

Title	The insider's dilemma: employed open source developers' identification imbalance and intentions to leave
Authors	Schaarschmidt, Mario;Stol, Klaas-Jan;Fitzgerald, Brian
Publication date	2025
Original Citation	Schaarschmidt, M., Stol, K.-J. and Fitzgerald, B. (2025) 'The insider's dilemma: employed open source developers' identification imbalance and intentions to leave', European Journal of Information Systems, pp. 1–20. https://doi.org/10.1080/0960085X.2025.2463984
Type of publication	Article (peer-reviewed)
Link to publisher's version	10.1080/0960085X.2025.2463984
Rights	© 2025, the Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group. This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (http://creativecommons.org/licenses/by-nc-nd/4.0/), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent - http://creativecommons.org/licenses/by-nc-nd/4.0/
Download date	2026-09-25 23:36:26
Item downloaded from	https://hdl.handle.net/10468/17102



University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

The Insider's Dilemma: Employed Open Source Developers' Identification Imbalance and Intentions to Leave

Mario Schaarschmidt, Klaas-Jan Stol & Brian Fitzgerald

To cite this article: Mario Schaarschmidt, Klaas-Jan Stol & Brian Fitzgerald (16 Feb 2025): The Insider's Dilemma: Employed Open Source Developers' Identification Imbalance and Intentions to Leave, European Journal of Information Systems, DOI: [10.1080/0960085X.2025.2463984](https://doi.org/10.1080/0960085X.2025.2463984)

To link to this article: <https://doi.org/10.1080/0960085X.2025.2463984>



© 2025 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.



View supplementary material [↗](#)



Published online: 16 Feb 2025.



Submit your article to this journal [↗](#)



Article views: 79



View related articles [↗](#)



View Crossmark data [↗](#)

RESEARCH ARTICLE

 OPEN ACCESS Check for updates

The Insider's Dilemma: Employed Open Source Developers' Identification Imbalance and Intentions to Leave

Mario Schaarschmidt^a, Klaas-Jan Stol^{b,c} and Brian Fitzgerald^{c,d}

^aRhine-Ruhr Institute of Information Systems, University of Duisburg-Essen Berliner Platz 6-8, Essen, Germany; ^bLero - The Science Foundation Ireland Research Centre for Software, University College Cork, Cork, Ireland; ^cLero - The Science Foundation Ireland Research Centre for Software, University of Limerick, Ireland; ^dUniversity of Limerick, Limerick, Ireland

ABSTRACT

In corporate-sponsored open source software development, company-employed developers become “insiders” to the OSS community, and therefore have two roles: they serve as a representative of their employing company, but may also identify as a member of the open source community. This study investigates what happens when identification with the company exceeds identification with the community (and vice versa), and also focuses on consequences when these insider roles come in conflict. Informed by social identity theory and organization-profession conflict theory, we report on two studies that predict identification imbalance to affect company turnover intention. Our first study is based on a survey of employed Linux kernel developers and uses polynomial regression to assess the effect of identification imbalance (and congruence) on company turnover intention. The second study extends our investigation beyond Linux and demonstrates that the effect of identification imbalance on turnover intention is mediated by role conflict. The findings suggest that turnover intention is lowest, when company and community identification match at high rather than low levels. We also find developers' company career ambition influences how role conflict relates to company turnover intention. This study holds implications for theory and for managers in companies who engage with OSS communities.

ARTICLE HISTORY

Received 26 February 2024
Accepted 4 February 2025

KEYWORDS

Open source software;
organizational identification;
turnover intention; response
surface method

1. Introduction

Companies play a vital role in the development of open source software (OSS) (Germonprez et al., 2016; Teigland et al., 2014), exemplified by the employment of developers to contribute to specific OSS projects – or, a “*man on the inside*” (Dahlander & Wallin, 2006; Kuk et al., 2024; Shaikh & Vaast, 2016). Hence, there is considerable research interest in the role of companies (and their deployed developers) for OSS project governance and management (Bonaccorsi et al., 2006; Fitzgerald, 2006; Germonprez et al., 2016; Rolandsson et al., 2011), and the potential conflicts that arise when commercial interests meet open source development principles (e.g., van Wendel de Joode, 2004). While prior research has primarily focused on the rationale and different types of relationships between companies on the one hand and OSS communities on the other hand (e.g., Dahlander & O'Mahony, 2011; Morgan et al., 2013; Schaarschmidt et al., 2015; West & O'Mahony, 2008), far less attention has been paid to the developers that “embody” these corporate participations in open source communities: employed open source developers.

Company-employed developers contribute to open source communities on their employer's behalf so as

to pursue corporate interests (Schaarschmidt, 2023), for example, to develop certain features that can be leveraged in commercial product offerings.

As in other areas of software development, companies active in OSS development are confronted with developer turnover (Ahuja et al., 2007; Foucault et al., 2015; Zaza et al., 2023), which is a managerial challenge for several reasons. First, companies are generally interested in retaining developers because when developers leave, they take their expertise and knowledge. Second, it is very challenging and costly to rebuild these lost competencies, either through training currently employed developers, or attracting new ones (Breaux & Moritz, 2021; Etemadi et al., 2022). There is a plethora of reasons why software developers might leave a company, such as insufficient rewards and promotion opportunities, lacking supervisor support, or unfair payment (Westlund & Hannon, 2008), the collaboration with an OSS community adds an extra layer of complexity to the turnover challenge. Experienced OSS developers have potentially spent considerable time building both a reputation and professional relationships within the open source community, and the specific expertise that is necessary to contribute and exert influence in a project in

a meaningful way (Dahlander & O'Mahony, 2011; Schaarschmidt, 2023). Hence, apart from costs associated with recruiting, training, and onboarding new developers within an organization (Westlund & Hannon, 2008), replacing influential developers in large OSS projects is very challenging because of the unique roles that many key developers play in OSS communities, and the long-term investment it takes for developers to gain influence in an OSS community (Zhou et al. 2016; Shaikh & Vaast, 2016).

Developers who are paid by a company to work with an OSS community, each of which has its own norms and values, face tensions and potential conflicts as exemplified in the following anonymized anecdote, shared in an interview by a project manager at a large OSS distribution company: a company that distributes an OSS operating system customized to the specific needs of a large customer is confronted with the following dilemma. Due to an update in the OSS code, some printer functionalities in the customized version running at the customer side are no longer accessible. A quick check reveals that the update contained code that had solved a bug, but affected the functionality of the customized code. The customer now wants the company to go back to the buggy version of the operating system because adapting the customized solution would be too expensive. The OSS community, however, would obviously not accept keeping a bug in the source code simply to please one company's client. OSS developers representing the software company now have a dilemma: should they ignore their employer's problem and support the community, or should they go against the community by pursuing their company's interests? Hence, working in "two worlds" entails potential conflict as a result of different approaches to collaboration, leadership, and control (Jensen & Scacchi, 2005).

How such a conflict will be resolved largely depends on a developer's identification with both the company and the community (Syna Desivilya & Eize, 2005). It cannot be assumed that all company-employed OSS developers share the same ideology, loyalty towards, and vision and goals of their employer while simultaneously being confronted with community norms and identity (Daniel et al., 2018). As a consequence of working in "two worlds," company-employed OSS developers may develop either an identification with their employing company, with the community they contribute to, or to both (Chan & Husted, 2010; Daniel et al., 2018).

Identification, in turn, is known to be negatively related to turnover intentions, also for software developers (e.g., Alexy et al., 2013; Bagozzi & Dholakia, 2006; De Moura et al., 2009), but less is known about the interaction of organization identification and community identification in determining turnover intentions. Hence, given the consequences of OSS

developer turnover for employing companies, the first research question is: *What effect does an organizational identification imbalance have on employed open source developers' intentions¹ to leave their company?*

Apart from tensions that arise from different development approaches and philosophies (e.g., open source versus proprietary software), there are also conflicts that arise from different (strategic) goals. As O'Mahony and Bechky (2008) note, OSS communities and supporting companies share some goals, such as ensuring the success of an OSS project or increasing a project's market share, but also have diverging views on other aspects, such as technical autonomy or project governance (Jensen & Scacchi, 2005). These strategic conflicts also concern individual developers with their specific identification profiles towards company and community. As quitting is one possible conflict resolution strategy (van Wendel de Joode, 2004), our second research question is: *How does identification imbalance shape the perceptions of company-community conflicts, which ultimately lead to turnover intention?*

Finally, while *current* organizational identification is important to determine turnover intentions, it is far from clear how ideas about *future* organizational identification influences the mechanisms described above. While we do not measure future organizational identification directly, we theorize that developers' career ambitions, defined as the persistent and generalized striving for success, attainment, and accomplishment in a domain (Hirschi & Spurk, 2021), are part of their future self, and are thus a good proxy for future identification (Boyle, 2021). It is increasingly common that developers wish to pursue a "career in open source," and paid positions within companies allow them to do this as this offers a secure source of income (Kendall et al., 2020; Riehle, 2015; van Wesel et al., 2017). Others may not share this ambition, but may aim for a career within the company instead. Hence, we seek to understand whether developers' career ambitions influence how company-community role conflicts relate to turnover intentions. Thus, our third research question is: *Does a career ambition to remain active, either as an open source developer or as an employed developer, change how perceptions of role conflict affect turnover intentions?*

To answer these questions, we draw on social identity theory (Tajfel & Turner, 2004) together with organizational-professional conflict theory (Wallace, 1995), and report the results of two empirical studies focusing on employed OSS developers. In the first study, we introduce the concept of identification imbalance and show its effect on developer turnover intention towards their company, using data collected through a survey among Linux kernel developers. In the second study, we replicate and expand this model

by investigating the mediating role of company-community role conflict and the moderating role of developers' future career ambitions (i.e., company vs. OSS community) for the effect of company-community role conflicts on quitting intentions.

The contributions of this research are threefold. First, this research sheds light on the effect of an identification imbalance on turnover intentions of developers who belong to two organizations that are separate yet related: their employing company, and the open source community to which they contribute. Second, by focusing on intention to leave as an undesirable outcome, this study identifies role conflict as an important mediator between imbalanced identification and turnover intentions and extends prior research on dual identification (e.g., Daniel et al., 2018). Third, this study extends the reasoning derived from social identity theory and introduces developers' career ambition as an important contingency of the identification imbalance-quitting intention link. Hence, this research is the first to combine aspects of *role conflict* with OSS developers' *career ambition* (Ke & Zhang, 2010; Riehle, 2015; Spaeth et al., 2015), linking previously unconnected research streams, and suggests actionable recommendations for managing employees who are confronted with identification imbalances and role conflicts that result from working with OSS communities.

2. Theoretical development

2.1. Social identification, open source software development, and intention to leave

Coalescence between an individual and an organization has been a focus of social scientists for decades (Fuchs, 2012). This coalescence is a consequence of close interactions between an individual and the organization, and over time, manifests in an individual's identity. Overlap of a person's identity and that of the organization has been referred to as *organizational identification* (e.g., Ashforth et al., 2008). Social identity theory explains the emergence of group identification through a classification process, as Ashforth and Mael (1989), p. 20) described: "*people tend to classify themselves and others into various social categories such as organizational membership, religious affiliation, gender, and age cohort.*" Thus, people see themselves and others as a member of a team or a group based on shared attributes. Identification does not necessarily require significant cognitive efforts; *perceptions* of being psychologically intertwined with the fate of the group is sufficient to start an identification process (Ashforth & Mael, 1989; Piening et al., 2020). These perceptions can be triggered by visual cues (e.g., a military uniform) or certain rituals (e.g., sharing an initiation ceremony to join a fraternity).

