and consumed: Production costs decreased significantly; collaboration among people became easier and user-communities emerged; the media on which information is stored became less important; dissemination became more efficient and its costs quasi-null.

Since the nineties FLOSS licenses have allowed user-communities and corporations to provide and benefit from software under unrestrictive copyright (Benkler 2002). Similarly, since December 2002, CC licenses allow user communities and corporations to provide artistic works under unrestrictive copyright, and to benefit from them (Lessig 2004).

CC licenses are directly inspired by FLOSS and its culture. However, in the case of FLOSS, developers themselves codified the existing sharing culture by writing many licenses. Unlikely the bottom-up FLOSS experience, CC licenses have a top-down approach. The licenses were created by the Creative Commons Organization, founded specifically to allow the sharing of intellectual works (Välimäki and Hietanen 2004).

Notwithstanding the enormous amount of literature on FLOSS, there is still a lack of literature about CC. Most literature on CC licenses is focused on how they compare to classical copyright protection. Little is known about the dynamics relating the use of CC licenses to successful project completion.

CC are standardized licenses based on copyright. Unlike a contract, the license only obliges the licensor to tolerate behaviors otherwise forbidden by copyright. It does not create any new obligation that is not already contemplated in the classical copyright regime (Hietanen 2007). In other words, CC licenses customize copyright law. In this way CC adapts copyright to the case in which a damage would be created by the privatization of collective production (Ciffolilli 2004).

The information contained in an intellectual work has aspects of both public goods and of commodities for commercial exploitation. Finding the balance between public good and private benefit criteria for accessing and using information, and the balance between collective benefits to society and individual ownership rights, has been a preoccupation for centuries (Flew 2005).

The use of CC licenses is a viable way to solve the conflicts between collective social benefits and individual interests. Using CC, creators can select the optimum degree of openness/restriction of copyright protection to balance both their interests and those of contributors. For this reason, CC licenses are able to achieve the goal of harmonizing the interests of society and individuals (Flew 2005, Broussard 2007).

CC licenses are able to reconcile the private interest of creators with the public interests of users because they reflect the ways people produce intellectual works (Kim 2008). Indeed, the financial gain from their works and contributions is not the direct goal of creators and users. Like in FLOSS, different social motivations (Lerner and Tirole 2005) drive CC production. Creators produce and distribute their works under CC to build their reputations and/or because they enjoy creating artistic goods and/or because they believe in sharing (Kim 2008).

In CC production the creator is the product. Indeed, under CC licenses the artificial scarcity of the artistic work is not imposed by a legal policy (the copyright law). In CC production the demand side is looking for something that is scarce: the connection between artists and those users who benefit from their works (Foong 2010). Like in the FLOSS case, communities of users emerge and support CC projects. In FLOSS, the communities of users who support the production are the primary direct contributors to the development and innovation of the software. Conversely, the communities around CC projects are the principal financial supporters of the project, its dissemination, and the remix of the works.

CC creators also produce commercially viable works (Kim 2008). Some business models are starting to emerge (Foong 2010):

Name	Business Model	Example
Connection with Fans	Fans that use (remix, modify, etc.) an information good create a relationship with the original creator. Then fans buy the other works sold by the creator.	Radiohead's album *"In the Rainbow"*
Sell the Creator	The fans are not paying for the work because they merely want a product, but because they appreciate the creator and wish to show their support.	Radiohead's album *"In the Rainbow"*
Divide the Market	The use of Non-Commercial clause to make the works legally free for fans (and then to profit from the marketing provoked by fans that legally and	Nine Inch Nails' albums "*Ghosts I-IV"* and "*The*

	freely share the works) and costly for other companies that want to use the works for commercial purposes.	*Slip"*

Table 1: Business models related to FLOSS. Adapted from (Foong 2010).

CC licenses are new and it will be not surprising if other business models emerge in the future.

This thesis aims to understand the dynamics underlying the production of works under CC licenses. Specifically, in this thesis we examine the production of online video under CC licenses. Focusing on a particular category of works helps us obtain real data for our studies.

This manuscript is organized into three parts: Chapter 2 presents a study of the impact of the creators' organizational status on the chosen CC license. We approached this question quantitatively with an empirical analysis of an original database of videos released under CC licenses. The database was created from the Internet Archive (IA). The IA is the largest repository of video under CC licenses, with more than 100,000 videos under the subsection "Community Video," and is explicitly recommended for storing works under CC license by the CC Organization. Chapter 3 presents a study of the use of CC licenses to stimulate innovation and fund projects. To do that a qualitative approach, consisting of a case study, was used. The case study focuses on the production of *Big Buck Bunny (BBB)*. BBB is one of the most successful videos produced with the support of a user-community. BBB was licensed under a CC license. The main result of this study is an extension to the *user-innovation* model (von Krogh, Haefliger et al. 2008, Haefliger, Jäger et al. 2010). We create a model to explain how CC and FLOSS licenses can be used to finance and harness user innovation. Chapter 4 presents a study on the characteristics that influence the success of a project or a work under CC license. To do this we develop an agent-based model that is able to replicate empirically observable results of the selection process of projects of works under CC licenses and then to simulate the unobservable factors in an empirical analysis.

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Chapter 2
The Use of Creative Commons Licenses

Abstract
With the advent of new technologies a set of alternative licenses, Creative Commons (CC) licenses, has emerged. The aim of this study is to explore the impact of the organizational status of creators on the openness of the chosen CC licenses. To do that an empirical analysis of video under CC licenses was performed using an original database created from the Internet Archive. The results of this study show that licenses that are very open are more likely to be adopted by: For-Profit creators in production and dissemination, Nonprofit creators in dissemination only, and Informal creators in production only. The results of our study suggest that, in order to attract contributions from users, creators adjust the degree of openness of the license to reflect their organizational status.

1 Introduction

Considering the high level of effort required to create and disseminate works, copyright protection seems to be essential for encouraging artists to create and investors to fund new works. However, Open Licenses, a new set of licenses that reduce copyright protection that allow creators to create and share their works, have emerged.

We define Open Licenses (OL) as the set of licenses that emerged from the Free/Open Source culture. Examples of OL can be software-oriented licenses (Free *Libre* Open Source Software, or FLOSS, licenses) or culture-oriented licenses (Creative Commons, or CC, licenses).

Among OL, FLOSS licenses are more familiar and have been subject to more scrutiny, whereas little is known about CC licenses. For this reason, in the present study we focus on the use of CC licenses.

CC licenses are directly derived from FLOSS licenses. Open-source software licenses and cultural works (video, music, texts, etc) under CC licenses share a common cultural, legal and digital heritage. Therefore, we assume that the motivation to participate in a FLOSS project or a CC project might be similar.

For purposes of this study we define as organizational status the legal status of the creators. Possible organizational statuses are: For-Profit (firms and professionals), Nonprofit (associations), public administration (the government), and Informal (undetermined legal status).

The aim of this study is to investigate the impact of the organizational status of the creators on the choice of the openness of the CC licenses under which they release their works.

2 Background

The organizational status and the type of open license are central to motivating users to contribute to a project (Lerner and Tirole 2005, Stewart, Ammeter et al. 2006, Colazo and Fang 2009, Singh and Phelps 2009).

As with FLOSS, in the production and dissemination of works under CC licenses creators cooperate, encourage, and reinforce cooperative behavior (Lerner and Tirole 2005, Lyubareva 2010). Moreover, creators obtain contributions from the related community of users (Stewart, Ammeter et al. 2006, Belleflamme, Lambert et al. 2011).

Users can contribute to a project in different ways, such as financing it, working on it for free, or giving feedback. However, in this study we do not differentiate between different types of user contributions. For the purpose of this study we define the contribution in terms of a single generic unit necessary for completion of the project.

According to the CC Foundation website,[2] CC licenses are a set of copyright licenses[3] devoted to "*expanding the range of creative works available for others to build upon legally and to share*."

In particular, CC licenses allow the creator to use different combinations[4] of clauses[5] to declare which rights are granted to users. In other words, the creator can decide to grant users the right to copy, modify, and make money.

Using different combinations of clauses it is possible to create different licenses with different degrees of openness, in both production and dissemination. Table 1 shows the four most used clauses, and Table 2 the six most used CC licenses.[6]

(Table 1 about here)

(Table 2 about here)

Moreover, using the Public Domain tool called CC0, available on the CC website,[7] creators are able to dedicate their works to the worldwide Public Domain (PD). The PD allows users to redistribute, modify, use as input, and contribute to the work.

Standard property rights theory claims that only the regime of private property rights, i.e. copyright, provides sufficient motivation for creators to produce works. This implies that the attenuation of property rights creates economic inefficiency. An alternative approach considers that *"[...] creators' property rights can be well protected in the absence of intellectual property, and that the latter does not increase either innovation or creation. They are an unnecessary evil"* (Boldrin and Levine 2008).

Some authors have considered the existence of alternative incentives to classical monetary motivation. Indeed, in the case of attenuation of property rights and, by extension, of classical monetary motivations, other motivations could incentivize users to participate in the creation of works (Lerner and Tirole 2002, Lakhani and Wolf 2005, Valentinov 2007). According to this approach, it is possible to organize the motivations to contribute into three main groups:

1. Extrinsic Monetary Motivations

- Administrative commands (Valentinov 2007): the orders of the management.
- Monetary (Valentinov 2007): to earn money.

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[2] http://creativecommons.org

[3] Released on December 16, 2002 by Creative Commons Corporation, a U.S. Non-Profit corporation founded in 2001 by Lawrence Lessig, headquartered in San Francisco, California, United States.

[4] I observe that not all combinations are allowed. Indeed, the No-Derivative-Works and Share Alike clauses are mutually exclusive.

[5] The most used clauses are Attribution, Non-Commercial, No-Derivative-Works and Share Alike.

[6] Source: the Creative Commons website www.creativecommons.org - last check February,10 2012

[7] https://creativecommons.org/publicdomain/

2. Extrinsic Non-Monetary Motivations

- Reputation (Lerner and Tirole 2002): to showcase one's abilities so as to elicit the admiration of others.

- Career concerns (Lerner and Tirole 2002): to showcase one's abilities to firms in hopes of landing a job.

- Peer recognition (Lerner and Tirole 2002): to showcase one's abilities or interests, to gain acceptance in a group.

- Sharing innovation (Harhoff, Henkel et al. 2003): to benefit from the sharing of new functionality.

3. Intrinsic Motivations

- Activity itself,(Lakhani and Wolf 2005, Valentinov 2007): the mere enjoyment of an activity.

- Ego gratification (Lerner and Tirole 2002, Lakhani and Wolf 2005): personal achievement.

- Need,(von Hippel 1988, Johnson 2002, von Hippel 2005): users create solutions to solve their particular needs.

Usually For-Profit creators use extrinsic monetary motivations, such as administrative commands and salary, to solicit contributions (Valentinov 2007). For example, they pay workers or they give financial interests to funders. By contrast, Nonprofit creators tend to be more successful in attracting contributions "for free." Indeed, they use extrinsic non-monetary and intrinsic motivations to compensate for low wages and to motivate volunteering and donations (Stewart, Ammeter et al. 2006, Lambert 2010, Belleflamme, Lambert et al. 2011).

3 Hypotheses

The goal of this study is to explore the impact of the organizational status of creators on the degree of openness of the chosen license, in production as well as dissemination.[8]

[8] Despite the importance of the business models, strategies, and reasons that motivate the different creators to produce and disseminate videos, they are not the subject of this paper. See Raymond (1999) and Schiff (2002) for an overview of the different reasons, strategies, and business models around Open Licenses.

For purposes of this analysis creators were grouped into four categories according to their organizational status, on the basis of their declared legal status:

1. For-Profit: They operate primarily to earn money. In this category we have professionals and enterprises from different industries, with different business models and strategies that give them reasons to create videos.
2. Nonprofit: They focus primarily on social, cultural, or political goals rather than making profit. In this category we have associations, political parties, etc., that create videos for many different reasons.
3. Informal: They do not declare any legal status. In this category we have amateurs who decide to create a video, sometimes "just for fun."
4. Government: This includes various administrations, for example the U.S. Congress.

All creators in the sample use CC, or PD, licenses that allow them to define the degree of openness in both the production and dissemination processes.