One of the core tenets of social identity theory is that when individuals identify with a group, they incorporate parts, or all, of the group's norms and values into their self-concept (Hogg et al., 1995; Tajfel & Turner, 2004). Leaving the group therefore implies *releasing* a part of oneself, an action that individuals tend to avoid unless major external cues require them to do so. Working in OSS projects is widely considered a social activity – apart from the technical complexities associated with the development of large software systems (Kotlarsky & Oshri, 2005; Ljungberg, 2000; Maruping & Matook, 2020; von Krogh et al., 2012). Developers digitally exchange opinions and knowledge, discuss software code, and coordinate activities (Dahlander & O'Mahony, 2011; Kuk et al., 2024; Lindberg et al., 2024). As developers engage with other community members through these actions, they start to identify as members of the community (Bagozzi & Dholakia, 2006; Choi et al., 2015; Sharma et al., 2022). Thus, when developers – either company-employed or volunteer developers – identify with a specific open source community, they are less likely to leave that community (e.g., Bagozzi & Dholakia, 2006; Daniel et al., 2020) unless external cues cause them to leave. Similarly, developers who identify strongly with the company they work for are less likely to quit their paid job (Ashforth et al., 2008; Edwards & Peccei, 2010). Thus, apart from well-known motives of IT professionals' turnover intentions such as a desire to move, ease of move, job-related factors, and organizational factors (Joseph et al., 2007), a lack of identification is also a strong driver of turnover intentions in the context of OSS.

2.2. Identification with multiple entities

While social identification with an entity or group strengthens commitment² to the entity (or group) and lowers intentions to quit, the mechanisms that come into play when individuals identify with *multiple* entities simultaneously are less straightforward (Bartels et al., 2007). First, organizational studies reveal that in situations with different identification targets, individuals *can* identify with more than one group (Ellemers & Rink, 2005; Smith et al., 2012). For example, employees may identify with both their company and a union (Blader, 2007); when they work for multinational companies, they can identify with both the local subsidiary and the overall corporation (Ma et al., 2022); consultants may identify with both their employer and the client they work with (Webber, 2011), and people with multiple jobs may identify with each of their employers (Walsh et al., 2016).

Second, individuals can simultaneously identify with their profession *and* the organization that employs them; for example, nurses can identify both with their profession as caregivers and the hospital

(Oppenheimer, 1972; Wallace, 1995). Similarly, software developers can identify with their profession as software engineers, and can identify as a member of their employing organization (Marks & Scholarios, 2007). OSS developers, specifically, can also identify with the OSS community they engage in, which very likely also reflects their identification with their profession. In the case of employed OSS developers, the different identifications are either “compound” (overlapping), or “nested” (one is fully contained within another) (Vora & Kostova, 2007). This means that although the identification is with two separate entities, these entities are *interrelated* – either because they have a high overlap (compound), or one identification is part of the other (nested), for example, seeing oneself as an OSS developer while being employed by a company. While there is consensus that dual identification (for profession- organization and profession- community-pairs) as well as a resulting dual allegiance is possible (George & Chattopadhyay, 2005), this duality becomes a major managerial challenge when identification with one entity exceeds identification with the other, that is, when an identification *imbalance* exists.

Previous research on OSS developers has provided some notable insights on how dual identification with a company and the community affects important downstream variables such as satisfaction, performance, and turnover intention. For example, Henkel (2009) observed that employed developers identify primarily with their company rather than the OSS community – though this may not always be the case. In particular, developers with a long history with a specific OSS community might identify more strongly with that community than with the company, and would rather switch employers than communities (Lerner & Tirole, 2002).

Maruping et al. (2019) found that OSS value congruence results in more commitment to the OSS community in terms of sustained code contributions. Homscheid and Schaarschmidt (2016) identified a link between developers’ perceived corporate reputation of their employer and reduced quitting intentions. Daniel et al. (2018) studied the effects of OSS ideology under-fit and over-fit on developer commitment; they found that OSS ideology over-fit increases commitment to the company but decreases commitment to the OSS community. Appendix A provides a non-exhaustive overview of studies that link forms of organizational identification to turnover intentions and other outcomes. We extend this line of research by 1) focusing on employed OSS developers’ dual identification with both their employer and the community they work in (and potential imbalance) and resulting intentions to leave the company, 2) conceptually integrating the lens of role conflict, and 3)

investigating career ambition as a part of a developer’s future self.

2.3. Company-community role conflict

As mentioned, different development philosophies and strategic interests between a company and a community comprise tensions (Jensen & Scacchi, 2005; O’Mahony & Bechky, 2008). These tensions can evolve into conflicts when both philosophies compete for the same resources (Weinert et al., 2024). Henkel (2009), for example, describes examples of conflict that arise from companies’ intentions to release some code as open source while keeping other code secret – a tactic that may not align with the OSS profession that values knowledge sharing.

Conflict is broadly defined as “perceived incompatibilities” (Boulding, 1963), and can further be divided into *task* conflict and *affective* conflict, with task conflict being rather functional and affective conflict being rather emotional (Amason & Amason AC, 1996). There are several strategies to solve conflicts, also in the realm of OSS. Van Wendel de Joode (2004) distinguishes four options: third-party intervention, modularity, parallel development lines, and exit option. In this study, we focus on turnover intentions as one exit-related thought that results from perceptions of conflict.

2.4. Hypotheses

Employees generally consider a variety of factors when deciding whether to quit their job. Griffeth et al. (2000) identified factors such as personal characteristics, job satisfaction, and a range of other dimensions such as pay satisfaction, environmental factors, and behavioral predictors. While these factors may play an important role in a software developer’s decision to leave or stay with their *employer*, developers who see themselves as a member of an open source community may also wish to balance other factors. In this context, we develop a set of six hypotheses that link identification imbalance (or congruence, its opposite) with OSS developers’ intention to leave their employer. Figure 1 depicts the conceptual model summarizing this research.

Social identity theory (Helm, 2013; Tajfel & Turner, 2004) suggests that a high degree of identification implies a stronger sense of “releasing a part of oneself” when leaving a group. Thus, *ceteris paribus*, strong identification with an organization acts as a “buffer” against unwanted influences and lowers turnover intentions. However, not all employed OSS developers identify with their employer and the OSS community to the same degree. Some work with an OSS community for instrumental reasons (“because they have to”), while others fully subscribe to the norms and values

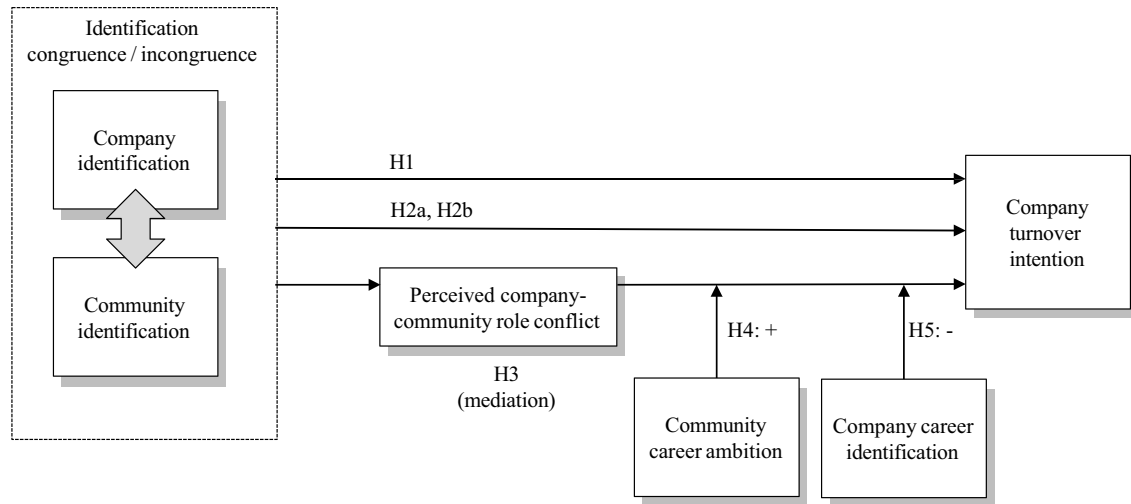


Figure 1. Conceptual research model.

typically attached to OSS communities, such as transparency and openness (Fang & Neufeld, 2009; Maruping et al., 2019), leading to different levels of community identification. Similar arguments apply to identification with an employer. Thus, different *patterns* of dual identification emerge: high levels of identification with both entities, low levels of identification with both entities, high community identification with low company identification, and low community identification with high company identification (Chan & Husted, 2010).

Considering intentions to leave the employing organization, increasing levels of organizational identification are associated with lower levels of turnover intentions (Tajfel & Turner, 2004). When identification with the community increases in tandem with organizational identification, community identification does not pose a threat to the developer's self and identification with the profession. Hence, it should not change the basic buffering mechanism that identification with an employer has on turnover intentions. In such cases, social identity theory suggests that individuals can benefit from their belonging to both groups. Thus, when identification is "on par" at high levels, the identification with the profession as an OSS developer and the identification as a member of the employing organization match at high levels and turnover intention should be lowest. Thus, more formally stated:

Hypothesis 1: Employed open source developers' turnover intention towards their employer will be lower if organizational identification with the employer and community identification match at high levels than when they fit at low levels.

Identification with OSS community and employing organization can also be skewed. Chan and Husted (2010) introduce a typology of developers based on different levels of allegiance: *company soldiers* are

those employed OSS developers that have a high allegiance to the company and a rather low one to the community. *Gone-natives*, in contrast, have a low allegiance to the company and a high allegiance to the community. When allegiance towards both targets is low, Chan and Husted (2010) prefer to use the term *Lone Wolves*; "Gatekeepers" is used for those with high levels of identification towards both the company and the community.

While Chan and Husted (2010) used the term "allegiance," and not identification, a similar pattern applies to social identification. Social identity theory (Ashforth & Mael, 1989) suggests that those who identify highly with a company, but not with the community, define their self through the benefits they receive from their employer. In these situations, they would not gain by leaving the company; hence, when organizational identification is high, but community identification is low, their turnover intention towards the company should also be low. In contrast, when identification with the community (and hence identification with the OSS profession) exceeds identification with their employer, OSS developers feel more attached to their profession as an OSS developer, than as an employee. In these cases, identification with the profession is likely to be more persistent than identification with the employer (Pratt & Rafaeli, 1997), with resulting higher turnover intentions. Hence, we posit that the effect of identification imbalance on turnover intentions is nuanced. In other words, in contrast to situations where identifications with both targets are "on par," the *direction* of imbalance matters in explaining turnover intentions. Hence, we posit:

Hypothesis 2a: When identification with the employer exceeds community identification, turnover intention increases.

Hypothesis 2b: When community identification exceeds identification with the employer, turnover intention decreases.

Apart from the direct influence on identification imbalance on turnover intention, indirect mechanisms help to explain how turnover intentions unfold. Companies share some, but not all OSS community goals (O'Mahony & Bechky, 2008). For example, companies have – as do OSS projects – an interest in OSS project success, but their monetary incentives might go against open source values (as illustrated with an example in the introduction section). Different goal structures lead to tensions when goals are in conflict. In addition, OSS communities and bureaucratic organizations typically exhibit different norms and values, different forms of governance and hierarchical control, and different approaches to software development (Kuk et al., 2024; von Krogh et al., 2012), a fact that may threaten dual identification. Accordingly, Daniel et al. (2011, p. 4) summarize such situations succinctly: “To the degree that the values are incompatible, conflict emerges.”

This potential conflict is also echoed in organizational-professional conflict theory (Kippist et al., 2009), which highlights that a professional's behavior is subject to professional norms, which may or may not match with norms provided by the employing organization. Such role conflicts generally relate to incompatibility of expectations associated with a role and occur when a role involves incompatible or opposing requirements (Miles & Perreault, 1976). In that sense, incompatible requirements between a company (e.g., releasing *some* code as OSS but not all) and an OSS community (e.g., releasing *all* code as OSS) may result in role conflict for employed developers.

Apart from *actual* role conflict, developers' *perceptions* of role conflict can trigger turnover intentions. That is, whether or not a role conflict is (objectively) severe, is unimportant; it is how developers perceive and cope with such conflicts that drives behavioral outcomes. Relatedly, a considerable body of literature suggests that role conflict leads to low job satisfaction (House & Rizzo, 1972; Jackson & Schuler, 1985). A low level of job satisfaction in turn may increase developers' intention or desire to leave their job. Similarly, Yu et al. (2012) found that developer dissatisfaction increases developers' intention to leave a project. Hence, perceptions of company-community role conflicts are an undesirable state from which developers intend to escape. This notion is echoed by organization-profession conflict theory, which shows that conflicts between the profession and the employing organization may increase turnover intentions (Aranya & Ferris, 1984; Shafer, 2002). We posit *perceptions* of such conflicts (i.e., not the conflicts as such) result from respective identification with entities.

A given conflict will be perceived as more severe when identification with the profession as an OSS developer exceeds identification with the company, and vice versa. Thus, we propose the following hypothesis.

Hypothesis 3: Company-community role conflict perceptions will have a mediating effect in the relationship between identification imbalance and turnover intention.

In addition to the role conflict that company-employed developers might face, these developers may pursue different career ambitions (Hirschi & Spurk, 2021; Ke & Zhang, 2010), that is, either company- or community-related, which have the potential to extend social identity theory because career ambitions may form (a part of) the future self. The term “career ambition” here refers to the *type* of career that developers may want to pursue – we distinguish a career with a software development company, and a career as an (employed) open source community developer (Riehle, 2015). The latter has become a realistic alternative to the more traditional software development career with a company (Riehle, 2015; Trinkenreich et al., 2020). In particular, those developers who have built a reputation and garnered influence in prominent open source projects will easily find employment at another company supporting the same project (Riehle, 2015). On the other hand, developers may pursue a career in a company, spanning multiple years and functions. For them, working for an OSS community is just one job among many in their corporate career. At the same time, career ambitions, which can be seen as stable personality dispositions (Hirschi & Spurk, 2021), are also part of developers' future self (Boyle, 2021); hence, they have potential to increase or decrease effects of organizational identification.

Without conflicts, company-employed OSS developers have little need to prioritize one work setting or philosophy over the other. When conflicts exist, however, exiting is a typical strategy, reflected in individual's tendency to leave their job (van Wendel de Joode, 2004). We posit that the extent to which company-community role conflicts drive turnover intention is contingent on the future identification a developer is likely to have with either the company or the community. Specifically, at some point in their career, developers might decide to concentrate on other non-OSS company projects or shift their attention to a specific OSS project exclusively.

This career ambition (company or OSS) determines how perceptions of conflict evolve into turnover intentions because the same amount of perceived conflict will lead to more (in the case of community career ambition) or less (in the case of company career ambition) turnover intention. Thus, we posit:

Hypothesis 4: Community career ambitions moderate the link between perceived company-community role conflict and company turnover intentions such that this relationship will be strengthened.

Hypothesis 5: Company career ambitions moderate the link between perceived company- community role conflict and company turnover intentions such that this relationship will be weakened.

2.5. Study overview

To test these six hypotheses, we conducted two empirical studies (see [Figure 1](#)). The first study investigates how identification imbalance links to an intention to leave the employing company. To test the associated hypotheses (H1 and H2a/b), we conducted a large-scale survey of 321 employed Linux kernel developers. Thus, this study involves high internal consistency as all respondents contribute to the same project. We also use the response surface method (described later) and present a series of robustness checks. Study 2 is a cross-sectional study (in the sense that respondents work in different OSS projects) and serves three purposes: First, it intends to increase external validity of the results of Study 1 beyond the Linux kernel project, which is a specific case with a high level of company involvement (Linux Report, 2020). Second, it introduces company-community role conflict as a mediator. Third, the study extends social identification theory by considering developers' career ambition (i.e., a part of the future self) as a contingency that affects how identification imbalance is related to turnover intentions. The second study tests Hypotheses 3 to 5, using a sample of 177 employed OSS developers involved in a range of (unspecified) sponsored open source projects.

3. Study 1: identification imbalance and turnover intention

3.1. Research design and construct operationalization

We conducted a large-scale survey among developers in the Linux kernel development community because Linux is considered a project with considerable engagement of companies (and their employed developers). More than 400 organizations have contributed to the Linux kernel annually between 2010 and 2020 (Linux Report, 2020).

We first asked for developers' employment status, which was used to filter questions for employed and volunteer developers (see Appendix B). We used established scales to measure the

constructs of interest (see Appendix C). Unless otherwise stated, we used seven-point Likert scales anchored at "1" (fully disagree) and "7" (fully agree). Identification with both the company and the community was assessed by the use of a Venn-diagram, a visual approach depicting increasing levels of overlap between the individual and the OSS community (Dukerich et al., 2002). The reason for using a Venn-diagram instead of an item-based measure of identification (e.g., Mael & Ashforth, 1992; see also Study 2) was to limit the number of survey questions for a population that can be difficult to reach.³ Turnover intentions towards the company were measured with three items from Smith et al. (2012). We also included control variables to test for alternative influences on turnover intention. These were age, gender, working hours, perceived own reputation, and tenure with the company. We included perceived own reputation because perceptions of one's own status in a community might affect turnover intentions. We measured perceived own reputation with three items adapted from Wasko and Faraj (2005) and Xu et al. (2009). Working hours were measured in hours per week and tenure with the company in years.

3.2. Data collection

We extracted Linux developer email-addresses from Gitlab and Marc.info, resulting in a set of over 100,000 addresses. Out of these addresses, we selected the 20,000 addresses that were most active in the last 5 years and invited a random sample of 8,000 developers to participate in the survey. Of these, about 10% could not be delivered. In respect of developers' time, no reminder emails were sent. To encourage participation, we promised to donate €500 to Linux initiatives if more than 200 developers answered, and to send a summary report to all participants who agreed to participate. We received 797 valid responses for this first study. Of the respondents, 755 (95%) were male, which is comparable to other studies on OSS development (e.g., Wu et al., 2007). The mean age was 34.7 years (SD = 8.77). In terms of education, 82 (10%) held a PhD, 356 (45%) held a master's degree, and 251 (31%) held a bachelor's degree. The remaining respondents indicated either no degree or a high school degree, or were currently in a form of apprenticeship. Given these results, we consider the sample as representative of OSS developer samples in terms of age and gender distribution (e.g., Xu et al., 2009). Based on a filter question, 321 (40%) respondents were categorized as company-employed, 476 (60%) as volunteer (including self-employed). We continued our analysis with 321 company-employed developers.

3.3. Measurement validation

We assessed the quality of the measurement model through a Confirmatory Factor Analysis (CFA) with SPSS AMOS 28 using Maximum Likelihood (ML) estimation (Bagozzi & Yi, 1988). We included all latent theoretical concepts (except organizational identification, which were single item measures) and correlated them. The resulting model revealed an excellent fit with the data ($\chi^2 = 59.521$, $df = 48$, $\chi^2/df = 1.24$, Comparative Fit Index (CFI) = .99, Tucker–Lewis Index (TLI) = .98, Root Mean Square Error of Approximation (RMSEA) = .027 with 90% Confidence Interval bounds of .000 and .048, and Standardized Root Mean Square Residual (SRMR) = .026). As our data could potentially be biased by common method variance (CMV), we used ex-ante and ex-post remedies to limit and detect it (Podsakoff et al., 2012) (see Appendix D). The results of these remedies indicated that CMV did not pose a concern in this study.

Next, we tested for indicator reliability, convergent validity, and discriminant validity. The composite reliability (CR) of all constructs exceeded the threshold of .7. In support of convergent and discriminant validity, average variance extracted (AVE) was greater than .5 for all constructs (Bagozzi & Yi, 1988), and all constructs' AVE was greater than their respective squared correlation with other construct (Fornell & Larcker, 1981). Correlations, indicator reliabilities, and results of discriminant validity can be found in Appendix E. As a further test for discriminant validity, we also calculated the heterotrait-monotrait ratios (HTMT) for correlations. All values fall below the strict cutoff of .85 (Henseler et al., 2015).

3.4. Methodological considerations

Assessing imbalance between two related constructs imposes a number of methodological challenges. For example, when difference scores are used to calculate “imbalance,” that is, subtracting identification with one target from identification with the other (e.g., Smith et al., 2012), it is no longer possible to distinguish patterns of low/low identification from high/high identification. That is, individuals with high/high identification would be treated identical to those with low/low identification. Similarly, taking absolute values of a difference score (see Walsh et al., 2016) has a downside. To this end, various authors have proposed the combination of polynomial regression and response surface method (RSM) to allow researchers to examine the extent to which combinations of two predictor variables relate to an outcome variable (Edwards, 2002; Klein et al., 2009; Tsai et al., 2022). Polynomial regression has advantages over more intuitive approaches in dealing with

imbalances, such as difference scores (e.g., Smith et al., 2012), because it does not rest on unrealistically restrictive assumptions, and it provides better conceptual clarity (Edwards & Parry, 1993). Furthermore, with polynomial regression, the independent effect of each component measure is retained (in contrast to a difference score approach). Thus, we use polynomial regression and RSM to study the effect of identification imbalance on turnover intention.

3.5. Results

3.5.1. Polynomial Regression Analysis

We follow the procedure by Shanock et al. (2010), which has also been applied successfully in IS research (e.g., Adam et al., 2023; see Appendix F). To prepare for the polynomial regression, we built mean-centered squared terms and interactions terms for the variables of interest. Mean-centering is intended to prevent unnecessary multicollinearity (Aiken & West, 1991). We also checked for the prerequisites to run polynomial regression: all variables are normally distributed and the assumptions of similar variances hold. The regression equation used was:

$$Z = b_0 + b_1X + b_2Y + b_3X^2 + b_4XY + b_5Y^2 + b_i c_i + \epsilon_0$$

where X refers to community identification, Y represents company identification, C_i represents a set of control variables, and Z represents the dependent variable company turnover intention.

Multi-item measures were reduced to factor scores (using the imputation procedure in SPSS AMOS, version 28), which provides more accurate results than averaging items, which would simply the unrealistic assumption that all items' loadings are equal. Regression coefficients along with results of the covariance matrix are then used to produce a three-dimensional plot, the response surface (Shanock et al., 2010). The actual analysis requires interpreting the effects along the line of congruence, where $X = Y$, and the line of incongruence, where $X = -Y$.

We calculated the polynomial regression stepwise, starting with a regression where only controls were included to predict the dependent variable, company turnover intention. These controls were as follows: age, gender, perceived own reputation, working hours, and tenure with the company ($R^2 = .03$). In a second step, we included community and company identification, for a significant increase in R^2 ($\Delta R^2 = .24$, $p < .001$). In the third and final step, we included squared terms and the interaction term. Again, R^2 increased significantly ($\Delta R^2 = .04$, $p < .01$). Given the significant increase in explanatory power, we reject the linear model in favour of the quadratic

Table 1. Polynomial regression results of study 1.