Openness in the production process means that the license allows other actors to participate in production of the work. In this case, new actors can modify a work previously produced or re-use parts of it to produce another work.

Openness in dissemination means that the license allows other actors to share the work.

CC and PD licenses are ordered according to the degree of openness from the point of view of production and distribution.

(Table 3 about here)

The CC Attribution (cc by) and PD licenses do not impose any restrictions on production or dissemination: *maximum* level of openness for both production and dissemination.

From the point of view of production, use of the No-Derivative-Works clause indicates the *minimum* level of openness. The Non-Commercial and/or Share-Alike clauses reduce the level of openness, but less than the No-Derivative-Works clause: *medium* level of openness in production.

On the other hand, from the point of view of dissemination, use of the Non-Commercial clause indicates the *minimum* level of openness. The No-Derivative-works and/or Share Alike clauses reduce the level of openness, but less than the Non-Commercial clause. Therefore they are labeled *medium* level of openness in dissemination.

A high degree of openness in the license tends to yield greater success in attracting the interest and contribution of users. Therefore, it is not surprising that a Nonprofit status combined with a high degree of openness in licensing tends to be the most successful in attracting the interest and contribution of users (Stewart, Ammeter et al. 2006).

It follows that, to increase the attractiveness and, consequently, benefits from the contribution of users motivated by extrinsic non-monetary and intrinsic motivation, For-Profit creators need to use very open licenses for production. Moreover, as with FLOSS, For-Profit creators have alternative business models

based on the disconnection of production from sales. Therefore, For-Profit creators prefer to encourage dissemination by using a high degree of openness in that area.

Informal creators are less able to attract users than Nonprofits, because their status isn't as attractive. We identify as Informal any creator with no legal status who decides to produce a work. Moreover, they differ from For-Profit creators in that they are less able to profit from alternative business models. It follows that they need to use open licenses for production, but they still need to use closed licenses for dissemination, allowing them to sell their work.

Following are our hypotheses regarding attracting users and benefiting from them:

(H1) Because their legal status does not attract contributions from users and because their business model is disconnected from sale of their works, creators with For-Profit legal status need to use a Creative Commons license with a greater degree of openness in both aspects, production and dissemination, to recruit contributions from users.

(H2) Because their legal status attracts contributions from users, creators with Nonprofit legal status need to use CC licenses with a higher degree of openness in only the dissemination aspect to increase both dissemination of the work and the number of potential contributors.

(H3) Because they are not strictly organized with a business model disconnected from the sale of the work and because they do not have a legal status that attracts contributions from users, creators with Informal legal status will use a license with a low degree of openness for dissemination only, so as to increase contributions from users, while retaining the option of commercializing the work.

4 Data Collection and Variables

An original database of videos under PD and CC licenses was created to explore the impact of the organizational status on the openness of the license. The subsection "Community Video"[9] hosted on the Internet Archive was used to create the database.

The Internet Archive (IA) is a non-profit digital library founded in 1996. The IA operates in the United States with the stated mission of "universal access to all knowledge." It offers permanent storage and access to collections of digitized materials, including web sites, music, videos, and books. The IA is a member of the American Library Association and is officially recognized by the State of California as a library. The CC web site recommends using the IA to store works.

The IA has a collection of more than 100,000 videos under the subsection "Community Video," but only 27,939 provide detailed information on the CC license. Some observations were dropped for purposes of this study, as they did not provide detailed information on the creator, the year of creation, or the year of publication.

Because the first works under CC licenses were published in December 2002, observations stored before 2003 were dropped. This selection yielded a sample of 999 observations.[10]

[9] http://www.archive.org/details/opensourcemovies checked on February 2010.

Each observation corresponds to a video and gives information on the creator, the license, and the year of publication.

Different creators with different legal statuses store their works in the IA under CC licenses or as PD. Four groups of creators were created according to their legal status, as described above.

In each group we have different creators with different goals, business models, and strategies, even if their legal statuses are similar. In example in the For-Profit group we can have video-makers, dentists, software houses, and many others that create videos for different purposes. Video-makers do it to disseminate their films, dentists to promote their businesses, software houses to give video-guides to their users, etc. For this study we do not differentiate between the varying purposes of the creators.

The different CC licenses are ordered according to their degree of openness in the production and dissemination processes. Following are the variables used in this study:

OpenProdDeg. This variable represents the degree of openness of the license from the point of view of the production process. This variable distinguishes among three degrees of openness in production:

1. The first category indicates the Maximum degree of openness (PD and cc-by).

2. The second category indicates the Medium degree of openness (cc by-sa, cc by-nc and cc by-nc-sa).

3. The third category indicates the Minimum degree of openness (cc by-nd, cc by-nd-nc).

OpenDissDeg. This variable represents the degree of openness of the license from the point of view of the dissemination process. This variable distinguishes among three degrees of openness in dissemination:

1. The first category indicates the Maximum degree of openness (PD and cc-by).

2. The second category indicates the Medium degree of openness (cc by-sa and cc by-nd).

3. The third category indicates the Minimum degree of openness (cc by-nc, cc by-nc-sa and cc by-nc-nd).

Informal. This dummy variable takes the value of "1" in the absence of any legal status.

For_Profit. This dummy variable takes the value of "1" to indicate For-Profit legal status.

Non_Profit. This dummy variable takes the value of "1" to indicate Nonprofit legal status.

[10] The database is under Creative Commons License by-sa 3.0 and is freely available at: https://archive.org/details/Gambardella_dataset_videos_CC

Public. This dummy variable takes the value of "1" to indicate a Government Administration. This is the reference variable, because the government tends to share work with citizens, making it likely to use a high degree of openness in both production and dissemination.

5 Outcomes

5.1 Descriptive Results

Table 4 describes the percentage of licenses used by different groups of creators. This table is useful for seeing the impact of the organizational status on the openness of licenses.

It is not surprising that, in our database, creators in the group "Government Administration" often license their works under the most open CC licenses or PD. This is because the U.S. Congress stores most of its works in this group and, according to the Federal Copyright Act, works produced by the Federal Government cannot be copyrighted.

(Table 4 about here)

From the point of view of the dissemination process: In all groups the most frequent choice is a medium degree of openness, the second choice is the maximum degree of openness, and the least frequent choice is the minimum degree of openness. We argue that in dissemination there is a tendency to use a medium/high degree of openness. We interpret these results as a consequence of the fact that all creators in our database decided to avoid the standard copyright protection by using CC licenses, which means that, from the beginning, they intended to renounce the maximum control of the dissemination process.

Among the four groups, Informal has the highest percentage of the minimum level of openness in the licenses chosen. However the percentages of the three different choices in the Informal group are similar, suggesting that no preferential choice emerged, probably as consequence of the high heterogeneity in this group. Indeed, creators in the Informal group are not organized in terms of goals and activities. This observation supports our hypothesis (H1), because the Informal group can include creators that need to use a low degree of openness in dissemination to retain the option of commercializing their work, but also creators that do not, because they have an alternative business model or simply because they do it "just for fun."

Creators in the For-Profit and Nonprofit groups feature similar percentages in their degree of openness in dissemination. This observation suggests that these two groups of creators have similar needs from the point of view of the dissemination process and supports our hypotheses (H1 and H2) that both For-Profits and Nonprofits behave similarly in terms of dissemination.

In the Government Administration group we observe a very low percentage of creators who use the minimum level of openness. This is because, as mentioned above, the U.S. Congress stores most of its works in this group and according to the Federal Copyright Act, works produced by the Federal Government cannot be copyrighted. However the percentage of creators who use the maximum and the medium degree of openness are similar. This is due to the use of the "SA" clause (47.52%), which we assume reduces the possibility of dissemination because it obliges new disseminators to reuse the same license and to not "copyright" the work or the modified version derived from it. Nonetheless, only 0.93% uses the non-commercial clause. Both observations are consistent with the above-mentioned

principle that U.S. public administrations (widely represented in this group) do not copyright their works.

In the production process only 2.17% of creators in the Government Administration group use the non-derivative clauses. Many creators in this group use a high or medium degree of openness: PD (46.27%) or by-sa clause (47.52%), respectively. We interpret these results in light of our observation that U.S. Government Administrations do not "copyright" their works.

With regard to the openness of the licenses, For-Profit creators show similar behavior in production and dissemination. Conversely, Nonprofit creators behave differently in production and dissemination. In dissemination they tend to use a minimum level of openness. This observation supports our hypotheses (H1 and H2) in which Nonprofits, in contrast to For-Profits, attract contributions by using a low degree of openness in production.

Unlike in dissemination, in production the Informal group is least likely to use the minimum degree of openness. This observation supports our hypothesis (H1), according to which Informal creators use a low degree of openness only from the production point of view.

The simultaneous use of clauses that reduce openness in both production and dissemination (nd + nc) is rare. Indeed, nc+nd is observed only for 0.40% of For-Profit and 0.70% of Informal agents. We interpret these results as a consequence of all creators in our database deciding to avoid standard copyright protection using CC licenses, indicating that they intended from the beginning to renounce the maximum control of production and dissemination.

To further investigate the relationship between organizational status and the openness of licenses, a study of the correlation among the different variables is performed.

(Table 5 about here)

The degree of openness in production (*OpenProdDeg*) is positively correlated with the degree of openness in dissemination (*OpenDissDeg*). This is true because, when creators increase the degree of openness in production, they automatically increase the degree of openness in dissemination. For example, according to Table 3, if a creator removes the non-commercial clause from cc by-nc, the work jumps from the Medium degree of openness in production to the Maximum degree of openness in production. At the same time, the work jumps from the Minimum degree of openness in dissemination to the Maximum degree of openness in dissemination.

The degree of openness in production (*OpenProdDeg*) is negatively correlated with Nonprofit and Informal creators. This is consistent with hypothesis H2.

The degree of openness in dissemination (*OpenDissDeg*) is negatively correlated with Informal creators. This is consistent with hypothesis H3.

Both degrees of openness (*OpenProdDeg* and *OpenDissDeg*) are positively correlated with the Government Administration (*Public*). This means that *Public* is positively correlated with a high degree of openness in both production and dissemination. We believe that this is a consequence of the fact that most Government Administrations in our database do not "copyright" their works.

5.2 Regression Results

5.2.1 Impact of Organizational Status on Openness in Production

For the production process, we investigate the impact of the organizational status of the creator on the degree of openness of the license by estimating an ordered logistic regression and marginal effects. The variable *Public* is used as reference variable.

(Table 6 about here)

The Wald Chi-Square statistic and the *p*-value indicate that the model is statistically significant. The Brant test confirms that the model is statistically significant.

Except for Medium degree of openness for *Non_Profit* in the marginal effects all other results are statistically significant ($p < 0.001$).

All independent variables (*Informal*, *Non_Profit* and *For_Profit*) have a negative impact on the dependent variable (*OpenProdDeg*). This negative effect is explained by the fact that the variable *Public* is the reference variable and *Public* is the most likely to adopt the highest degree of openness both for production and dissemination. The variable *Public* is most likely to reflect the highest degree of openness because it contains a lot of works by U.S. government administrations and, as mentioned above, U.S. public administrations do not "copyright" their works.

Both For-Profit and Informal creators are more likely to adopt a higher degree of openness in production than a Nonprofit creator. More precisely, For-Profit creators are more likely to adopt a higher degree of openness in production than Informal creators.

(Figure 1 about here)

These results are consistent with hypotheses H1, H2, and H3. Nonprofit creators who are able to attract users' contributions because of their legal status, while For-Profit and, to a lesser degree, Informal creators, need to use a higher degree of openness in production than Nonprofits to attract contributions from users.

5.2.2 Impact of Organizational Status on Openness in Dissemination

From the point of view of dissemination, we estimate an additional ordered logistic regression to investigate the impact of the creators' organizational status on the degree of openness of licenses. Like in the previous regression, the variable *Public* is used as a reference variable.

(Table 7 about here)

The Wald Chi-Square statistic and the *p*-value indicate that our model is statistically significant. The Brant test confirms that our model is statistically significant.

All results are statistically significant. All independent variables (*Informal*, *For_Profit*, and *Non_Profit*) have a negative impact on the dependent variable (*OpenDissDeg*), because the variable *Public* is the

reference variable and, as mentioned above, *Public* is more associated with a high degree of openness from both the production and dissemination point of view.