	Company turnover intention	
	<i>B</i> (SD)	<i>p</i>
Age	-.00 (.01)	.546
Gender	.24 (.28)	.400
Perceived own reputation	-.05 (.08)	.533
Working hours	-.00 (.00)	.088
Tenure with company	-.01 (.02)	.724
Company identification	-.39 (.04)	< .001
Community identification	-.01 (.04)	.858
Company identification × community identification	-.07 (.02)	.005
Company identification squared	.04 (.02)	.120
Community identification squared	-.04 (.02)	.112
<i>R</i> ²		.31
Adjusted <i>R</i> ²		.28
<i>N</i>		321

Unstandardized coefficients; Values in bold signal significant results ($p < .05$).

Table 2. Results from response surface method of study 1.

	Surface along the line of congruence ($X = Y$)		Surface along the line of incongruence ($X = -Y$)	
	Linear slope	Curvature	Linear slope	Curvature
DV: Turnover intention company	-.39***	-.07	.38***	.07

Unstandardized coefficients, *** $p < .001$.

model (J. R. Edwards, 2002). A test of *variance inflation*, which is a reliable indicator of multicollinearity, revealed acceptable values for the Variance Inflation Factor (VIF) of less than for all predictor variables, which is well below recommended cutoff values (a common threshold is 10 (Kline 2016)).

Table 1 shows the results of the third model (i.e., the quadratic model). As can be seen, company identification has a significant and negative direct effect on company turnover intention ($b = -.39$, $p < .001$). In addition, the interaction term yield significance ($b = -.07$, $p < .01$). None of the other variables had a significant influence on turnover intention. As these coefficients cannot be interpreted directly, we used them to feed the RSM.

3.5.2. The response surface method

We briefly revisit the hypotheses so as to clarify how the response surface should be interpreted. The RSM technique holds values for a *slope* and a *curvature* at the line of congruence (or line of fit, where identification with company and community are equally strong; $X = Y$) and at the line of incongruence, where $X = -Y$. Hypothesis 1 proposed that OSS developers' turnover intention towards their employer will be lower if organizational identification and community identification match at high levels, than when they match at low levels. For this to happen, a significant, negative slope needs to emerge because the slope of this line shows the various levels of the outcome variable (i.e., turnover intention) for employed OSS developers whose levels of the two predictor variables are essentially the same across the continuum from low ratings on both predictors to high ratings on both predictors (Shanock et al., 2010). In addition, the curvature

should be non-significant because a significant curvature would indicate a non-linear relationship, which we did not theorize. Hence, while the polynomial regression depicts a necessary first step, interpreting the resulting graphical plots is the actual test of the hypothesis.

The relevant features for the RSM analysis are the slope and curvature at the line of congruence and the line of incongruence. The results are shown in Table 2 and Figure 2. Table 2 shows that the slope of the surface along the line of fit is negative ($a_x = -.39$, $p < .001$) and linear (as indicated by the non-significant curvature). This implies that with increasing levels of fit between company and community identification (i.e., from low/low to high/high), turnover intentions reduce. Hence, the results of the analyses provide support for H1.

H2a predicted that, as identification with the employer exceeds identification with the community, the effects of imbalance on turnover intention would be negative. For this hypothesis to be supported, the linear slope of the response surface along the line of incongruence should be positive. As the results in Table 2 show, the linear slope of the response surface along the line of incongruence is positive and significant ($a_y = .38$, $p < .001$). The significant positive linear slope of the response surface suggests that turnover intentions increase when OSS community identification exceeds company identification; turnover intention decreases when company identification exceeds community identification. H2b predicted a similar pattern: when community identification exceeds identification with the employer, turnover intentions towards the employer increase. Thus, H2b is supported as well. In sum, the results lend support for both H2a and H2b.

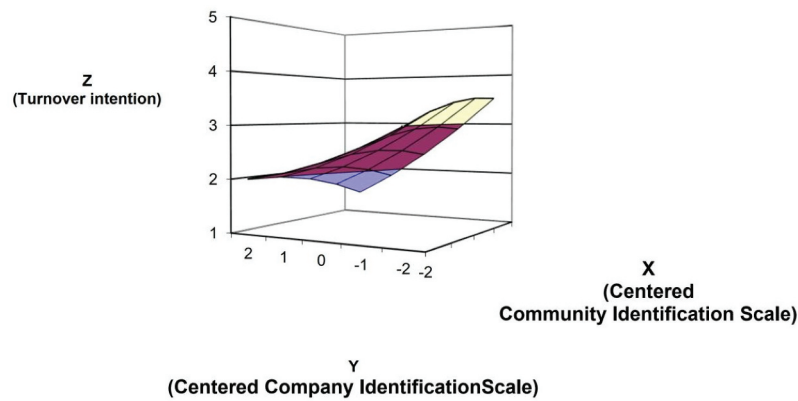


Figure 2. Response surface for identification imbalance/congruence study 1.

3.6. Robustness check

To gain further confidence in these results, we conducted a robustness check. Our results could be biased by endogeneity and participant selection. To this end, we performed propensity score matching (PSM, see Appendices G and H), which is suggested to increase the robustness of observational studies (e.g., Rosenbaum & Rubin, 1985), and which has been applied in IS research (e.g., Durward et al., 2020). With this technique, observational data is used in a quasi-experimental design as the sample is split into “treatment” cases and “control” cases based on their propensity scores (King et al., 2011). To generate treatment and control cases, we mean-split the dataset based on turnover intention related to the company (1: high, treatment; 0: low, control).

This approach is also useful to exclude potential selection biases. We calculated propensity scores using R’s (Rstudio v. April 1 1106) *matchit* procedure with nearest neighbor matching. This procedure then pairs each treatment case with a comparable control case based on the propensity score. The propensity score-matched sample comprises 270 developers: 135 with high, and 135 with low turnover intentions. Appendix G shows the distribution of propensity scores for raw and matched data. Results are consistent with the results for the full Study 1 sample (see Appendix H).

3.7. Summary of study 1

Study 1 sought to address Research Question 1: *What effect does an identification imbalance have on employed open source developers in relation to their intentions to leave their company?* Based on a sample of 321 employed Linux kernel developers, Study 1 showed that turnover intention is lowest, when identification with the company and the community fit at high rather than low levels. Hence, to use the conceptualization provided by Chan and Husted (2010), turnover intention is lowest for *gatekeepers*. In addition, the results reveal that

identification imbalance explains company turnover intention, when identification with the company exceeds identification with the community. Hence, in line with the conceptualisation of Chan and Husted (2010), *company soldiers* have low turnover intentions compared to *lone wolves*.

These results are robust for different samples.

4. Study 2: replication and extension

4.1. Research design and construct operationalization

In Study 2, we focus on the same concept of identification imbalance, but extend it by investigating mediating and moderating variables. Whereas Study 1 relied on a sample of employed developers working on the Linux kernel project, for this study we conducted a cross-sectional survey of employed developers contributing to any open source project (see Section 4.2). We developed a questionnaire which consisted of validated measurement instruments for the various theoretical constructs in our model (see Appendix B) as well as a set of self-designed questions. Unless otherwise stated, all items were measured using seven-point Likert scales, with scale anchors “1” (fully disagree) and “7” (fully agree).

4.1.1. Independent variable

To capture *Identification*, factor scores of both company identification and community identification were measured using an established six-item instruments developed by Mael and Ashforth (1992).

4.1.2. Mediator

We measured *Company-Community Role Conflict* with three items adapted from Rizzo et al. (1970). For this study, we selected only those items out of the original eight that fit within the context of our study, and those with satisfactory factor loadings. We

adapted the items to capture typical issues of OSS company-community role conflict.

4.1.3. *Dependent variables*

Company Turnover Intention was adapted from an instrument by Smith et al. (2012) and was identical to Study 1.

4.1.4. *Moderator*

For assessing career ambitions, we developed items based on Wu et al. (2007) idea of “motivation on career advancement.” The final set of items consists of three-item measures for company and community career ambition (see Appendix B).⁴

Control variables and demographics. In addition to the focal constructs, demographic questions were included such as age, gender, company tenure (in months), and whether or not a company offers dual career support; presence of the latter would potentially affect turnover intentions towards the company. In addition, some developers may wish to pursue a career path in management, perhaps ultimately at executive level. Such developers may see their current job as a stepping stone towards this goal, and their involvement with an open source project is only incidental. Other software developers may either have more interest in advancing their expertise as a developer, aspiring to a technical career, while others still may aspire to a more prominent role in the open source community (Riehle, 2015). We call this concept *career direction*, for which we also wanted to control. As no instrument was available for this, we developed the following items that capture developers’ career direction: “*I want to pursue a manager career with more personnel responsibility*” (managerial); “*I want to pursue a technical career with more autonomy*” (technical); and “*I want to gain a central role in the community*” (progressing to the community center, Dahlander & O’Mahony, 2011). We note that career direction stands orthogonal to our concept of career ambition, as technical as well as managerial careers can be pursued in both the company and the community.

4.2. *Data collection*

We used four approaches to contact potential respondents: 1) A link to the online survey instrument was distributed to companies which regularly contribute to OSS (e.g., RedHat, SUSE) along with a request to distribute the questionnaire among their developers; 2) we posted the link on several OSS-related websites and discussion forums. 3) The Open Source Business Alliance (OSBA), which consists of more than 120 member companies, distributed the link on our behalf; and 4) we contacted employed developers directly through professional social networks including

LinkedIn. To increase the likelihood of participation, we again offered respondents to make a donation to a social project of their choosing (Kull & Heath, 2016); for each completed response, we offered to donate two euro to one of six social projects; those projects later received the combined donations. In total, 1,393 individuals visited the survey website. As the first page stated that the survey targeted “employed developers,” a large number of potential respondents dropped out at this stage, most likely because they did not qualify based on this criterion.

Ultimately, 185 respondents completed the survey (13% conversion rate). We excluded eight respondents because they indicated they were not employed (at the time of the survey), leaving 177 responses for analysis; of those, ten (6%) were female and the mean age was 35.7 (SD = 9.8) with a range from 22 to 68. Thus, again, the sample mirrors typical open source developer samples (e.g., Spaeth et al., 2015; Xu et al., 2009). About 75% of respondents indicated that they had a form of dual career support, meaning that the company supports efforts for progressing in the company as well as in the community.

4.3. *Measurement validation*

We assessed the quality of the measurement model through a CFA with SPSS AMOS 28 using ML estimation. We included all latent theoretical concepts and correlated them. The results revealed a borderline acceptable fit with the data ($\chi^2 = 670.60$, $df = 301$, $\chi^2/df = 2.23$, CFI = .89, RMSEA = .084 with 90% Confidence Interval bounds of .075 and .092, and SRMR = .085).

Because the fit of this model was not ideal (specifically, the value for CFI was a little low; χ^2/df , RMSEA and SRMR were in acceptable ranges), we conducted a separate exploratory factor analysis (EFA) to identify potential cross-loadings which would limit our model’s validity. The analysis with varimax rotation resulted exactly in seven factors (reflecting our latent constructs), and only one item for *community identification* was slightly cross-loading onto the organizational identification factor ($\gamma = .421$). Furthermore, this item had only a small loading on its own construct. All other items had loadings of at least .75 on the intended factor, and no other cross-loadings of over .4 emerged.⁵

We reran the CFA without the *community identification* construct. The resulting model fit was good ($\chi^2 = 336.50$, $df = 173$, $\chi^2/df = 1.95$, CFI = .93, RMSEA = .073 with 90% confidence interval bounds of .062 and .085, and SRMR = .067). Given that no substantial cross-loadings were observable in the EFA, together with good fit values for a model without community identification and the fact that we used regression analysis, and not SEM, we used the full set of items to construct our variables of interest.

Next, we analysed factor reliability as well as discriminant validity. The CR values all exceeded the recommended threshold of .7, and the AVE was at least .5 (Bagozzi & Yi, 1988), which suggests all measures are reliable. Finally, the square-root of the AVE exceeded shared variance for each construct, in support of discriminant validity (Fornell & Larcker, 1981). All HTMT ratios fell below the recommended cut-off value of .85 (Henseler et al., 2015). Appendix I reports correlations and reliability values for all multi-item measures. Appendix D includes results of the tests for CMV, which suggested that this was not a threat in this study.

4.4. Polynomial regression results and response surface method

We used the same technique used in Study 1 to quantify effects of identification congruence and incongruence on company turnover intention. Table 3 presents

the results of the polynomial regression. Of the controls, management career direction ($b = .16$, $p < .05$) and technical career direction ($b = .18$, $p < .05$) both show a positive and significant effect on company turnover intention. As in Study 1, company identification had a strong and significant direct effect on company turnover intention ($b = -.47$, $p < .001$), in line with previous research (e.g., Helm, 2013). In addition, the interaction of company and community identification is also significant, as in Study 1.

The results for the direct effect of congruence/imbalance show a similar pattern as in Study 1 (see Table 4 and Figure 3). At the line of congruence, where $X = Y$, the effect is significant and negative ($a_x = -.20$, $p < .05$), while the effect at the line of incongruence is positive ($a_y = .76$, $p < .001$). These results offer support for H1 and H2a/b. One difference to Study 1 is the significant curvature at the line of incongruence, meaning that company turnover intention increased more sharply in case of a more

Table 3. Polynomial regression results of study 2.

	Company turnover intention	
	<i>B</i> (SD)	<i>p</i>
Age	-.01 (.01)	.363
Gender	-.27 (.48)	.576
Tenure with company	.01 (.02)	.515
Dual career support	.06 (.26)	.835
Career direction: management	.16 (.07)	.016
Career direction: technical	.18 (.09)	.049
Career direction: progressing to the center	.00 (.08)	.943
Company identification	-.47 (.13)	<.001
Community identification	.28 (.13)	.031
Company identification $\times$ community identification	-.17 (.08)	.049
Company identification squared	.01 (.05)	.810
Community identification squared	.20 (.05)	<.001
R^2		.31
Adjusted R^2		.27
<i>N</i>		177

Unstandardized coefficients, Effects with $p < .05$ in bold.

Table 4. Results from response surface method of study 2.

	Surface along the line of congruence ($X = Y$)		Surface along the line of incongruence ($X = -Y$)	
	Linear slope	Curvature	Linear slope	Curvature
DV: Turnover intention company	-.20*	.04	.76***	.38**

Unstandardized coefficients, *** $p < .001$, ** $p < .01$, * $p < .05$.

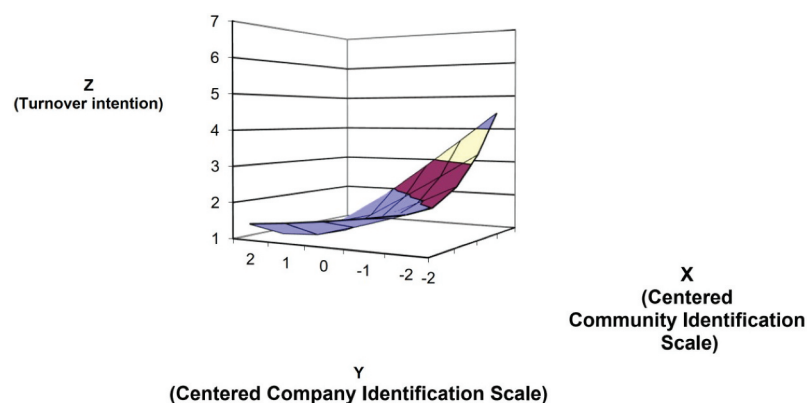


Figure 3. Response surface for identification imbalance/congruence study 2.

positive or less negative identification misfit. Hence, Study 2 results are largely in line with Study 1, which we consider a successful replication of study results.

4.5. Mediation effects

H3 proposed an indirect or mediation effect; a mediation occurs if the effect through the mediator is greater than the direct effect (Bauer et al., 2006; Preacher et al., 2007). In this study, company-community role conflict could potentially be a mediator between identification imbalance and turnover intentions. To test our hypothesis, we used the SPSS macro PROCESS (v 3.4.1) developed by Hayes (2018), together with bootstrapping (5,000 draws), which makes no assumptions about the shape of the sampling distribution. In addition, the PROCESS macro has several advantages compared to piecemeal procedures for testing mediation and SEM, including robustness against violations of normal distribution and data processing, which allows for additional analysis and visualization. Results of PROCESS and SEM calculations have been shown to be similar (Hayes et al., 2017; Preacher et al., 2007).

Before calculating our model, we created a block variable for identification congruence and imbalance, because effects of polynomial regression coefficients in path models are difficult to interpret (Klein et al., 2009; Maruping et al., 2019). To do so, we regressed company turnover intentions on the five variables that were used for the polynomial regression (see the equation in 3.5.1). The coefficients were then used to calculate the block variable.

PROCESS provides a large number of predefined models (see Hayes, 2018); we used PROCESS Model 4 for calculating indirect effects with the block variable as independent variable, company-community role conflict as mediator, and company turnover intention as outcome. In support of H3, the indirect effect was significant because the bootstrap interval did not contain zero ($b = .92$, BootSE = .24, LLCI = .45, ULCI = 1.39). However, the direct effect was significant ($b = 2.03$, BootSE = .43, LLCI = 1.16, ULCI = 2.89), suggesting partial rather than full mediation. Given these results, we consider H3 supported.

4.6. Moderation effects

To test moderation effects, we again used the PROCESS macro, Model 14, which calculates

mediation and moderation analyses simultaneously. That is, we again used the block variable as our independent variable, role conflict as the mediator, and company turnover intention as dependent variable but now also included our moderators. We applied mean-centering to the mediator variable as well as the two moderators to limit the threat of multicollinearity. We first ran a model with community career ambitions as the moderator between company-community role conflict and company turnover intention. The respective interaction was insignificant ($b = -.07$, n.s.), which is why we must reject H4. Next, to test H5, we reran the procedure with the company's career ambitions as the moderator. The respective interaction was significant ($b = -.18$, $p < .05$), in support of H5.

The analyses to test moderation effects are usually conducted using so-called “spotlight analysis,” commonly using values for the mean plus and minus one standard deviation. Hayes (2018), p. 254 reminds us that such conventions are entirely arbitrary, despite widespread conventions in the literature to do so. More recently, several authors have called for determining the nature of interactions by focusing on *regions of significance*, or what Spiller et al. (2013) have called “floodlight analysis.” To this end, we applied the Johnson-Neyman (JN) technique. The JN technique allows analysis of *regions of significance* (and insignificance) of the moderator's values. This technique revealed no specific regions of significance, but different effects sizes at different levels of the moderator. As Table 5 shows, with increasing levels of company career ambitions, the effect of company-community role conflict on turnover intentions becomes weaker, in support of H5.

4.7. Summary

Study 2 sought to address RQ2 and RQ3. The results suggest evidence for what we label the “insider's dilemma”: company-employed developers whose job is to work on an OSS project may experience an identification imbalance, which may lead to role conflict, which in turn is a driver of turnover intentions towards the company. In addition, we found support for company career ambitions as a confounding factor that limits turnover intentions toward the company when role conflict exists. Thus, higher intentions to pursue a career in the company temper OSS

Table 5. Conditional effects of role conflict on company turnover intentions at values of the moderator.

Levels of the moderator	Coefficient	SE	p	Lower-limit CI	Upper-limit CI
Low: 4.123	1.07	.11	.0000	.84	1.31
Medium: 5.053	.91	.09	.0000	.73	1.09
High: 6.061	.73	.12	.0000	.49	.07

developers' intentions to leave in the presence of company-community role conflict. No such effect could be found for community identification.

5. Discussion

5.1. Implications for theory

Employed OSS developers are a specific group of software developers as they have to balance company and community interests. The presence of different goals, values, and ideologies among contributors in an open source project can lead to tensions, which in turn can create community-company role conflicts (Daniel et al., 2018; Kendall et al., 2020). The perceptions of role conflict, in turn, rest on a pattern of identification with both the company and the community. An imbalanced identification, which we call "the insider's dilemma," is a managerial challenge as it may affect the actions and behavior of individuals; most notably turnover intentions. A central question that guided our research therefore was: *How does imbalanced identification influence employees' intentions to leave their employer?* The two studies presented in this paper provided expected as well as surprising results.

Companies and OSS communities benefit from members who identify with the goals, norms, and values of the group, through sustained or increased commitment, or increased organizational involvement (Albert et al., 2000; Conroy et al., 2017; He & Brown, 2013). Chan and Husted (2010) distinguish four types of employed OSS developers based on their level of allegiance towards the company and the open source community. So-called *Lone Wolves* have a low allegiance to both the company and the community. *Company Soldiers* have a strong sense of loyalty to their company, and little or no loyalty to the community. The opposite of company soldiers is what Chan and Husted (2010) refer to as *Gone-Natives*; over time, these employees have developed an allegiance towards the community which has become stronger than their loyalty to their company. The last type of company-employed OSS developers are *Gatekeepers*. Gatekeepers have a high level of allegiance to both the company and the community, and have a keen ability to maintain a balance between the two. Gatekeepers are usually aware of the organizational politics within both the company and the community (Husted & Michailova, 2010). Given these types, our results hold at least three theoretical implications.

First, in line with social identification theory, identification matters when it comes to turnover intentions, as does identification imbalance, but in a nuanced way. The findings from Study 1 suggest that 1) increased levels of matched identification reduce turnover intentions and 2) the *direction* of identification imbalance matters: An imbalance

towards the company *reduces* turnover intentions while an imbalance towards the community *increases* turnover intentions. Second, identification imbalance is linked to company-community role conflict and is *indirectly* related to company turnover intentions. Hence, perceptions of role conflict are a driver of turnover intentions; developers may consider leaving their company in the presence of role conflicts.

Third, this study extends social identification theory by introducing career ambitions, which may be viewed as part of the individual's future self, as a contingency of the effect of identification imbalance on turnover intentions, mediated by role conflict. The results suggest that for employed developers, company career ambition act as a moderator in relation to company turnover intention. This result complements findings of Study 1 in that effects in relation to the employing company are significant while those in relation to the community are not; speaking to a generally stronger company allegiance of employed open source developers.

5.2. Implications for management

This study also holds implications for the management of employed OSS developers. First, neither communities nor companies are served well by developers who wish to leave. However, according to our results, an intention to leave is the consequence of company-community role conflicts. For companies, it is important to remain cognizant of this finding, and consider the specific role that developers may have in an open source community as they negotiate to make specific contributions on behalf of their employing company. Contentious situations, which could arise if employed developers contribute code on their company's behalf that would not serve the OSS project well, should be prevented. While companies may have a strong interest in steering a project in their desired direction (Schaarschmidt, 2023), it is imperative they do so in a way that is respectful towards the community. For example, before instructing paid OSS developers to make contributions, the desirability and viability of these contributions should be discussed with these OSS developers to identify any potential issues arising from conflicting goals and values vis-à-vis company vs. community. These actions would be in line with other conflict resolution strategies such as third-party intervention or parallel development (van Wendel de Joode, 2004). Our findings further correspond to Ågerfalk and Fitzgerald's (2008) study of the "open-sourcing" phenomenon. However, while they investigated the relationship between a company releasing source code to build an open source community, in this paper we have focused on a company investing in an already existing community by putting a "man on the inside" (Dahlander & Wallin, 2006).