Just like For-Profit creators, Nonprofit creators are also more likely to adopt a high degree of license openness for the dissemination process. However, in this case, Informal creators are more likely to adopt a low degree of openness.

(Figure 2 about here)

These results are consistent with hypotheses H1, H2 and H3. Indeed, in the case of dissemination, For-Profit creators need to adopt a higher degree of openness to attract the interest of users and benefit from their contributions.

6 Conclusions

This study analyses the impact of the organizational status on the openness of the licenses.

According to the standard property rights approach, the regime of private property rights provides sufficient motivation for creators to produce works. As a consequence, creators should be more likely to use restrictive licenses. The results of this study suggest that in the case of products under non-restrictive property rights regimes, such as CC licenses, the opposite is observed. Indeed, the results of this study confirm our hypothesis: When For-Profit creators decide to use CC licenses, they are more likely to adopt a high degree of openness in both production and distribution (Hypothesis 1).

This can be explained by the fact that For-Profit creators need open licenses in order to:

• share the right to control of the production process so as to attract contributions from users motivated by extrinsic non-monetary motivations and intrinsic motivations;

• maximize dissemination so as to increase potential contributions from users and potential customers. Indeed, as in the case of FLOSS, they have business models characterized by the sale of services or other indirect benefits.

Moreover, the results of this study confirm our hypothesis that Nonprofit creators are more likely to adopt a low degree of openness in production and a high degree of openness in dissemination (Hypothesis 2).

This can be explained because Nonprofit creators:

• don’t need to share control of the production process to attract contributors. Indeed, they are already able to attract users’ interest and contributions because of their legal status;

• don’t need to retain the option of selling the product. Indeed, they did not produce the work for profit, but they need to increase the number of potential contributors and encourage dissemination of the work.

In the final analysis, our results show that, from the production point of view, Informal creators are more likely to adopt licenses that are less open than those of For-Profit creators, but more open than those of

Nonprofit creators. Our results show also that, from the dissemination point of view, Informals are more likely to adopt a low degree of openness than For-Profits and Nonprofits (Hypothesis H3).

This can be explained because Informal creators:

• need to share part of the control of the production process to attract contributions from users. Indeed in contrast with Nonprofit creators, the organizational status of Informal creators is less able to attract contributions from users, but not to the same extent as the organizational status of For-Profit creators;

• need to retain control over dissemination to have the option of selling the work, because in contrast with For-Profits and Nonprofits they are unstructured and they cannot have any business model that allows the sale of services or other indirect sources of funding.

In conclusion, all are hypotheses are confirmed.

Appendix

Table 1: The four mosts used Creative Commons clauses

Clauses		
Attribution	- *by* -	Users may copy, distribute, display and perform the work and make derivative works based on it only if they give the creator the credits in the manner specified by these
Non-Commercial	- *nc* -	Users may copy, distribute, display and perform the work and make derivative works based on it only for non-commercial purposes.
No-Derivative Works	- *nd* -	Users may copy, distribute, display and perform only verbatim copies of the work, not derivative works based on it.
Share-Alike	- *sa* -	Users may distribute derivative works only under a license identical to the license that governs the original work.

Table 2: The six mosts used Creative Commons licenses

Licenses		
Creative Commons Attribution alone	- *CC by* -	This license allows users to redistribute, modify, using as input and contribute to the content. This license does not oblige derivative works under the same license, but forces a declaration of the original author.
Creative Commons Attribution + Non-Commercial	- *CC by-nc* -	This license allows users to redistribute, modify, using as input and contribute to the content. but only for non-commercial purposes. This license does not oblige derivative works under the same license, but forces a declaration of the original author.
Creative Commons Attribution + No-Derivative-works	- *CC by-nd* -	This license allows users to redistribute, the content, but does not allow modification, using as input and contribute to the content.
Creative Commons Attribution + Share-Alike	- *CC by-sa* -	This license allows users to redistribute, modify using as input and contribute to the content. This license obliges derivative works under the same license and force a declaration of the original author.
Creative Commons	- *CC by-nc-nd* -	This license allows users to redistribute

Continued on next page...

... table 2 continued

Licenses		
+ Non-Commercial + No-Derivative-works		the content, but only for non-commercial purposes. This license does not allow users to modify, using as input and contribute to the content.
Creative Commons + Non-Commercial + Share-Alike	- *CC by-nc-sa* -	This license allows users to redistribute, modify, using as input and contribute to the content, but only for non-commercial purposes. This license obliges derivative works under the same license and forces a declaration of the original author.

Table 3: Degree of openness

Degree of openness	**Production**	**Diffussion**
Maximum	PD	PD
	CC by	CC by
Medium	CC by-sa	CC by-sa
	CC by-nc	CC by-nd
	CC by-nc-sa	
Minimum	CC by-nd	CC by-nc
	CC by-nd-nc	CC by-nc-sa
		CC by-nc-nd

Table 4: Percentage of different legal status on different licences

	Legal Status				
Licenses	Informal	For_Profit	Non_Profit	Public	Total
CC by	39	8	7	10	64
	60.94%	12.50%	10.94%	15.62%	100%
	13.73%	3.17%	4.96%	3.11%	6.41%
CC by-sa	28	98	15	153	294
	9.52%	33.33%	5.10%	52.04%	100%
	9.86%	38.89%	10.64%	47.52%	29.43%
CC by-nc	55	13	24	0	92
	59.78%	14.13%	26.09%	0%	100%
	19.37%	5.16%	17.02%	0%	9.21%
CC by-nc-sa	32	27	1	3	63
	50.79%	42.86%	1.59%	4.76%	100%
	11.27%	10.71%	0.71%	0.93%	6.31%
CC by-nd	76	26	54	7	163
	46.93%	15.95%	33.13%	4.29%	100%
	26.76%	10.32%	38.30%	2.17%	16.32%

CC	2	1	0	0	3
by-nd-nc	66.67%	33.33%	0%	0%	100%
	0.70%	0.40%	0%	0%	0.30%
PD	52	79	40	149	320
	16.25%	24.69%	12.50%	46.56%	100%
	18.31%	31.35%	28.37%	46.27%	32.03%
Total	284	252	141	322	999
	28.43%	25.23%	14.11%	32.23%	100%
	100%	100%	100%	100%	100%

Table 5: Correlation

Variables	OpenProdDeg	OpenDiffDeg
OpenProdDeg	1.000	
OpenDiffDeg	0.680	1.000
	(0.000)	
Informal	-0.153	-0.197
	(0.000)	(0.000)
For_Profit	0.016	-0.036
	(0.607)	(0.253)
Non_Profit	-0.153	-0.041
	(0.000)	(0.200)
Public	0.247	0.254
	(0.000)	(0.000)

Table 6: Ordered Logistic Regression and Marginal Effect Results

	(Dep. Var.)	(Marginal Effects)		
	OpenProdDeg	Maximum	Medium	Minimum
Informal (d)	-1.085***	-0.231***	0.0611***	0.170***
	(0.158)	(0.0292)	(0.0110)	(0.0305)
For_Profit (d)	-0.609***	-0.135***	0.0443***	0.0904***
	(0.138)	(0.0289)	(0.00884)	(0.0230)
Non_Profit (d)	-1.370***	-0.262***	0.0159	0.246***
	(0.241)	(0.0334)	(0.0259)	(0.0551)
N	999	999	999	999
Log lik.	-989.3	-989.3	-989.3	-989.3
Chi-squared	67.28	67.28	67.28	67.28
p	1.64e-14	1.64e-14	1.64e-14	1.64e-14

Marginal effects; Standard errors in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7: Ordered Logistic Regression and Marginal Effect Results

	(1)	(2)	(3)	(4)
	OpenDiffDeg	Open	Medium	Restrict
OpenDiffDeg				
Informal (d)	-1.233***	-0.259***	0.0693***	0.190***
	(0.166)	(0.0292)	(0.0126)	(0.0329)
For_Profit (d)	-0.760***	-0.166***	0.0548***	0.111***
	(0.147)	(0.0296)	(0.00907)	(0.0256)
Non_Profit (d)	-0.830***	-0.174***	0.0441***	0.130***
	(0.183)	(0.0334)	(0.00909)	(0.0350)
N	999	999	999	999
Log lik.	-983.5	-983.5	-983.5	-983.5
Chi-squared	68.76	68.76	68.76	68.76
p	7.88e-15	7.88e-15	7.88e-15	7.88e-15
Standard Error	Robust	Robust	Robust	Robust

Marginal effects; Standard errors in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 1: Marginal effects of impact of Legal Status on Open Production Degree

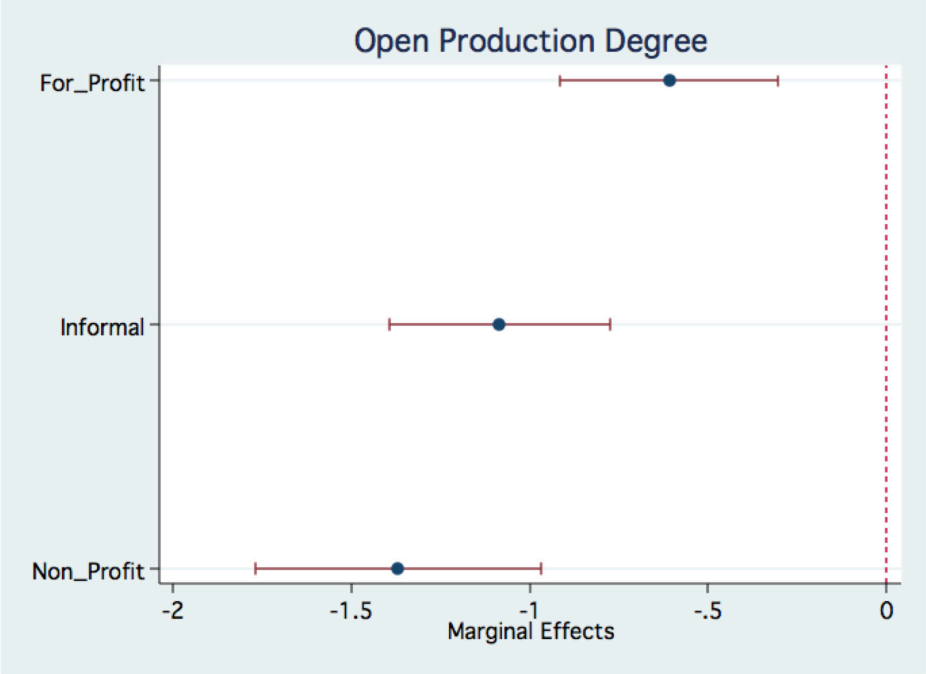
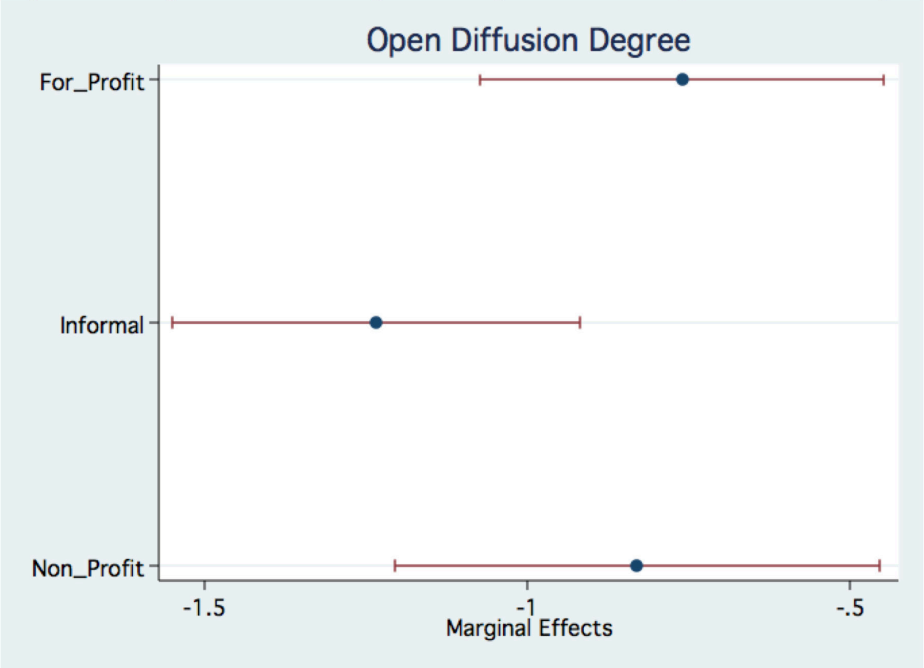


Figure 2: Marginal effects of impact of Legal Status on Open Diffusion Degree



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Chapter 3
Funding Innovation – The Case of Big Buck Bunny

ABSTRACT

In this study we explore the use of the emergent Creative Commons (CC) licenses as an alternative for leveraging funding for innovation. We study how the Blender Foundation managed open licenses to motivate users to fund production of the movie Big Bug Bunny and provide an indirect source of innovation for the software Blender. We then propose a model of innovation processes for a product (software) that is powered by a collective effort in a related industry (video).