Second, our results point to open source developer career ambitions (company vs. community) as a boundary condition that can be used by company managers. Career ambitions, which are stable personal dispositions, are known to directly affect turnover intention (Hirschi & Spurk, 2021); our research shows that they also can exhibit moderating influences.

Specifically, company career ambitions moderate the link between perceived company- community role conflict and company turnover intentions such that this relationship will be weakened. No such effect emerged for community career ambition. While career ambition is not directly measurable in practice, managers get a sense of developers' career ambition through interviews and interaction with them. Hence, based on our results we suggest managers should maintain regular interaction with developers to understand their career ambition. Tracking such career ambitions over time then can be useful to predict turnover intentions in relation to role conflicts. Table 6 provides an overview of implications in relation to specific research questions.

5.3. Limitations and future research

We are aware of some limitations of this research which we discuss next. First, in terms of sampling,

we put a premium on contacting and including only Linux developers (Study 1) or professional, company-employed open source developers (Study 2) for this research. For Study 2 however, although we included a set of control questions that identified non-employed developers, we cannot state with absolute certainty that the sample did not include any non-employed OSS developers. Second, we did not employ a longitudinal design, where measures for independent and dependent variables could be captured at different points in time. Future research might consider this option, as quitting intentions may evolve over time. Third, this research does not consider the business model of the companies (for which company-employed respondent developers work). For example, being a software distributor such as Red Hat involves different strategies other than simply adopting and adapting an open source product. This fact is especially important when interpreting the results of Study 2, where developers from multiple projects participated. Furthermore, this research does not consider the organizational position of developers within the company – this survey was targeted at developers without further distinction. Future research could consider the impact of organizational position on employees' intentions. Also, this study focused on role conflicts that arise through developers'

Table 6. Summary of findings and implications.

Research Question	Findings	Implications
What effect does an organizational identification imbalance have on employed open source developers' intentions to leave their company?	Increased levels of matched identification reduce turnover intentions (H1). An imbalanced identification towards the company reduces company turnover intentions, but an imbalance towards the community increases turnover intentions.	The results support the underlying notion that <i>Gatekeepers</i> have lower turnover intentions toward the company compared to <i>Lone Wolves</i> .
How does identification imbalance shape the perceptions of company-community conflicts, which ultimately lead to turnover intention?	Company-community role conflict partially mediates identification imbalance and turnover intentions (H3). Perceived role conflict may drive paid OSS developers to leave their company.	Companies should carefully consider their roadmap for OSS projects in terms of the contributions they wish to make, and identify potentially contentious issues. Where possible, potentially contentious contributions should be discussed with both the internal OSS contribution team (i.e., the developers they employ to contribute) and with the community of the OSS project they seek to contribute to. Before instructing paid OSS developers to make contributions, the desirability and viability of these contributions should be discussed with these OSS developers to identify any potential issues arising from conflicting goals and values vis-à-vis company vs. community. Managers should respect paid OSS developers' insights and opinions regarding the potential non-viability of contributions, and the potential dilemma that these insiders face.
Does a career ambition to remain active, either as an open source developer or as an employed developer, change how perceptions of role conflict affect turnover intentions?	Community career ambition does not moderate (increase) the link between perceived company-community role conflict and company turnover intentions (H4 not supported). Company career ambition does moderate (reduce) the same link between company-community role conflict and company turnover intention (H5 supported).	Managers should maintain regular interaction with developers to understand their career ambitions. Managers should develop and communicate clear career pathways within the company for their employed OSS developers. Further, managers should consider that certain employed OSS developers may prefer a community career. Such employees may be very valuable on short-term (e.g., 1–3 years), but appropriate measures should be taken to plan for their replacement in the long run.

identification with the company and the open source community. However, we did not distinguish role conflicts caused by ideology clashes between private and collective interests arising from conflicts that are the consequence of different private interests (Daniel et al., 2018; Kuk et al., 2024). Finally, this study did not capture any data regarding respondents' geographic location nor the role of socio-cultural differences. Apart from these limitations, future research could also focus more on companies' reasons to withdraw their teams from the OSS project, in addition to individual level turnover (Zhang et al., 2022). Notwithstanding these limitations, this research establishes an initial baseline, which we believe is the first to investigate imbalanced developer identification, role conflict, intention to leave, as well as the moderating role of career ambition, and we believe these limitations can provide excellent points of departure for future research and replications.

6. Conclusion

Companies increasingly employ software developers to participate in co-development with open source communities. Some of these developers may identify themselves, first and foremost, as employees of their company, or "company soldiers" (Chan & Husted, 2010), whereas others may start to see themselves as community members, or "Gone-Natives." An exclusive (or skewed) identification with either the company or the community is what we have termed an *identification imbalance*. This paper presents one of the first detailed investigations of imbalance effects on developers' intention to leave their employing company. Given the increasing reliance of the software industry on open source projects, it is imperative to better understand the relationships between companies and open source communities, since the forces that affect the sustainability of the latter may also negatively impact the former. The key findings of this research are that 1) company turnover intention is lowest when company identification and community identification fit at high rather than low levels, 2) an identification imbalance of company-paid open source developers can lead to role conflict, which in turn can lead to an increase in developers' intention to leave their company or community, and 3) that only company career ambitions have a moderating effect in relation to company turnover. Given the increasingly important role that open source projects represent to companies, and that establishing a "man on the inside" is a time-consuming investment, this study contributes practical insights that companies can use to manage their deployed developers.

Notes

1. We use the terms quitting intention, turnover intention, and intention to leave interchangeably throughout this paper.
2. We note that while identification is an attitude-like evaluation of the relationship between oneself and an entity, commitment, allegiance, and loyalty share the notions of actual behavior, and hence, are potential consequences of identification.
3. To evaluate the validity of this choice, we conducted an additional survey among 129 Amazon Mechanical Turk workers. We required participants to be employed (not necessarily as developers). We included both the Venn-diagram and an item-based measure of identification (Mael & Ashforth, 1992) to assess identification with the employer. All participants passed attention check ($M_{Age} = 35.47$ (9.39), working hours = 40.24 (13.13)). Cronbach's Alpha for the item-based measure of organizational identification was .90. Correlation between Venn-diagram and item-based measure of organizational identification was .65 ($p < .001$), which we interpret as a signal that both measurement approaches are valuable.
4. Some of the factor loadings for organizational identification are below the recommend threshold of .7 (Bagozzi & Yi, 1988). However, all indicators load significantly on the related constructs, all factor loadings are above .6, which has been used as a threshold for a long time, and all tests for validity passed. We therefore consider the measurement appropriate to answer the research questions.
5. We reran our analysis (see Section 4.4) with factor scores that did not include this specific item. Results remain identical.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work is supported by Science Foundation Ireland (SFI) grant [13/RC/2094-P2] to Lero.

References

- Adam, M., Wiener, M., & Benlian, A. (2023). Online Labor Platforms and the Role of Job Security and Compensation (Mis) Fits for Gig Workers. *Proceedings of the International Conference on Information Systems (ICIS)*, Hyderabad, India.
- Ågerfalk, P. J., & Fitzgerald, B. (2008). Outsourcing to an unknown workforce: Exploring opensourcing as a global sourcing strategy. *MIS Quarterly*, 32(2), 385–409. <https://doi.org/10.2307/25148845>
- Ahuja, M. K., Chudoba, K. M., Kacmar, C. J., McKnight, D. H., & George, J. F. (2007). It road warriors: Balancing work-family conflict, job autonomy, and work overload to mitigate turnover intentions. *MIS Quarterly*, 31(1), 1–17. <https://doi.org/10.2307/25148778>
- Aiken, L. S., & West, S. G. (1991). *Multiple Regression: Testing and Interpreting Interactions*. Sage Publications.

- Albert, S., Ashforth, B. E., & Dutton, J. E. (2000). Organizational identity and identification: Charting new waters and building new bridges. *Academy of Management Review*, 25(1), 13–17. <https://doi.org/10.5465/amr.2000.2791600>
- Alexy, O., Henkel, J., & Wallin, M. W. (2013). From closed to open: Job role changes, individual predispositions, and the adoption of commercial open source software development. *Research Policy*, 42(8), 1325–1340. <https://doi.org/10.1016/j.respol.2013.04.007>
- Amason, A. C., & Amason AC. (1996). Distinguishing the effects of functional and dysfunctional conflict on strategic decision making: Resolving a paradox for top management teams. *Academy of Management Journal*, 39(1), 123–148. <https://doi.org/10.2307/256633>
- Aranya, N., & Ferris, K. R. (1984). A reexamination of accountants' organizational-professional conflict. *The Accounting Review*, 59(1), 1–15.
- Ashforth, B. E., Harrison, S. H., & Corley, K. G. (2008). Identification in organizations: An examination of four fundamental questions. *Journal of Management*, 34(3), 325–374. <https://doi.org/10.1177/0149206308316059>
- Ashforth, B. E., & Mael, F. (1989). Social identity theory and the organization. *Academy of Management Review*, 14(1), 20–39. <https://doi.org/10.2307/258189>
- Bagozzi, R. P., & Dholakia, U. M. (2006). Open source software user communities: A study of participation in Linux user groups. *Management Science*, 52(7), 1099–1115. <https://doi.org/10.1287/mnsc.1060.0545>
- Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science*, 16(1), 74–94. <https://doi.org/10.1007/BF02723327>
- Bartels, J., Pruyn, A., De Jong, M., & Joustra, I. (2007). Multiple organizational identification levels and the impact of perceived external prestige and communication climate. *Journal of Organizational Behavior*, 28(2), 173–190. <https://doi.org/10.1002/job.420>
- Bauer, D. J., Preacher, K. J., & Gil, K. M. (2006). Conceptualizing and testing random indirect effects and moderated mediation in multilevel models: New procedures and recommendations. *Psychological Methods*, 11(2), 142–163. <https://doi.org/10.1037/1082-989X.11.2.142>
- Blader, S. L. (2007). What leads organizational members to collectivize? Injustice and identification as precursors of union certification. *Organization Science*, 18(1), 108–126. <https://doi.org/10.1287/orsc.1060.0217>
- Bonaccorsi, A., Giannangeli, S., & Rossi, C. (2006). Entry strategies under competing standards: Hybrid business models in the open source software industry. *Management Science*, 52(7), 1085–1098. <https://doi.org/10.1287/mnsc.1060.0547>
- Boulding, K. E. (1963). Towards a pure theory of threat systems. *The American Economic Review*, 53(2), 424–434.
- Boyle, K. A. (2021). Millennial career-identities: Reevaluating social identification and intergenerational relations. *Journal of Intergenerational Relationships*, 21(1), 89–109. <https://doi.org/10.1080/15350770.2021.1945989>
- Breaux, T., & Moritz, J. (2021). The 2021 software developer shortage is coming. *Communications of the ACM*, 64(7), 39–41. <https://doi.org/10.1145/3440753>
- Chan, J., & Husted, K. (2010). Dual allegiance and knowledge sharing in open source software firms. *Creativity and Innovation Management*, 19(3), 314–326. <https://doi.org/10.1111/j.1467-8691.2010.00566.x>
- Choi, N., Chengalur-Smith, I., & Nevo, S. (2015). Loyalty, ideology, and identification: An empirical study of the attitudes and behaviors of passive users of open source software. *Journal of the Association for Information Systems*, 16(8), 674–706. <https://doi.org/10.17705/1jais.00405>
- Conroy, S., Henle, C. A., Shore, L., & Stelman, S. (2017). Where there is light, there is dark: A review of the detrimental outcomes of high organizational identification. *Journal of Organizational Behavior*, 38(2), 184–203. <https://doi.org/10.1002/job.2164>
- Dahlander, L., & O'Mahony, S. (2011). Progressing to the center: Coordinating project work. *Organization Science*, 22(4), 961–979. <https://doi.org/10.1287/orsc.1100.0571>
- Dahlander, L., & Wallin, M. W. (2006). A man on the inside: Unlocking communities as complementary assets. *Research Policy*, 35(8), 1243–1259. <https://doi.org/10.1016/j.respol.2006.09.011>
- Daniel, S., Jananefat, S., Diamant, E. I., & Ren, Y. (2020). Single-and double-loop learning: Linking free/libre open source software (FLOSS) developer motivation, contribution, and turnover intentions. *ACM SIGMIS Database: The DATABASE for Advances in Information Systems*, 51(4), 68–92. <https://doi.org/10.1145/3433148.3433153>
- Daniel, S. L., Maruping, L. M., Cataldo, M., & Herbsleb, J. (2018). The impact of ideology misfit on open source software communities and companies. *MIS Quarterly*, 42(4), 1069–1096. <https://doi.org/10.25300/MISQ/2018/14242>
- Daniel, S., Maruping, L., Cataldo, M., & Herbsleb, J. (2011). When cultures clash: participation in open source communities and its implications for organizational commitment. In *Proceedings of the 32nd International Conference on Information Systems (ICIS)*, Shanghai.
- De Moura, G. R., Abrams, D., Retter, C., Gunnarsdottir, S., & Ando, K. (2009). Identification as an organizational anchor: How identification and job satisfaction combine to predict turnover intention. *European Journal of Social Psychology*, 39(4), 540–557. <https://doi.org/10.1002/ejsp.553>
- Dukerich, J. M., Golden, B. R., & Shortell, S. M. (2002). Beauty is in the eye of the beholder: The impact of organizational identification, identity, and image on the cooperative behaviors of physicians. *Administrative Science Quarterly*, 47(3), 507–533. <https://doi.org/10.2307/3094849>
- Durward, D., Blohm, I., & Leimeister J, M. (2020). The nature of crowd work and its effects on individuals' work perception. *Journal of Management Information Systems*, 37(1), 66–95. <https://doi.org/10.1080/07421222.2019.1705506>
- Edwards, J. R. (2002). Alternatives to difference scores: Polynomial regression and response surface methodology. In F. Drasgow & N. W. Schmitt (Eds.), *Advances in Measurement and Data Analysis* (pp. 350–400). Jossey-Bass.
- Edwards, J. R., & Parry, M. E. (1993). On the use of polynomial regression equations as an alternative to difference scores in organizational research. *Academy of Management Journal*, 36(6), 1577–1613. <https://doi.org/10.2307/256822>
- Edwards, M. R., & Peccei, R. (2010). Perceived organizational support, organizational identification, and employee outcomes. *Journal of Personnel Psychology*, 9(1), 17–26. <https://doi.org/10.1027/1866-5888/a000007>
- Ellemers, N., & Rink, F. (2005). Identity in work groups: The beneficial and detrimental consequences of multiple

- identities and group norms for collaboration and group performance. *Advances in Group Processes*, 22, 1–41. [https://doi.org/10.1016/S0882-6145\(05\)22001-5](https://doi.org/10.1016/S0882-6145(05)22001-5)
- Etemadi, V., Bushehrian, O., & Robles, G. (2022). Task assignment to counter the effect of developer turnover in software maintenance: A knowledge diffusion model. *Information and Software Technology*, 143, 106786. <https://doi.org/10.1016/j.infsof.2021.106786>
- Fang, Y., & Neufeld, D. (2009). Understanding sustained participation in open source software projects. *Journal of Management Information Systems*, 25(4), 9–50. <https://doi.org/10.2753/MIS0742-1222250401>
- Fitzgerald, B. (2006). The transformation of open source software. *MIS Quarterly*, 30(3), 587–598. <https://doi.org/10.2307/25148740>
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39–50. <https://doi.org/10.1177/002224378101800104>
- Foucault, M., Palyart, M., Blanc, X., Murphy, G. C., & Falleri, J. R. (2015). Impact of developer turnover on quality in open-source software. *Proceedings of the 10th Meeting on Foundations of Software Engineering*, Bergamo, Italy. (pp. 829–841).
- Fuchs, S. (2012). *Understanding Psychological Bonds Between Individuals and Organizations: The Coalescence Model of Organizational Identification*. Palgrave Macmillan UK.
- George, E., & Chattopadhyay, P. (2005). One foot in each camp: The dual identification of contract workers. *Administrative Science Quarterly*, 50(1), 68–99. <https://doi.org/10.2189/asqu.2005.50.1.68>
- Germonprez, M., Kendall, J. E., Kendall, K. E., Mathiassen, L., Young, B., & Warner, B. (2016). A theory of responsive design: A field study of corporate engagement with open source communities. *Information Systems Research*, 28(1), 64–83. <https://doi.org/10.1287/isre.2016.0662>
- Griffeth, R. W., Hom, P. W., & Gaertner, S. (2000). A meta-analysis of antecedents and correlates of employee turnover: Update, moderator tests, and research implications for the next millennium. *Journal of Management*, 26(3), 463–488. <https://doi.org/10.1177/014920630002600305>
- Hayes, A. F. (2018). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. The Guilford Press.
- Hayes, A. F., Montoya, A. K., & Rockwood, N. J. (2017). The analysis of mechanisms and their contingencies: PROCESS versus structural equation modeling. *Australasian Marketing Journal*, 25(1), 76–81. <https://doi.org/10.1016/j.ausmj.2017.02.001>
- He, H., & Brown, A. D. (2013). Organizational identity and organizational identification: A review of the literature and suggestions for future research. *Group & Organization Management*, 38(1), 3–35. <https://doi.org/10.1177/1059601112473815>
- Helm, S. (2013). A matter of reputation and pride: Associations between perceived external reputation, pride in membership, job satisfaction and turnover intentions. *British Journal of Management*, 24(4), 542–556. <https://doi.org/10.1111/j.1467-8551.2012.00827.x>
- Henkel, J. (2009). Champions of revealing--the role of open source developers in commercial firms. *Industrial and Corporate Change*, 18(3), 435–471. <https://doi.org/10.1093/icc/dtn046>
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1), 115–135. <https://doi.org/10.1007/s11747-014-0403-8>
- Hirschi, A., & Spurk, D. (2021). Ambitious employees: Why and when ambition relates to performance and organizational commitment. *Journal of Vocational Behavior*, 127, 103576. <https://doi.org/10.1016/j.jvb.2021.103576>
- Hogg, M. A., Terry, D. J., & White, K. M. (1995). A tale of two theories: A critical comparison of identity theory with social identity theory. *Social Psychology Quarterly*, 58(4), 255–269. <https://doi.org/10.2307/2787127>
- Homscheid, D., & Schaarschmidt, M. (2016). Between organization and community: Investigating turnover intention factors of firm-sponsored open source software developers. *Proceedings of the 8th ACM Conference on Web Science*, Hannover, Germany. (pp. 336–337).
- House, R. J., & Rizzo, J. R. (1972). Role conflict and ambiguity as critical variables in a model of organizational behavior. *Organizational Behavior & Human Performance*, 7(3), 467–505. [https://doi.org/10.1016/0030-5073\(72\)90030-X](https://doi.org/10.1016/0030-5073(72)90030-X)
- Husted, K., & Michailova, S. (2010). Dual allegiance and knowledge sharing in inter-firm R&D collaborations. *Organizational Dynamics*, 39(1), 37–47. <https://doi.org/10.1016/j.orgdyn.2009.10.004>
- Jackson, S. E., & Schuler, R. S. (1985). A meta-analysis and conceptual critique of research on role ambiguity and role conflict in work settings. *Organization Behavior and Human Decision Processes*, 36(1), 16–78. [https://doi.org/10.1016/0749-5978\(85\)90020-2](https://doi.org/10.1016/0749-5978(85)90020-2)
- Jensen, C., & Scacchi, W. (2005). Collaboration, leadership, control, and conflict negotiation and the netbeans.Org open source software development community. In *Proceedings of the 38th Annual Hawaii International Conference in System Sciences* (pp. 1–9, Big Island, HI).
- Joseph, D., Ng, K.-Y., Koh, C., & Ang, S. (2007). Turnover of information technology professionals: A narrative review, meta-analytic structural equation modeling, and model development. *MIS Quarterly*, 31(3), 547–577. <https://doi.org/10.2307/25148807>
- Ke, W., & Zhang, P. (2010). The effects of extrinsic motivations and satisfaction in open source software development. *Journal of the Association of Information Systems*, 11(12), 784–804. <https://doi.org/10.17705/1jais.00251>
- Kendall, K. E., Kendall, J. E., Germonprez, M., & Mathiassen, L. (2020). The Third Design Space: A postcolonial perspective on corporate engagement with open source software communities. *Information Systems Journal*, 30(2), 369–402. <https://doi.org/10.1111/ijis.12270>
- King, D., Ho, G., Stuart, E. A., & Imai, K. (2011). MatchIt: Nonparametric preprocessing for parametric causal inference. *Journal of Statistical Software*, 8(1), 1–28.
- Kippist, L., Fitzgerald, A., & Hyde, P. (2009). Organisational professional conflict and hybrid clinician managers: The effects of dual roles in Australian health care organisations. *Journal of Health Organization and Management*, 23(6), 642–655. <https://doi.org/10.1108/1477260911001653>
- Klein, G., Jiang, J. J., & Cheney, P. (2009). Resolving difference score issues in information systems research. *MIS Quarterly*, 33(4), 811–826. <https://doi.org/10.2307/20650328>
- Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed.). Guilford publications.
- Kotlarsky, J., & Oshri, I. (2005). Social ties, knowledge sharing and successful collaboration in globally