1. INTRODUCTION

An important aspect of innovation management is identifying and absorbing external innovation (West and Gallagher 2006) and financing it.

Information about the needs of users is often found at the user level (von Hippel, 1994, 2007), so users can often contribute to innovation. Indeed, between 10% and 40% of users have developed new products in different industries (Von Hippel, 2007).

Users can innovate in different areas and innovative users may, or may not, be professionals, (Jeppesen & Frederiksen, 2004; Shah, 2000). Users tend to organize their innovation processes with user communities (Shah, 2000; Von Hippel, 2007).

These communities are able to solve problems such as the risk of failure of new products and production costs.

Integrating and managing user innovation is a big challenge for corporations.

In this study we focus on how the emergent Free *Libre* Open Source (FLOSS) and Creative Commons (CC) licenses can be used by a corporation to absorb and manage user innovation.

The purpose of this study is to understand how the Blender Foundation (a software house) managed FLOSS and CC licenses in order to absorb and manage user innovation.

Indeed, the Blender Foundation was able to obtain the services of underpaid experts and funds from users to produce the movie Big Buck Bunny *(BBB)* and to incorporate innovations into the software Blender.

In this paper we describe a case study focused on production of the movie *BBB*. *BBB* is one of the most successful movies produced with the support of an online community of users. BBB is released under the *Creative Commons Attribution 3.0* license (cc-by). This license allows users to share (copy, distribute, etc) and adapt the movie (reuse, create derivative works, remix, use as raw material, etc), even for commercial purposes, as long as proper attribution is provided.

The *Team* that created BBB was sponsored and organized by the *Blender Foundation*. The *Blender Foundation* is a non-profit independent corporation acting to maintain and improve *Blender*—creating services for its users and developers. *Blender* is a Free/Open Source 3D computer graphics software product. *Blender* is used to create animated movies, visual effects, interactive 3D applications, and video games.

Extending the *User-Innovation* theory (Haefliger, Jäger, & von Krogh, 2010) we propose a three-step model that explains how a producer obtains funds from users and absorbs user innovations.

2. CASE STUDY AND DATA COLLECTION

Since 2002, the Blender Foundation has licensed the Blender software under a FLOSS license, the GNU/GPL license, in order to share the property and the development efforts with its community of users (von Hippel, 1988, 2005, 2009; von Hippel & Katz, 2002).

In 2007 the Blender Foundation decided to use the most open CC license (CC Attribution) to attract user input, in particular funds and the services of underpaid experts.

"We always use Creative Commons Attribution for our projects, so people can re-use our work fully free, even for commercial reasons. The Blender community is our investor, so we should allow them to do business with our work!"(Ton Rosendaal –founder of Blender Foundation)

They were able to collect approximately 75,000€ from users. The total budget was about 150,000€, and the Dutch government covered the balance.

The Blender Foundation organizes and sponsors a User Team to innovate (Dahlander & Magnusson, 2008; Jeppesen & Frederiksen, 2006; West & Gallagher, 2006) and cooperate (Jeppesen & Molin, 2003). All the members of the Team were selected from the Blender User Community. The Blender Foundation uses the CC license (by) to attract their contributions (Gambardella, 2011). Users contributed funding to the project (Belleflamme et al., 2011;

Kleemann et al., 2008; Lambert & Schwienbacher, 2010; Ordanini et al., 2011; Schwienbacher & Larralde, 2010) and/or worked on the project for little or no compensation (Brabham, 2008; Kleemann et al., 2008; Schenk & Guittard, 2009).

Therefore, the User Community participated in the project in two ways. First, it was the source of underpaid experts, both artists and developers. Second, it funded the project by pre-paying the final product.

For purposes of this study we assembled qualitative data from a variety of sources (Yin, 2003). Using multiple data sources is important because it guarantees coverage of the different perspectives required for a qualitative analysis of this type of phenomenon (Ordanini et al., 2011).

Our data consists of face-to-face interviews, data from the Blender website[11], press reports, and other public sources. We also analyze the evolution of the Blender software to check for updates and innovations before and after the creation of BBB. The semi-structured interviews constitute the starting point of our study. We performed a qualitative data analysis of 15 interviews (see Table 1).

(Table 1 about here)

We interviewed selected members of the Blender Foundation, of the Team that created BBB, and of the Blender Community on the occasion of the Blender Conference 2008 in Amsterdam.

Eleven interviews were in English and four in Italian, and eleven of these were approximately 15 minutes long and four approximately 50 minutes long (one in Italian and three in English).

We interviewed Ton Rosendaal (46min 10sec), the leader of the Blender Community and founder of the Blender Foundation. Rosendaal was also member of the Team, with the role of Producer. In total we interviewed 3 of 9 members of the Team. In addition to Rosendaal, we interviewed Enrico Valenza, the Lead Artist, and Andy Goralczyk, the Art Director.

We also interviewed Pablo Vasquez, a member of the Team that created the videogame Apricot, a spin-off of BBB. The other interviewees were selected randomly from members of the Blender Community.

Except Ton Rosendaal, none of them were permanent employees of the Blender Foundation.

[11] http://www.blender.org

According to the "Grounded Theory" approach (Eisenhardt, 1989), which has already been used in similar analysis (Ordanini et al., 2011), our *bottom-up* strategy and the total number of respondents were sufficient to ensure a consistent analysis (Glaser & Strauss, 1967).

The Team consisted of nine selected creators—six artists and three developers—who worked together physically. The reason for uniting the Team like this was because *"they have not only developers, but also artists. Creative people want to be together, technical people they don't mind" (Rosendaal)*.

The Team worked in Amsterdam for six months, and a multitude of sponsors pre-paid the final product. It was possible to be a donor and named in the credits (30€ or more) or identified as a main sponsor (250€ or more). The team members (see Table 2), having different roles, tasks, and skills, and coming from various parts of the world, only received a reimbursement for travel and accommodation expenses.

(Table 2 about here)

The Blender user community supported the movie BBB, which was produced and distributed by the *Blender Foundation.* BBB offers an ideal context to explore how user innovation can be organized, led, and absorbed because:

- It lets us observe a software producer enter the movie industry, supported by its user community;The producer was able to make a movie, despite the high entry barriers that traditionally characterized the movie industry;
- It is possible to analyze the strategies used by the Blender Foundation and its Community to sustain their business model;
- It is useful for understanding the motivation to create, fund, and participate in the production of a freely available work;
- It gives us the opportunity to observe *horizontal user innovation* from the software industry to the movie industry;
- It gives us the opportunity to observe the absorption of *user innovation* and users' needs from the movie industry to the software industry;
- It also gives us the opportunity to study how economic actors (producers, managers) manage copyright using CC licenses.

3. DISCUSSION

The case-study described in this manuscript is a clear example of free revelation of innovation-related information (Von Hippel, 2007) to attract contributions from users. Indeed, the Blender Foundation uses *open licenses*—GNU GPL for the software and CC-BY for the movie—because they benefit more from freely revealing the "source" than from enforcing standard property rights. Indeed, using classical copyright protection the Blender Foundation would not be able to collect contributions and funds from the user community.

Two different communities form the whole Blender community: (1) Blender Developers and (2) Blender Artists. Developers contribute to the development of the Blender software. We define artists as intermediate users. Intermediate users are users who use some goods and services to produce other goods and services. Intermediate users are often the source of the innovation in many industries (Bogers, Afuah, & Bastian, 2010).

According to Dolf Veenvliet and Ton Rosendaal, artists can become developers to create the tools they need; it almost never works the other way around.

"I have a degree in arts. I want tools to do things otherwise impossible. So you have to create your own tool." (Veenviliet)

This observation reveals the existence of an asymmetry in knowledge between artists and developers. Indeed, artists may feel that they need to improve on the software for it to meet their needs. This supports the hypothesis that to improve software it could be important to reduce this knowledge asymmetry by collecting the requirements of artists and translating them to developers.

Artists and developers have difficulty communicating with each other because they have different backgrounds, priorities, and communication standards. Thus, a team of artists and developers was assembled to produce a movie in order to avoid this problem.

According to our interviews, most artists did not care about licenses in their general production of goods. Consequentially they used copyright for their own products. Exceptions were one artist who used Creative Commons and another who used Public Domain because the University sponsored his products. We interpret this result as indicating that the majority of artists generally use Blender software to produce a marketable final product.

In case of BBB, users funded the production because they were motivated by *intrinsic motivations*

"I like Blender. I like the background, the philosophy behind it. The sharing. Everything should be open. No constraint. You should be done whatever you want." (Velasquez)

and *extrinsic motivations*

"Aver fatto Big Buck Bunny è stata una grande esperienza. Fondamentalmente imparare sul campo come si fa un film. Quello che abbiamo cercato di fare è stato

quello di seguire una pipeline professionale, quella che usano i grandi studios. Mi ha anche dato molta visibilità dal punto di vista professionale"[12] *(Valenza).*

However according to all the interview subjects, the main motivation for contributing to the movie production was to innovate the Blender software, because they need it for their final marketable works.

This goal was achieved. Indeed, the "Bunny release" of the Blender software (Blender 2.46 release) was a result of the BBB project. This release contains many innovations developed to meet artists' needs that became apparent during the project: a new hair and fur tool, faster fur rendering, a new mash deformation system, cloth simulation, and many other features[13].

4. MODEL: A THREE-PHASES PROCESS TO FUND AND ABSORD USER INNOVATION

The study of *BBB* allows us to extract the following model to fund and absorb user innovations. The model consists of three phases:

In the first phase the producer loosens copyright protection to elicit new contributions. The reduction of copyright protection could take the form of copyright infringement (Haefliger et al., 2010) or legally, as in case of FLOSS (Lerner & Tirole, 2004, 2005; San Wong, 2007) and CC licenses (Gambardella, 2011; Lessig, 2001, 2004).

In our case study, the Blender Foundation reduced the copyright protection of Blender software using a FLOSS license. In this way they could benefit from users' contributions while collecting funds and expertise to develop the Blender software.

In the second phase, intermediate users move the innovation (*horizontal user-innovation*) from one industry to another (Haefliger et al., 2010). The creation of a team composed of artists and developers made possible the transition from one industry (software) to another (movie) and then the creation of a new work: the movie BBB. In this phase, artists and developers are a source of innovation in both the software and the movie industries. Indeed, the team was able to create a new work in the movie industry and invoke new movie making techniques. Moreover, thanks to the use of cc-by, all parts of the movie are available to other artists for further creations. The Blender software was improved and enhanced during the production of BBB to solve issues that arose related to producing the movie.

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[12] "*Big Buck Bunny was a great experience. Basically I learned how to make a film. We tried to follow a professional pipeline, similarly to the pipeline used by big studios. I also got a lot of visibility from the professional point of view."*

[13] See http://www.blender.org/development/release-logs/blender-246/ for the complete list of upgrades and new features.

In the third phase, the producer in the software industry absorbed innovation generated by intermediate users in the movie industry, resulting in a new, more powerful, release of the Blender software.

The Blender Foundation was able to indirectly finance the development of the Blender software and absorb innovation that emerged from the needs of users. The Team was integrated with users of Blender software (the artists) (Füller, Bartl, & Ernst, 2006) to identify needs (Jaworski & Kohli, 2006), to innovate (Roberts et al., 2005; von Hippel, 1988, 2005), to develop new features (Füller et al., 2006; Herstatt & Hippel, 1992; Jeppesen & Molin, 2003; Urban & von Hippel, 1988), and to transfer the innovations from users to producer (von Hippel & Katz, 2002).