- distributed system development projects. *European Journal of Information Systems*, 14(1), 37–48. <https://doi.org/10.1057/palgrave.ejis.3000520>
- Kuk, G., Schaarschmidt, M., & Homscheid, D. (2024). All of the same breed? A networking perspective of private-collective innovation. *Journal of Business Research*, 172, 114406. <https://doi.org/10.1016/j.jbusres.2023.114406>
- Kull, A. J., & Heath, T. B. (2016). You decide, we donate: Strengthening consumer–brand relationships through digitally co-created social responsibility. *International Journal of Research in Marketing*, 33(1), 78–92. <https://doi.org/10.1016/j.ijresmar.2015.04.005>
- Lerner, J., & Tirole, J. (2002). Some simple economics of open source. *The Journal of Industrial Economics*, 50(2), 197–234. <https://doi.org/10.1111/1467-6451.00174>
- Lindberg, A., Schecter, A., Berente, N., Hennel, P., & Lyytinen, K. (2024). The Entrainment of Task Allocation and Release Cycles in Open Source Software Development. *MIS Quarterly*, 48(1), 67–94. <https://doi.org/10.25300/MISQ/2023/16789>
- Linux Report. (2020). *Linux Kernel History Report 2020*. https://project.linuxfoundation.org/hubfs/Reports/2020_kernel_history_report_082720.pdf
- Ljungberg, J. (2000). Open source movements as a model for organising. *European Journal of Information Systems*, 9(4), 208–216. <https://doi.org/10.1057/palgrave.ejis.3000373>
- Ma, D., Fee, A., Grabowski, S., & Scerri, M. (2022). Dual Organizational Identification in Multinational Enterprises and Interpersonal Horizontal Knowledge Sharing: A Conceptual Model. *Journal of International Management*, 28(1), 100907. <https://doi.org/10.1016/j.intman.2021.100907>
- Mael, F., & Ashforth, B. E. (1992). Alumni and their alma mater: A partial test of the reformulated model of organizational identification. *Journal of Organizational Behavior*, 13(2), 103–123. <https://doi.org/10.1002/job.4030130202>
- Marks, A., & Scholarios, D. (2007). Revisiting technical workers: Professional and organisational identities in the software industry. *New Technology, Work and Employment*, 22(2), 98–117. <https://doi.org/10.1111/j.1468-005X.2007.00193.x>
- Maruping, L. M., Daniel, S. L., & Cataldo, M. (2019). Developer centrality and the impact of value congruence and incongruence on commitment and code contribution activity in open source software communities. *MIS Quarterly*, 43(3), 951–976. <https://doi.org/10.25300/MISQ/2019/13928>
- Maruping, L. M., & Matook, S. (2020). The evolution of software development orchestration: Current state and an agenda for future research. *European Journal of Information Systems*, 29(5), 443–457. <https://doi.org/10.1080/0960085X.2020.1831834>
- Miles, R. H., & Perreault, W. D., Jr. (1976). Organizational role conflict: Its antecedents and consequences. *Organizational Behavior & Human Performance*, 17(1), 19–44. [https://doi.org/10.1016/0030-5073\(76\)90051-9](https://doi.org/10.1016/0030-5073(76)90051-9)
- Morgan, L., Feller, J., & Finnegan, P. (2013). Exploring value networks: Theorising the creation and capture of value with open source software. *European Journal of Information Systems*, 22(5), 569–588. <https://doi.org/10.1057/ejis.2012.44>
- O'Mahony, S., & Bechky, B. A. (2008). Boundary organizations: Enabling collaboration among unexpected allies. *Administrative Science Quarterly*, 53(3), 422–459. <https://doi.org/10.2189/asqu.53.3.422>
- Oppenheimer, M. (1972). The proletarianization of the professional. *Sociological Review*, 20(1_suppl), 213–227. <https://doi.org/10.1111/j.1467-954X.1972.tb03218.x>
- Piening, E. P., Salge, T. O., Antons, D., & Kreiner, G. E. (2020). Standing together or falling apart? Understanding employees' responses to organizational identity threats. *Academy of Management Review*, 45(2), 325–351. <https://doi.org/10.5465/amr.2016.0457>
- Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of Method Bias in Social Science Research and Recommendations on How to Control it. *Annual Review of Psychology*, 63(1), 539–569. <https://doi.org/10.1146/annurev-psych-120710-100452>
- Pratt, M. G., & Rafaeli, A. (1997). ORGANIZATIONAL DRESS as a SYMBOL of MULTILAYERED SOCIAL IDENTITIES. *Academy of Management Journal*, 40(4), 862–898. <https://doi.org/10.2307/256951>
- Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing Moderated Mediation Hypotheses: Theory, Methods, and Prescriptions. *Multivariate Behavioral Research*, 42(1), 185–227. <https://doi.org/10.1080/00273170701341316>
- Riehle, D. (2015). How open source is changing the software developer's career. *Computer*, 48(5), 51–57. <https://doi.org/10.1109/MC.2015.132>
- Rizzo, J. R., House, R. J., & Lirtzman, S. I. (1970). Role conflict and ambiguity in complex organizations. *Administrative Science Quarterly*, 15(2), 150–163.
- Rolandsson, B., Bergquist, M., & Ljungberg, J. (2011). Open source in the firm: Opening up professional practices of software development. *Research Policy*, 40(4), 576–587. <https://doi.org/10.1016/j.respol.2010.11.003>
- Rosenbaum, P. R., & Rubin, D. B. (1985). Constructing a control group using multivariate matched sampling methods that incorporate the propensity score. *American Statistician*, 39(1), 33–38. <https://doi.org/10.1080/00031305.1985.10479383>
- Schaarschmidt, M. (2023). Innovating beyond firm boundaries: Resource deployment control in open source software development. *Information Technology & People*, 36(4), 1645–1668. <https://doi.org/10.1108/ITP-08-2021-0624>
- Schaarschmidt, M., Walsh, G., & von Kortzfleisch, H. F. (2015). How do firms influence open source software communities? A framework and empirical analysis of different governance modes. *Information and Organization*, 25(2), 99–114. <https://doi.org/10.1016/j.infoandorg.2015.03.001>
- Shafer, W. E. (2002). Ethical pressure, organizational-professional conflict, and related work outcomes among management accountants. *Journal of Business Ethics*, 38(3), 261–273. <https://doi.org/10.1023/A:1015876809254>
- Shaikh, M., & Vaast, E. (2016). Folding and unfolding: Balancing openness and transparency in open source communities. *Information Systems Research*, 27(4), 813–833. <https://doi.org/10.1287/isre.2016.0646>
- Shanock, L. R., Baran, B. E., Gentry, W. A., Pattison, S. C., & Heggstad, E. D. (2010). Polynomial regression with response surface analysis: A powerful approach for examining moderation and overcoming limitations of difference scores. *Journal of Business & Psychology*, 25(4), 543–554. <https://doi.org/10.1007/s10869-010-9183-4>
- Sharma, P. N., Daniel, S. L., Chung, T. (.), & Grover, V. (2022). A motivation-hygiene model of open source

- software code contribution and growth. *Journal of the Association for Information Systems*, 23(1), 165–195. <https://doi.org/10.17705/1jais.00712>
- Smith, L. G. E., Amiot, C. E., Callan, V. J., Terry, D. J., & Smith, J. R. (2012). Getting new staff to stay: The mediating role of organizational identification. *British Journal of Management*, 23(1), 45–64. <https://doi.org/10.1111/j.1467-8551.2010.00728.x>
- Spaeth, S., von Krogh, G., & He, F. (2015). Research Note — Perceived Firm Attributes and Intrinsic Motivation in Sponsored Open Source Software Projects. *Information Systems Research*, 26(1), 224–237. <https://doi.org/10.1287/isre.2014.0539>
- Spiller, S. A., Fitzsimons, G. J., Lynch, J. G., Jr., & McClelland, G. H. (2013). Spotlights, floodlights, and the magic number zero: Simple effects tests in moderated regression. *Journal of Marketing Research*, 50(2), 277–288. <https://doi.org/10.1509/jmr.12.0420>
- Syna Desivilya, H., & Eize, D. (2005). Conflict management in work teams: The role of social self-efficacy and group identification. *International Journal of Conflict Management*, 16(2), 183–208. <https://doi.org/10.1108/eb022928>
- Tajfel, H., & Turner, J. C. (2004). The Social Identity Theory of Intergroup Behavior. In S. Worchel & W. Austin (Eds.), *Political psychology: Key readings*, (pp. 276–293). New York, USA: Psychology Press.
- Teigland, R., DiGangi, P. M., Flåten, B. T., Giovacchini, E., & Pastorino, N. (2014). Balancing on a tightrope: Managing the boundaries of a firm-sponsored OSS community and its impact on innovation and absorptive capacity. *Information and Organization*, 24(1), 25–47. <https://doi.org/10.1016/j.infoandorg.2014.01.001>
- Trinkenreich, B., Guizani, M., Wiese, I., Sarma, A., & Steinmacher, I. (2020). Hidden Figures: Roles and Pathways of Successful OSS Contributors. *Proceedings of the ACM on Human-Computer Interaction*, 4(CSCW2), 1–22. <https://doi.org/10.1145/3415251>
- Tsai, C. Y., Kim, J., Jin, F., Jun, M., Cheong, M., & Yammarino, F. J. (2022). Polynomial regression analysis and response surface methodology in leadership research. *The Leadership Quarterly*, 33(1), 101592. <https://doi.org/10.1016/j.leaqua.2021.101592>
- van Wendel de Joode, R. (2004). Managing Conflicts in Open Source Communities. *Electronic Markets*, 14(2), 104–113. <https://doi.org/10.1080/10196780410001675059>
- van Wesel, P., Lin, B., Robles, G., & Serebrenik, A. (2017). Reviewing career paths of the Opentack developers, In 2017 IEEE International Conference on Software Maintenance and Evolution (ICSME), 19–22 September, Shanghai, China. 544–548. <https://doi.org/10.1109/ICSME.2017.25>
- von Krogh, G., Haeflinger, S., Spaeth, S., & Wallin, M. W. (2012). Carrots and Rainbows: Motivation and social practice in open source software development. *MIS Quarterly*, 36(2), 649–676. <https://doi.org/10.2307/41703471>
- Vora, D., & Kostova, T. (2007). A model of dual organizational identification in the context of the multinational enterprise. *Journal of Organizational Behavior*, 28(3), 327–350. <https://doi.org/10.1002/job.422>
- Wallace, J. E. (1995). Organizational and professional commitment in professional and nonprofessional organizations. *Administrative Science Quarterly*, 40(2), 228–255. <https://doi.org/10.2307/2393637>
- Walsh, G., Dahling, J. J., Schaarschmidt, M., & Brach, S. (2016). Surface-acting outcomes among service employees with two jobs: Investigating moderation and mediation effects. *Journal of Service Management*, 27(4), 534–562. <https://doi.org/10.1108/JOSM-05-2015-0169>
- Wasko, M. M., & Faraj, S. (2005). Why should I share? Examining social capital and knowledge contribution in electronic networks of practice. *MIS Quarterly*, 29(1), 35–57. <https://doi.org/10.2307/25148667>
- Webber, S. S. (2011). Dual organizational identification impacting client satisfaction and word of mouth loyalty. *Journal of Business Research*, 64(2), 119–125. <https://doi.org/10.1016/j.jbusres.2010.02.005>
- Weinert, C., Maier, C., Laumer, S., & Weitzel, T. (2024). How Embeddedness Influences IT-Induced Work–Home Boundary Reduction, Work–Home Conflict, and Job Outcomes. *Information & Management*, 61(3), 103929. <https://doi.org/10.1016/j.im.2024.103929>
- West, J., & O'Mahony, S. (2008). The role of participation architecture in growing sponsored open source communities. *Industry & Innovation*, 15(2), 145–168. <https://doi.org/10.1080/13662710801970142>
- Westlund, S. G., & Hannon, J. C. (2008). Retaining talent: Assessing job satisfaction facets most significantly related to software developer turnover intentions. *Journal of Information Technology Management*, 19(4), 1–15.
- Wu, C. G., Jh, G., & Young, C. E. (2007). An empirical analysis of open source software developers' motivations and continuance intentions. *Information & Management*, 44(3), 253–262. <https://doi.org/10.1016/j.im.2006.12.006>
- Xu, B., Jones, D. R., & Shao, B. (2009). Volunteers' involvement in online community based software development. *Information & Management*, 46(3), 151–158. <https://doi.org/10.1016/j.im.2008.12.005>
- Yu, Y., Benlian, A., & Hess, T. (2012). An Empirical Study of Volunteer Members' Perceived Turnover in Open Source Software Projects. *Proceedings of the 45th Hawaii International Conference on System Sciences*, Hawaii, USA. (pp. 3396–3405).
- Zaza, S., Joseph, D., & Armstrong D, J. (2023). Are it professionals unique? A second-order meta-analytic comparison of turnover intentions across occupations. *MIS Quarterly*, 47(3), 1213–1238. <https://doi.org/10.25300/MISQ/2022/16951>
- Zhang, Y., Liu, H., Tan, X., Zhou, M., Jin, Z., & Zhu, J. (2022). Turnover of Companies in OpenStack: Prevalence and Rationale. *ACM Transactions on Software Engineering and Methodology*, 31(4), 1–24. <https://doi.org/10.1145/3510849>
- Zhou, M., Mockus, A., Ma, X., Zhang, L., & Mei, H. (2016). Inflow and retention in OSS communities with commercial involvement: A case study of three hybrid projects. *ACM Transactions on Software Engineering and Methodology*, 25(2), 1–29. <https://doi.org/10.1145/2876443>