5. CONCLUSION

Artists and developers, the two types of members of the Blender User Community, are not able to communicate with each other because of their different backgrounds. A team of artists and developers was created to solve this problem and absorb user innovations.

In this study we argue that the Blender Foundation used a CC license to create and manage a user community in order to directly finance the movie BBB and indirectly bring innovation to the software (Blender software). Moreover, the Blender Foundation was able to absorb the innovation that emerged from the needs of users.

From observing the production of BBB we developed a three-phase model that suggests how a corporation can harness users to finance and innovate their products.

Our analysis demonstrates how users, who are usually considered only consumers, can be used to finance productions (Belleflamme, Lambert, & Schwienbacher, 2011; Lambert & Schwienbacher, 2010; Ordanini, Miceli, Pizzetti, & Parasuraman, 2011; Schwienbacher & Larralde, 2010), as partners in vertical integration (Jeppesen & Molin, 2003; von Hippel & Katz, 2002), and as sources of innovation (Lundvall, 1985; Urban & von Hippel, 1988; von Hippel, 1988, 2009).

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Appendix

Table 1

	Name	Family Name	Type	Role	Time
1	Filip	Sendsem	developer and artist	community member	9 min
2	Alexander	Krause	artist	community member	18 min
3	Pablo	Vazquez	artist	community member	50 min
4	Viktor	Kolokotronis	developer	community member	10 min
5	Claudio	Andaur	3d artist	community member	12 min
6	Dolf	Veenvliet	technical artist	community member	19 min
7	Marco	Amato	developer and artist	community member	56 min
8	Riccardo	Covino	graphical artist	community member	35min
9	Andy	Goralczyk	artist (but also developer to fix his needs)	team member	
10	Enrico	Valenza	artist	team member	20 min 30
11	Giovanni	Gallo (anonymus)	researcher and teacher of Blender	community member	17min30
12	Jason	van Gumster	writer and teacher	community member	31min49
13	Fabrizio	Valpreda	designer and teacher	community member	16min14
14	Tom	Bartlett	manager of a 3D image/movie firm	community member	28min36
15	Ton	Rosendaal	designer	team member (leader)	46min10

Table 2

Sacha Goedegebure	Director - Story and screenplay - Storyboard artist - Character designer - Animatic editor - Character animator	Netherlands
Andy Goralczyk	Art director - Character modeler - Character animator - Texture painter - Environment modeling and shading - Fur and feathers - Shading, lighting, compositing - Graphics design (web, dvd)	Germany
Enrico Valenza	Lead artist - Storyboard artist - Color guide artwork - Animatic editor - Character animator - Matte and texture painter - Environment design, layout, modeling and shading - Environment and props animation	Italy
Nathan Vegdahl	Rigger & Animation - Character animation - Character rigging - Environment and props animation	USA

	- Compositing	
William Reynish	Animator - Character animation - Animatic editing	Denmark
Brecht Van Lommel	Technical Director - Software development, support & bug fixes - 3D tools and rendering development, - Hair, grass and environment rendering software	Belgium
Campbell Barton	Technical Director - Software development, support & bug fixes - Scripting & tools - Tree modeling and scripting - Environment and props animation - Render wrangler - Studio pipeline	Australia
Jan Morgenstern	Music and sound design - Sound effects, foley design, audio mixing and post-production	Germany
Ton Rosendaal	Producer - Project realization, finances, planning - Software development, scheduling	Netherlands

Chapter 4
Modeling production in the Creative Commons[14]

Abstract

Creative Commons (CC) licenses are increasingly used and the number of works under these licenses is growing. However, for each successful project there are many others that fail because they are unable to attract user contributions. Soliciting the contributions of users is a challenge for the management of a CC project. The aim of this paper is to shed light on the factors that contribute to the success of a CC project. To do that we develop an agent-based model that simulates the hidden dynamics of the production of CC works. This model is able to replicate stylized facts of CC production. Moreover, the model shows that characteristics of the CC project, such as the effort necessary to complete the project, the prestige of the producer, and its legal status are fundamental to its success.

1 Introduction

The number of projects under Creative Commons (CC) licenses has increased rapidly over the last ten years, piquing our desire to understand the factors involved in the production of works under these licenses.

The CC are a set of licenses directly derived from Free *Libre* Open Source Software (FLOSS) licenses. Unlike FLOSS, CC are used in art productions. Like FLOSS, the aim of CC licenses is to facilitate the sharing of works among people and the collection of contributions from users (Lessig 2004).

Despite the extensive work on FLOSS production, there is little literature analyzing CC production (Mustonen 2010).

The collection of data is more difficult for projects under CC than under FLOSS licenses. In the case of FLOSS all information on the production process and the contributions of users is stored in online platforms (such as SourceForge, GitHub, Bitbucket, Google Code, etc.) used by developers. Conversely, in case of videos, music, or texts under CC licenses only the final result of the production process is stored on online platforms (such as YouTube, Internet Archive, DailyMotion, Flicker, Picasa, Spotify, SoundCloud, etc.).

For each successful CC project there are many others that never succeed, failing to attract contributions from users. Soliciting the contributions of users is a challenge for

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the management of a CC project. The aim of this paper is to understand the paths (David 1985) and factors that contribute to the success of a CC project.

Motivational rules and objective functions govern the behavior of producers and users who contribute to a work. This behavior can be described by a model in which is possible to observe consistent "emergent properties" (Dalle and David 2005). To do that, we developed the basic structure of a model that reproduces the stylized facts observable in real life (Malerba, Nelson et al. 2006). This model is an Agent-Based Model (ABM) (Tesfatsion and Judd 2006) that reproduces the stylized facts of a production of artistic works under CC licenses. Specifically, in this model the output is a selection among video projects under CC licenses, represented by the stylized facts. As mentioned above, this output can be empirically observed on online platforms. For purposes of this study we decided to replicate empirical data (the output of the video-project selection process) extracted from the Internet Archive (IA). This output was used to develop and calibrate an ABM that can simulate the hidden patterns present in CC production. We decided to use the IA because it is the platform recommended by the Creative Commons Organization for storing CC works.[15]

On IA we observe different creators, such as video-makers, dentists, software houses, the U.S. Congress, Nonprofits and many others having different goals, business models, and strategies, and which create videos for a variety of purposes. Video-makers do it to disseminate their films, dentists to promote their businesses, software houses to give video guides to their users, etc. For purposes of this study we do not differentiate between the various objectives of different creators.

Each work starts from a project. If the project succeeds the work is done. A project succeeds if it is able to collect a sufficient number of contributions. Different types of contributions might be required to complete a project: funds, unpaid work, feedback, etc. In this study we do not distinguish between the different types of contributions; a contribution is considered a single unit of something that is necessary to complete the project. When the project is completed we have the final work. Then the work is stored and observable on the online platform.

However for each project that succeeds there are many others that fail. Our agent-based model is able to simulate the dynamics of such selection process.

We assume that a project succeeds when it is completed. Thus, the success of a CC project is attributable to its capacity to attract a sufficient number of contributions.

Participants in CC production are heterogeneous and their decisions to allocate efforts reflect different motivations. The ABM is an excellent tool to focus on individuals with heterogeneous behavior (Radtke, Janssen et al. 2009).

The model universe consists of agents and projects. Agents may choose to create a new project, to contribute to an existing one, or to do nothing. We assume that the creator of a new project acts as producer and that contributors act as users.

[15] http://creativecommons.org/weblog/entry/7629

Our ABM consists of a *prior-platform* that is a sort of virtual market in which agents propose their projects, decide which one to contribute to, or opt to do nothing. Agents decide to participate in a project on the basis of their utility functions. Each utility function accounts for different factors reflecting the characteristics of each project. The output of this virtual market is the list of completed projects that we can empirically observe on the online platform (the IA).

This model can be used to explore the conditions necessary for eliciting the contributions of users, who play a fundamental role in determining the success of CC projects.

This paper contains 5 sections. In the next section we present the influential factors of the model and a description of the model itself. In the following section we describe the calibration and validation methods. Then we introduce the results of our model and formulate an econometric model to run on the output of the ABM. Finally we discuss the results of both the output of the model and the regression analysis.

2 The Model

The model is a tool to help generate hypotheses about what process might have generated the results observed on IA. The model itself defines the structure of the process. In our case, participants with given preferences are selected randomly to initiate new projects or to contribute to existing projects or to do nothing.

Our hypotheses are on the preferences and characteristics of the participants. In order to explore a range of assumptions that might lead to the desired outcome, we run simulations of the model with different instantiations of these preferences and characteristics. Then we observe the average outcome of each simulation to check how close it is to our benchmark, the empirical data.

Our benchmark spans several periods. For each period we can imagine the likely preferences and characteristics of participants based on our intuition and corroborated by the model output. Based on these exercises for each period, we can then reconstruct the likely evolution of preferences and characteristics in CC production.

3.1 Influential Factors

A fundamental step in developing an ABM is to identify the main factors that are most likely to influence the dynamics. We identify two categories of influential factors:

1. The characteristics of the projects
2. The motivations of the users

The *characteristics of the projects* are features directly related to projects and their production. Characteristics can be subjective (beautiful or ugly, interesting or boring, etc.) or objective (completed or not, started by a Nonprofit producer or not, started by a prestigious producer or not, the number of contributions necessary for it to be completed). For these purposes we create variables corresponding to the objective characteristics of the projects:

"Success" is the dependent variable that represents the success of a project—the work is done and published on the online platform. It is the production average of a single producer. This average is calculated from the different scenarios of the different years.

"Commercial" is an independent variable. It is randomly assigned to the model. It is a dummy variable that indicates whether a For-Profit or a Nonprofit producer started the project. To be produced by a For-Profit is considered to have a negative impact on the success of a project (Valentinov 2007) (Gambardella 2011).

"Prestigious" is an independent variable. It is randomly assigned to the model. It is a dummy variable that indicates whether a prestigious producer started the project. To be started by a prestigious producer is considered conducive to the success of the project. We assume that prestige helps to promote the project, attracting users motivated by *reputation*, *peer-recognition* and *career concerns* (Lerner and Tirole 2005).

"Maturity" is an independent variable. It is randomly assigned to the model. This variable indicates the remaining level of effort required to complete the project. To require greater effort is considered to have a negative impact on the success of the project. We assume that the request for more effort tends to discourage the contribution of users.

Motivations are the different factors that induce users to contribute to a particular project. These are usually subjective and difficult to identify and measure.

In this study monetary incentives are not considered motivational factors because contributing to a CC project does not yield a direct economic return. Therefore, this study considers social factors as the main motivational factors (von Hippel 1988, Johnson 2002, Harhoff, Henkel et al. 2003, Lakhani and Wolf 2005, Lerner and Tirole 2005, von Hippel 2005, Valentinov 2007).

Usually, Nonprofit creators tend to be more successful in attracting contributions (Valentinov 2007). Indeed, they use social factors to compensate for lower salaries and incentives and to reward volunteering and donations (Stewart, Ammeter et al. 2006, Lambert 2010, Belleflamme, Lambert et al. 2013).

Producers who use open licenses and/or are prestigious tend to be more successful in attracting contributions from users because they use social factors to compensate for lower salaries and incentives and to reward volunteering and donations (Lerner and Tirole 2002, Lessig 2004).

In the following paragraph we describe the motivations used in the utility functions to define the behaviors of agents (users and producers).

3.2 The Utility Function

In this study the Cobb-Douglas (CD) utility function is used to simulate the behavior of agents:

$$U(x_1, \dots, x_n) = \prod_{i=1}^{n} x_i^{\alpha^i}$$

This utility function is used to evaluate the quality of a potential project and determine the users' potential contribution. Agents choose to contribute to projects hosted on the *prior-platform* on the basis of this utility function. Once projects have received a sufficient number of contributions they are removed from the *prior-platform* and published.

This model allows for an analysis of creative commons production in the context of an environment reminiscent of Kickstarter (Mollick 2013).

The x_i^{α} in the utility function are the different attributes of each project that agents take into account:

- x_1^{α} (effort) represents the propensity to participate in a project in light of the maturity of the project. The more mature the project, the less "effort" is needed. The value of x_1 depends on the *maturity* of the project. Above, the value of the *maturity* of a project can be from 1 (minimum) to 10 (maximum). The value of x_1 is normalized to range from 1 (minimum) to 2 (maximum).
- x_2^{α} (prestige) represents the propensity to be attracted by prestigious projects. The value of x_2 depends on the characteristic of the producer—1 if the producer is not prestigious or 2 if the producer is prestigious.
- x_3^{α} (status) represents the propensity to be attracted by Nonprofit associations. The value of x_3 depends on the status of the producer, it is 1 if the producer is For-Profit and 2 if the producer is Nonprofit.
- x_4^{α} (dissemination) represents the propensity to be attracted by licenses that are open from a dissemination perspective. The value of x_4 depends on the openness in dissemination of the project license (see Table 2): 1 if minimum, 1.5 if medium, and 2 if maximum.
- x_5^{α} (control) represents the propensity to be attracted by licenses that provide an opportunity to co-produce and modify the original work. The value of x_5 depends on the openness in production of the project license (see Table 2): 1 if minimum, 1.5 if medium and 2 if maximum.

We add another attribute, x_6^{α} (skip), to accommodate the possibility that the agent decides to not participate in a project. A value of x_6 equal to 2 represents the utility to the agent of the blank idea (do nothing); otherwise it is equal to 1.

α^i represents the sum of α in each utility function. Each α represents the weight of each factor in the different utility functions.

The CD utility function does not strictly require that the weights assigned to the factors sum to 1. However, it is useful to normalize the utility function by constraining our weights to sum 1 both for algebraic convenience (Varian 2000) and to allow inter-agent comparisons (Elster and Roemer 1991, Brown and Robinson 2006).

3.3 Model Description

As mentioned above, our model universe consists of agents and projects. We assume that creators of new projects act as producers and contributors act as users. Moreover, agents can also decide to do nothing.

In this model each contribution to a project is represented by a one-unit decrease in the contribution required to complete the project (*maturity*).

The description of the actions in each step of the model is as follows:

- "Action 0": the model is initialized and *n* agents are created. The values of the *characteristics* (commercial, prestigious, maturity, and license) that each agent transfers to each project are randomly assigned.
- "Action 1": an agent is chosen randomly who "imagines" 7 different projects, one for each CC license, plus 1 blank idea. The blank idea indicates the non-creation of a project. The licenses are organized according to the degree of openness (*minimum*, *medium* and *maximum)* in production as well as in dissemination (Gambardella 2011) (see Table 2).
- "Action 2": these "imagined" projects are stored in a sort of "prior-platform." The prior-platform contains the 8 "imagined" projects and eventually the projects already selected by agents in previous steps.[16]
- "Action 3": the selected agent finds which project in the *prior-platform* maximizes his or her utility function. This agent then contributes effort to the "selected project." An agent who selects one of the imagined projects acts as a "producer," while one who selects a project already chosen in a previous step acts as a "user." If the agent selects the "blank idea," the agent does nothing and no project is created.
- "Action 4": if the selected project is the blank idea, all imagined projects are dropped and we go back to "Action 1." If the selected project is one of the 7 imagined, this project is kept in the *prior-platform* with a number of contributors equal to 1 and the other 6 imagined projects are dropped. If the selected project is one of the projects already presented in the *prior-platform*,[17] a contribution equal to 1 is added to this project and all the imagined projects are dropped.
- "Action 5": the *maturity* of projects is checked and if the project is complete it acquires the status of "completed project." A project is completed when the number of agents having contributed equals the value of "maturity," randomly assigned at "Action 0." The complete project is removed from the *prior-platform* and published on the *visible-platform*.
- "Action 6": we go back to "Action 1" to start another step until the chosen number of steps is completed.

We notice that at the first step there are only 7 projects plus a blank idea in the *prior-platform*. The 7 projects in the *prior-platform* are the selected agent's 7 "imagined projects."

[16] There are 0 prior projects at the first step.

[17] This means that it is a project previously selected from an agent's 7 imagined projects.

At the first step, the selected agent can only choose from among his or her 7 imagined projects or do nothing (the blank idea). If the agent decides to do nothing the *prior-platform* will be empty, otherwise we will have 1 project stored on it.

At the second step, the number of "evaluable projects" consists of the project that may already be stored in the *prior-platform* plus the 7 imagined projects of the new randomly chosen agent.[18] Then this agent chooses the utility-maximizing project.

If the agent chooses to do nothing, all imagined projects are dropped and only the previously chosen project is kept in the *prior-platform*. In this case the number of contributors to this project does not change.

If the agent chooses to contribute to a project already stored in the *prior-platform,* all imagined projects are dropped and only the previously chosen project is kept in the *prior-platform*. In this case, the number of contributors increases by 1.

If the agent chooses to contribute to one of his or her 7 imagined projects, the other imagined projects are dropped and this chosen project is stored in the *prior-platform* together with previously chosen projects. In this case the number of contributors to the newly chosen project increases by 1 and the number of contributors to previously chosen projects does not change.

This process continues until the number of steps is completed. A project is completed when the number of contributors is equal to the value of *maturity* required to complete the project. In this case, the project succeeds and is published.

The model is repeated for each year. In our empirical database we have 7 years to simulate (2003 to 2009).

Each project contains the information about its own *characteristics*. Agents' characteristics are constant over the years; this is important for tracking the different projects. Indeed, the characteristics of the agents represent the characteristics of the projects.

The *attributes* of agents change over the years because we need to have all combinations of users' motivations. The *attributes* represent the motivations of users, they are the arguments of each agent's utility function. However we do not track them because we are not interested in changes in contributors' motivations.

In other words, projects started by the same agent have the same characteristics, but agents that contribute in different years can be either different agents or the same agent, but with different motivations. In this way we can track the attractiveness of characteristics of projects.

On the basis of the number of contributions, participants can estimate how much effort is required to complete the project. Less effort is, of course, preferred.

[18] We notice that previously chosen agents can be selected again.

The attributes in the utility function of each agent indicate the weight assigned to the characteristics of each project.

As an example, at the first step of the model simulation Agent_64 is randomly chosen. He imagines 7 projects plus a blank idea and decides which of the 8 projects maximizes his utility function (7 imagined projects plus a blank idea). Then Agent_64 solves his different utility function for the 7 different licenses and the blank idea. For example, the utility function of Agent_64 and project under CC BY-NC is:

$$U_{64_{by-nc}} = effort^{\alpha_1}\ status^{\alpha_2}\ control^{\alpha_3}\ dissemination^{\alpha_4}\ prestige^{\alpha_5}\ skip^{\alpha_6}$$

Then we use the value of the characteristics of Agent_64 (*effort*, *status*, *prestige*), the degree of openness of the license (*control*, *dissemination*), and the blank idea (*skip*) to assign values to the attributes in the utility function. Finally, we assign weights to his *attributes* in the utility function $(\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6)$ reflecting the motivations of the agent.[19] The value of *effort* is normalized to reflect the maximum possible value of the required effort. We let the maximum possible value be 10. Then the necessary effort is equal to 2, and *effort* = 1 + (2/10) = 1.2.

The values of *status* and *prestige* are equal to 2 if the agent is *Nonprofit* and *prestigious*, respectively, 1 if not.

The values of *control* and *dissemination* are equal to 2 (maximum) or 1.5 (medium) or 1 (minimum) according to the degree of openness in *production* and *dissemination* respectively (see Table 2):

$$U_{64_{by-nc}} = 1.2^{0.07}\ 2^{0.30}\ 2^{0.23}\ 1^{0.31}\ 2^{0.05}\ 1^{0.04}$$

This means that this agent is more attracted by the Nonprofit status ($\alpha_2 = 0.30$) and a license that is open in production ($\alpha_3 = 0.23$) and dissemination ($\alpha_4 = 0.31$). The necessary effort to complete the project ($\alpha_1 = 0.07$), the prestige of the project ($\alpha_5 = 0.05$), and doing nothing ($\alpha_6 = 0.04$) are not very important to this agent.

In case of a blank idea all *attributes* except *skip* are equal to 1. *Skip* is equal to 2. In this case we take into account only the weight of doing nothing:

$$U_{64_{blank}} = 1^{0.07}\ 1^{0.30}\ 1^{0.23}\ 1^{0.31}\ 1^{0.05}\ 2^{0.04}$$

Once Agent_64 solves his utility function for all projects, he keeps the one that yields the highest utility. Then this project is stored in the *prior-platform* and the other projects are dropped. In this case Agent_64 acts as producer.

In the second step, Agent_94 is chosen at random. She imagines the 8 projects (7 projects for the CC licenses and the blank idea) and solves her utility function for the 8 projects plus the project already stored in the *prior-platform*. It happens that the highest utility of Agent_94 results from using the characteristics of the project created

[19] For this example values calculated with the results of the calibration procedure of paragraph 4 were used.

by Agent_64 and already stored in the *prior-platform*. Thus, Agent_94 contributes to the project started by Agent_64. All 8 projects imagined by Agent_94 are dropped. In this case Agent_94 acts as contributor.

Each contribution to the project started by Agent_64 decreases the effort needed to complete the project. It starts with *maturity* equal to 4. After the first contribution by Agent_64 and then that by Agent_94, the necessary effort required to complete the project is equal to 2. When the necessary effort is equal to 0 the project is completed and published.

The model continues selecting other agents randomly at each step until the number of steps is completed.

We arbitrarily set the number of agents at 100, since this number is more than enough to generate different combinations of characteristics of agents. These characteristics are randomly assigned. The weights of *attributes* in utility functions and the number of steps are calibrated so that the model replicates the results of the empirical database.

4 Calibrations

In order to properly investigate and validate our simulation we use a joint analysis methodology (Kennedy, Xiang et al. 2005) that has already been used for ABM including individuals (such as producers) (Garcia, Rummel et al. 2007).

To validate our ABM we compare the simulated results from the *prior-platform* to the behavior empirically observed in the real *visible-platform*. The empirical database was created from data in the IA (Gambardella 2011). For this study we only selected videos licensed under CC and created by Nonprofit and For-Profit producers from the original database.

Previous research has shown that CC licenses impact the behavior of producers and users (Lerner and Tirole 2002, Lerner and Tirole 2005, von Hippel 2005, Colazo and Fang 2009). Nonprofit producers and open licenses are more likely to attract contributions from users (Valentinov 2007, Gambardella 2011).

The ABM presents different parameters to which values have to be assigned. Since a random search of the parameters is not practical and will not cover all possible combinations, an important challenge of this study was calibration of the parameters. Using an "iterated racing procedure" called *iRace* (López-Ibánez, Dubois-Lacoste et al. 2011) we obtained different sets of parameters to calibrate our model in order to replicate the empirical results. The output of the different scenarios offers the opportunity to capture decision-making behavior and reveals strategies to attract contributions from users (Fagiolo and Roventini 2012).

Iterated racing is an automatic configuration method that consists of three steps: (1) sampling new configurations according to a particular distribution, (2) selecting the best configurations from the newly sampled ones by means of racing, and (3) updating the sample distribution in order to bias the sampling towards the best configurations (López-Ibánez, Dubois-Lacoste et al. 2011).

First, a target is defined. In our case we use as the target the number of projects published each year by Nonprofit and For-Profit producers in our empirical database.

(Table 3 about here)

To run the calibration some parameters have to be defined:

- the number of agents;
- the range of steps;
- the computational budget .

As mentioned above we decided to use 100 agents. We also tested the model with 10 and 1000 agents and the results were similar: The model does not appear to exhibit scale effects. Once the agents are created, the model randomly assigns values to their characteristics. These values do not change during the instances of iRace.

The range of steps, *s*, indicates the minimum and maximum number of steps of each instance of the model. We define *s = [10, 2000]* the range of steps. We consider 2000 to be sufficient as the maximum number of steps because in previous tests the number of steps necessary to reach the target was less than 500.

The computational budget determines the maximum number of experiments allowed to reach the target. Each experiment tests a random configuration of α_n. In each experiment, every configuration has different vectors of α_n. We define 50,000 as the maximum computational budget because previous tests with a lower budget did not produce results.

With this procedure we selected the value of each characteristic of the different projects and the value of α for each attribute in the different utility functions for each year.

iRace allows for different scenarios, but we selected only those that were able to reach the targets in each year, as mentioned above.

Each scenario contains the characteristics of agents, a weight for agents' attributes and the necessary number of steps.

(Table 4 about here)

The characteristics of the agents are the same in each scenario. Once agents have transferred their characteristics to the project, these characteristics do not change over time or with the scenarios. The weight on attributes, which represent the motivations of agents, changes in each scenario.

Moreover, the procedure provides the probability, *p*, of choosing the best project (the project that maximizes the utility function of the agent).

$$p = \frac{m^r}{m^r + M^r}$$

m represents a project that does not maximize the utility function and *M* represents the project that does. The value of *r* represents the sensitivity of agents to the differences among projects. The higher the value of *r,* the greater the probability that agents choose exactly those projects that maximize their utility functions. For example, if *r* equals 1 and Agent_1's project yields utility equal to 1.8 and Agent_2's project yields utility equal to 1.9, the former has a 49% probability of being chosen; if *r* is equal to 100 this probability decreases to 0.4%. In each scenario the value of *r* is the same, representing the stickiness of information (see Table 3). The stickiness of information indicates the incremental expenditures required to obtain a unit of information (von Hippel 1998). In our model, this represents the possibility that agents know all the characteristics of potential projects and then choose the best one. We observe a constant *r* from 2005 to 2009; indicating that the stickiness of information remained constant during those years. We observe that 2004 has a high *r* compared to other years, meaning that during this year it was possible for agents to select the best project. We interpret this result as the consequence of a decline in the level of stickiness of information.

Each scenario selected replicates the results of each year observable in the empirical database.

5 Results

Our model respects the fundamental ingredients of a "canonical" ABM (Fagiolo and Roventini 2012). The model is able to reproduce the key characteristics observed in the real platform mentioned above. Moreover, the model is able to open the "black box" and show the hidden dynamics that cause the results that are visible on the real platform. What we observe on the real platform is sort of a result of competition among projects. Only projects that are able to collect enough contributions survive and can be observed. We cannot observe uncompleted projects and we cannot observe the motivations that incite users to contribute to a project. The model is able to provide an explanation for these underlying dynamics.

An important goal of our ABM is to mimic the hidden behavior of producers. Empirical data only reveals the characteristics of producers who survive (who publish their works). Our ABM is capable of modeling the different attributes of each agent's utility function.

Given an initial number of agents, the model provides different scenarios for each year. Each scenario contains the different attributes of utility functions and the characteristics of projects for each agent. Each scenario is able to replicate the real platform.

We test our ABM using 100 agents, from 10 to 2000 steps, and 50,000 computational budgets. After calibration we obtain different scenarios for each year.

In each scenario, the characteristics of agents remain the same while the weights on the attributes change. This means that potential producers are the same in each scenario, but the motivations of contributors change.

Stochastic components are included in the model. To be sure of the results, 100 runs are performed for each scenario. The average results of the runs for each scenario are compared to the empirical data.

As in history-friendly models (Franco Malerba and Winter 2001), we compare the stylized facts of the real phenomenon with the results of our model.

It clearly emerges that our model is able to mimic the general results we have on the real platform (Figure 1). With the parameters and characteristics of agents as inputs, the model's output is consistent with the empirical data. Indeed, the number of projects that succeed each year is consistent with the number of works we observe on the real platform.

Moreover, the model is able to distinguish between, and simulate, the behavior of both Nonprofit and For-Profit agents.

In the case of For-Profit production (Figure 2) we easily observe an increase in production starting in 2005 and ending in 2007, followed by a downturn. In the case of Nonprofit production (Figure 3) we easily observe that production increases over the entire period. In both the For-Profit and the Nonprofit cases, the simulated plot is close enough to the plot of empirical data.

Our real data shows an increase in CC works in the IA over time, particularly during the period 2005–2007, and particularly produced by For-Profit producers. We interpret this data as the consequence of the fact that, as shown by a Google Trends[20] plot (Figure 4), from 2005 to 2007 Creative Commons licenses became much more well-known. Indeed, at the end of 2004 the popular magazine Wired, in collaboration with the Creative Commons organization and sixteen musicians, assembled the first major compilation of music that was free to sample and share under CC.[21] In 2006, Microsoft and the Creative Commons organization released a tool to license works under CC. In 2007, Wikipedia contents became licensed under CC.[22]

Notwithstanding standard property rights theory, according to which the attenuation of property rights eradicates the motivation to produce, we observe an increase in the use of licenses (CC and FLOSS) that attenuate property rights (Lessig 2004, Boldrin and Levine 2008). This happens because alternative incentives such as *non-monetary* (reputation, career concerns, peer recognition, and sharing innovation) and *intrinsic* (activity itself, ego gratification, and need) motivations (von Hippel 1988, Johnson 2002, Lerner and Tirole 2002, Harhoff, Henkel et al. 2003, Lakhani and Wolf 2005, von Hippel 2005, Valentinov 2007) are able to attract contributions from users. Non-monetary and intrinsic motivations are represented as attributes in the utility functions of our agents. Indeed a *prestigious* project is more able to attract users motivated by

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[20] Google Trends is a tool that shows how often a particular term is searched on Google, we tested the term: Creative Commons from the beginning of 2004 to the end of 2009. It was not possible to test from 2003 because Google Trends starts from 2004

[21] http://creativecommons.org/wired/

[22] http://tech.slashdot.org/story/07/12/01/2032252/wikipedia-to-be-licensed-under-creative-commons

non-monetary motivations; the necessary *effort* and the propensity to do nothing (*skip*) impact on the people motivated by *intrinsic* motivations. Our model is able to replicate such a selection process leading to the success of some projects.

Moreover, our model mimics the effect that *For-Profit* producers are more attracted to CC licenses because they need to be more attractive than *Nonprofits* (Valentinov 2007). Thus, we are not surprised to find more projects under CC created by *For-Profit* agents than by *Nonprofit* ones.

To better investigate the impact that variables representing the characteristics of a project (*commercial, prestige, effort*) have on its *success* (dependent variable) a linear regression was estimated. The output of the model was used in the regression.

The *p*-value indicates that our model is statistically significant. The Brant test confirmed that our model is statistically significant. All results are significant ($p < 0,001$).

The results (see Table 1) are consistent with our expectations. The regression results show that, despite the classical property rights approach in which for-profit producers need a strong copyright to be motivated to produce, an alternative way is possible. The use of CC licenses reduces copyright power. The regression results confirm that a *for-profit* status has a negative impact on the success of a project and consequently *for-profit* agents need to renounce part of the copyright by using more open CC licenses if they are to attract contributions from users and succeed.

Our model is able to show variables that we cannot observe in the empirical database. The variable *commercial* in the empirical database can only be observed for projects that succeed—which are the ones visible on the online platform. In our model we also have characteristics of the producers who fail.

In the empirical database there is no information on the *prestige* of the producers and the *necessary level of effort*.

The *prestige* of the producer is not easy to observe. Indeed, a producer might be famous within a certain community of users, but unknown elsewhere. For example, an artist can be well-known in a certain circle, but totally unknown on the Internet. This artist is able to use his or her celebrity to collect funds to produce a video, but it is impossible for us to empirically observe this dynamic. Our model is able to mimic the *prestige* of the producer in its community of users.

The *necessary effort* required by the producer to complete the project and succeed is information we cannot observe in the empirical data. Though some objective data can be collected (such as costs of the project), this is only possible for projects that succeed—we have no information on projects that fail. Moreover, from the point of view of contributors, the effort associated with each contribution is subjective. Our model is able to mimic the effort required from producers of projects that succeed as well as of those that fail. Moreover, our model mimics users' propensity to contribute from their subjective point of view.

8 Conclusions

Collecting contributions from users and leading the project to success is a challenge. It is important to understand the conditions that contribute to project success for the management of CC projects. To explore the conditions that contribute to the success of a CC project, this study uses an ABM of CC production. The model is built on assumptions regarding users' motivations, which have already been analyzed in the literature, and calibrated using empirical data from the IA. In the case of projects under open licenses such as CC licenses, users prefer to contribute to prestigious projects because they receive non-monetary compensation motivated by things like peer-recognition, career concerns, reputation, etc. Our model accounts for these motivations.

The model reveals that in CC production the success of a project depends on its own characteristics and on its capacity to attract contributions from users. The status and prestige of the producer and the effort required by the project are important factors. These results are consistent with the literature on open licenses.

The model helps to observe the impact of unobservable variables on the empirical database. Indeed, we can only collect data on projects that succeeded from the empirical database, and we do not have any data on projects that failed. Moreover, the subjective perception of the effort and benefits associated with contributing is not observable in the empirical database.

Our model is able to mimic these unobservable data and the behavior of producers and contributors. As a result, we can observe how the characteristics of projects attract contributions from users and, thus, how they succeed.

This study contributes to alleviating the shortage of literature on CC production. To our knowledge, this is the first model of CC evolution that includes the role of users' utility and the projects' characteristics in determining the success of projects.

The main challenge posed by this model is calibrating it with empirical data. To accomplish this, we used an iterated procedure that tests different combinations of values and generates scenarios that replicate the results in the empirical database. Our model is able to replicate the pattern observed in the empirical data.

The model examines results drawn from a real selection of projects. Different scenarios are run to generate the target values. Each scenario contains the characteristics of projects that succeed and that fail and the weight of attributes in the utility functions of users, who may contribute or not. The utility functions represent agents' motivations to create and/or contribute to a project.

Using this data as the input, the model is able to replicate the behavior of users and producers. Then we can observe which projects succeed or fail. We can also observe the contributions of users. The model is able to mimic the selection process and generate the total amount of production observed in the empirical data. It is also able to predict the increase and decrease in production over time and to distinguish and replicate production by For-Profit and Nonprofit agents. Moreover, the model is able to replicate the impact the characteristics of a project have on its success.

In conclusion, the model is useful for acquiring a better understanding of the conditions necessary for the success of CC projects.

Further implementations of the model are necessary to better analyze the characteristics that allow CC projects to succeed.

Such implementations of the model could focus on three directions.

A first implementation could examine the different variables in agents' utility functions. This would help to better understand the behavior of users: when and why they do or don't contribute to projects.

A second possible implementation could be a representation of the degree of openness of licenses. This may help to better describe which other requirements are necessary for a project to succeed.

A third possible implementation would be the calibration on other databases of CC works (music, texts, pictures, software). This may help to better understand CC production in general.

These implementations would make it possible to have a more complete representation of the conditions determining the success of CC projects in real life.

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Appendix

Figure 1

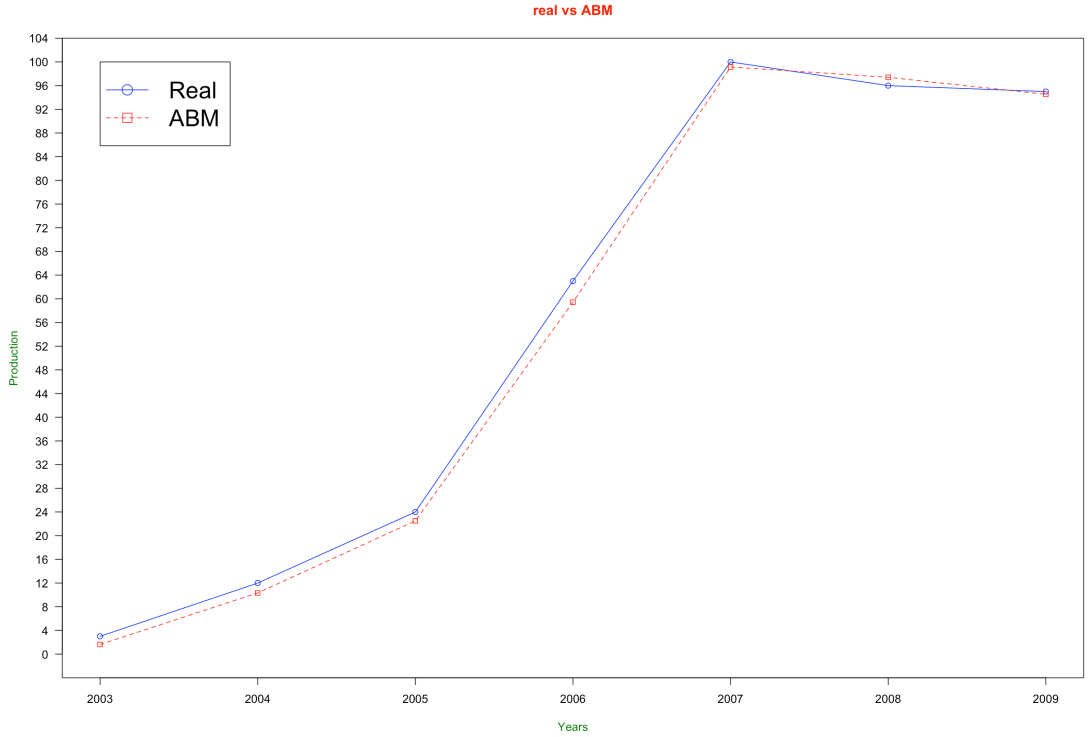

Figure 2

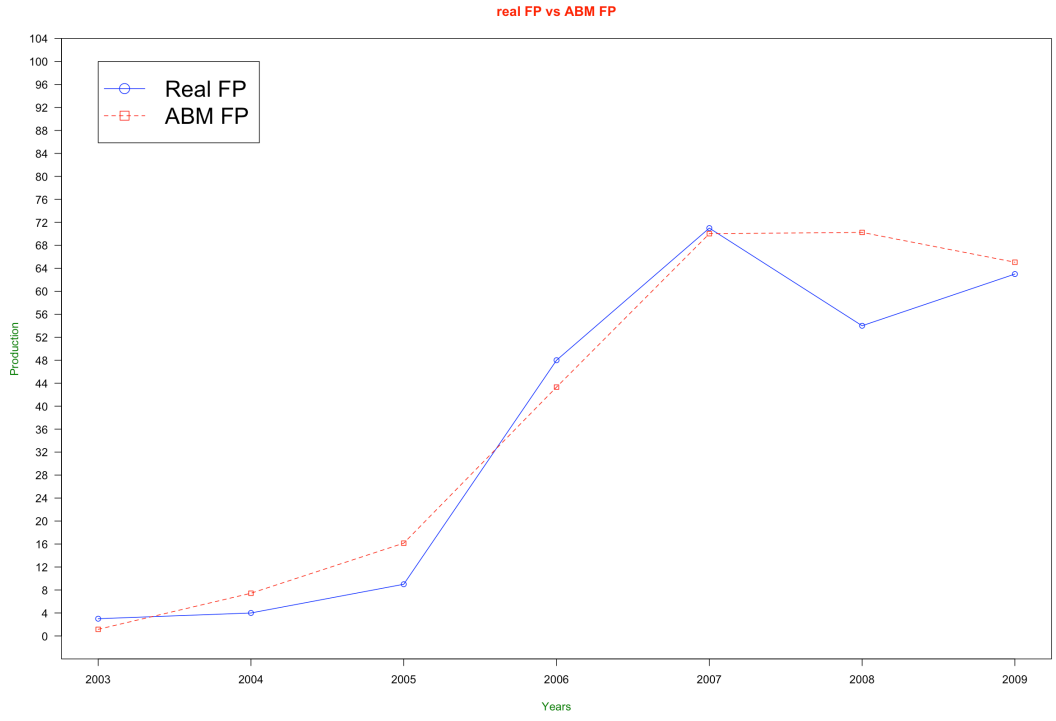

Figure 3

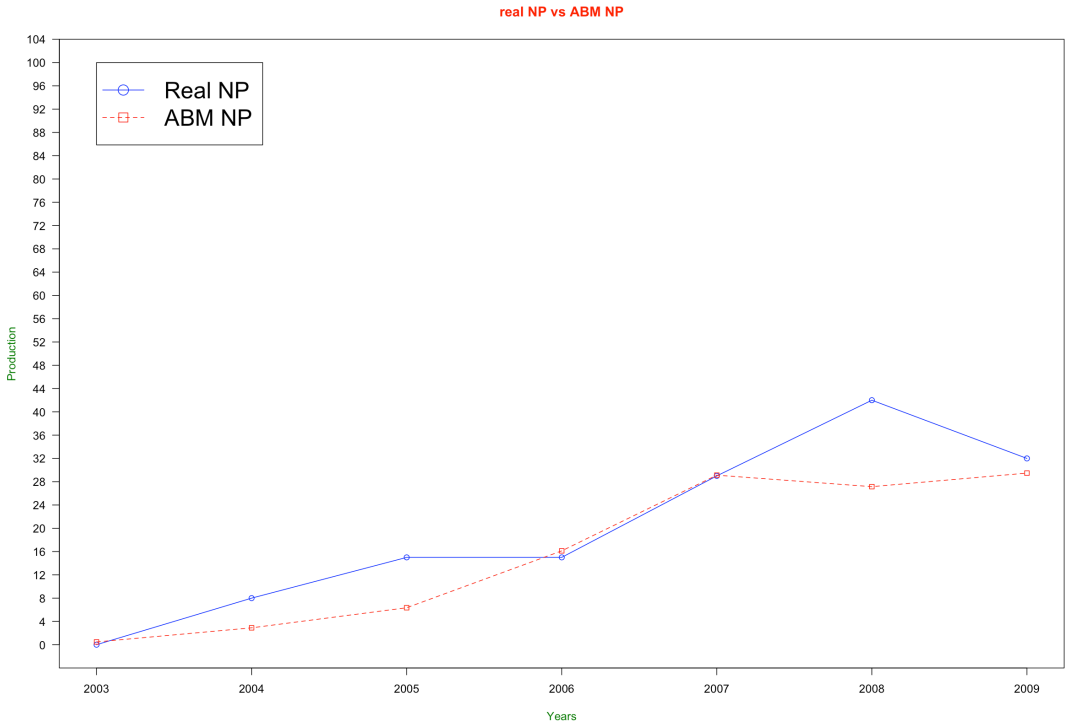

Figure 4

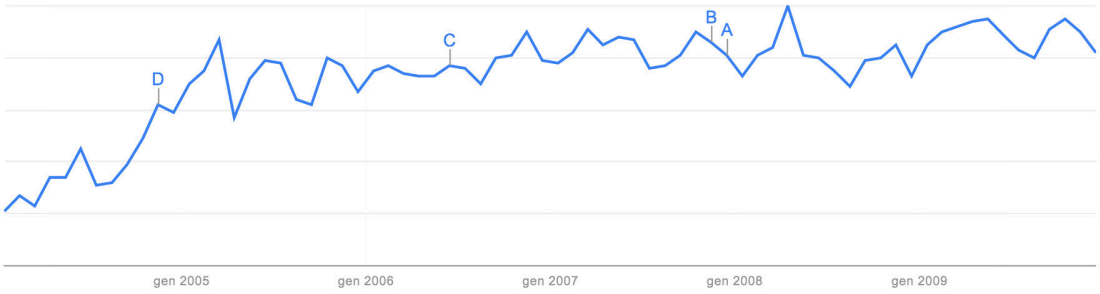

Table 1

Table 1: Impact on Success

Variable	**Coefficient** (Std. Err.)
commercial	-0.311** (0.046)
famous	0.494** (0.047)
difficulty	-0.063** (0.008)
Intercept	0.808** (0.055)
N	700
R^2	0.251
$F_{(3,696)}$	77.739

Significance levels : † : 10% ∗ : 5% ∗∗ : 1%

Table 2

Degree of openness	**Production**	**Diffussion**
Maximum	PD	PD
	CC by	CC by
Medium	CC by-sa	CC by-sa
	CC by-nc	CC by-nd
	CC by-nc-sa	
Minimum	CC by-nd	CC by-nc
	CC by-nd-nc	CC by-nc-sa
		CC by-nc-nd

Table 3

	Targets						
	2003	2004	2005	2006	2007	2008	2009
For-profit	3	4	9	48	71	54	63
Nonprofit	0	8	15	15	29	42	32

Table 4

	2003	2004	2005	2006	2007	2008	2009
n. of scenarios	4	3	2	5	4	2	5

Table 5

	r by years						
Scenario	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
1	21	64	10	11	10	10	10
2	11	97	12	10	10	10	10
3	70	92	-	10	11	-	10
4	16	79	-	11	11	-	10
5	-	-	-	12	-	-	11

Chapter 5

Conclusion

The well-documented success of FLOSS over the past decades attests to the need for an alternative approach to the classical copyright.

The encyclopedia Wikipedia and the microcontroller Arduino, both under a CC license, are notable examples of a FLOSS approach in sectors other than software. The general aim of all these projects is to attract user contributions in order to innovate and improve.

We wondered whether the FLOSS approach could be applicable in other sectors. In particular, we investigated the potential application of the FLOSS approach to the online video sector.

This thesis focuses on three aspects of the production of online video under Creative Commons (CC) licenses: (1) the optimal choice of the degree of openness of the license, (2) the strategy for funding and leading the innovation, and (3) the paths that determine the success of the projects.

We decided to focus on online video under CC licenses for four basic reasons: First, CC licenses are directed derived from FLOSS culture and experience; second, they provide the opportunity to collect and use real data; third, to our knowledge there is no published research in this field; and, fourth, there is a growing interest in the production and distribution of online video.

To better investigate the different aspects of the production of online video under CC licenses, we adopted three different approaches, one for each aspect.

First, we used a quantitative approach to investigate successful choices among the different degrees of openness in CC licenses. This approach involved an econometric analysis of video under CC licenses stored on an online platform, the Internet Archive. The results of this study suggest that, in order to attract contributions from users, producers use licenses with varying degrees of openness according to their organizational status.

Next we used a qualitative approach to investigate the strategy for funding and leading users' innovations. This involved a case study of a video produced under a CC license, *Big Buck Bunny*. The results of this study suggest that users, usually considered only consumers, can be harnessed to contribute to financing the production, as partners in vertical integration, and as a source of innovation.

Finally, we used a modeling approach to investigate the path and characteristics of successful projects under CC licenses. This approach consisted of developing an agent-based model that simulates the selection process of projects under CC licenses. The results of this study demonstrated that the model is able to replicate the stylized facts of the production of a CC video stored on an online platform. The model is able to mimic motivations that are impossible to observe empirically and shows that

characteristics of the CC project (such as the effort necessary to complete the project and the prestige and legal status of the producer) are fundamental to the success of a project.

Works under CC licenses bypass the exclusion mechanisms imposed by the classic copyright. They preserve the public-good characteristics typical of the information contained in each intellectual work. Indeed, even using the more restrictive CC licenses, both non-excludability (everybody can use it) and non-rivalry (one individual's use does not reduce availability to others) are preserved. However this thesis shows that works under CC licenses, despite their similarity to public goods, can be the object of business strategies. We show how producers can use CC licenses to benefit from users' contributions.

It emerges from our analysis that, to benefit from the social motivation of users and thus elicit their contributions, producers need to adjust the degree of openness in the licenses to reflect their organizational status: CC and FLOSS licenses can be used to fund and lead innovations. The success of a project under a CC license depends on the appeal of its characteristics to users, who then became contributors.

Producers and contributors do not necessarily share the same goals and interests, potentially generating conflict. Our study suggests that *open licenses*, such as FLOSS and CC licenses, are able to solve these potential conflicts and also to balance the different goals and interests of producers and contributors.

In this thesis we present ways in which *open licenses* are able to create a sort of invisible company in which the users became part of the production process. Sharing production with users has several advantages such as: reducing business risk, reducing production costs, and providing the opportunity to collect funds and expertise. The reduction of production costs does not reduce the value of the information contained in the works. However, *open licenses* allow producers and users to manage dynamics and alternative business models that are not based on the simple sale of works and the payment of employees and investors. Moreover, *open licenses* allow producers to lead users' contributions.

Our results show that *open licenses* are not some kind of magic wand, which can be waved to automatically simplify the production of intellectual works, reduce production costs, and boost innovation. To be successful, producers need to manage these licenses and choose the correct one to motivate users to contribute to a project and harmonize the objectives of the various stakeholders. Producers need to learn how to do this and how such licenses can be used.

Our results derive from three different approaches that explore the dynamics of how *open licenses*, in particular CC licenses, can be used to succeed in the production process. Our results indicate the correct way to manage CC licenses for success in the production process.

Our results can be used to choose the appropriate CC license in accordance with the producer's goals, characteristics, business model, and requirement for potential contributors.

Our results can help achieve a better understanding of the dynamics underlying some sectors of the market, in which the classical copyright approach does not fully capitalize on the potentiality for production and innovation. Therefore, our results could improve management in these sectors, helping to create alternative strategies for producing, disseminating, innovating, and creating new business models.