

Shadow IT: Steroids for Innovation

Mario Silic¹, Dario Silic², Goran Oblakovic²

¹Institute of Information Management (IWI), University of St. Gallen, Switzerland

²Zagreb School of Economics and Management, Zagreb, Croatia

Abstract. Shadow IT is relatively new and emerging phenomenon which is bringing number of concerns and risks to the organizational security. Past literature has mostly explored the “negative” effects of the Shadow IT phenomenon, including, for example, the security aspect where Shadow systems are said to undermine the official systems and endanger organizational data flows. But, they are also said to increase innovation. However, the current literature does not provide any evidence of a possible innovation increase. We used three methods to understand if Shadow IT can be an important source of innovation for firms: 1) Single case study with international firm that adopted Shadow IT; 2) Interviews with 15 IT executives and 3) Focus group using twitter as enabling tool to interact with 65 IT professionals. Our study reveals that Shadow IT can be an important source of Innovation for organizations. Finally, our research brings new theoretical contributions for researchers and important insights for practitioners. We also provide limitation and future directions for research.

Keywords: Shadow IT; software; organizational IT; shadow systems; information security; innovation

1 Introduction

Shadow IT represents all software, hardware, or any other solutions used by employees inside of the organizational ecosystem which did not receive any prior formal IT department approval. “I got to do my job, I have to do it fast and I’m confident that the benefits will outweigh the risks.” - is a typical answer to the question of why employees are using something that is non-approved and consequently, is illegal.

User of these Shadow systems can be any employee that is looking to solve its own needs. Sometimes, this user innovation can be source of a successful commercial product. Sports equipment such as the rodeo kayak [1], mountain bike [2], snowboard [3], and surfboard [4], medical equipment [5], juvenile products such as the baby jogger [6], services such as computerized commercial banking services [7], computer games [8], and films in the animation genre [9] are few examples where user innova-

Copyright © by the paper’s authors. Copying permitted only for private and academic purposes.

In: S. España, M. Ivanović, M. Savić (eds.): Proceedings of the CAiSE’16 Forum at the 28th International Conference on Advanced Information Systems Engineering, Ljubljana, Slovenia, 13-17.6.2016, published at <http://ceur-ws.org>

tions was a success. Can Shadow IT really be considered as an important source of innovation for firms? Shadow IT is relatively a new and emerging phenomenon which is bringing number of concerns and risks to the organizational security. Past literature has mostly explored the “negative” effects of the Shadow IT phenomenon, including, for example, the security aspect where Shadow systems are said to undermine the official systems [10] and endanger organizational data flows [11]. But, they are also said to increase productivity and innovation. However, the current literature does not provide any evidence of a possible innovation increase. We are missing a deeper understanding of the phenomenon and its link with innovation.

The objective of this paper is to show that the Shadow IT is an important source of innovation for organizations result of illegal activities performed by employees. To achieve our objective we are using a triangulation approach combining three different methods 1) revelatory qualitative case study [12] with a global firm that had successfully adopted Shadow IT innovation process; 2) Interviews with Chief Information Officers (CIOs) and 3) Online focus group using Twitter as enabling tool.

2 Theoretical background

Shadow IT defines the same autonomous developed systems, processes and organizational units developed without awareness, acceptance, knowledge and support of the IT department [13]. Shadow IT phenomena can be seen as an important security threat [14]. It is also an “insider-threat” where there is strong non-compliance behavior of employees related to the information security policies [15]. “If users do not comply with ISsec policies, ISsec measures lose their efficacy” [16]. Furthermore, Shadow IT has an important dual-use context [17-19] where its use can have positive and negative consequences. On the possible negative consequences there is the possibility to undermine the official system [10], endanger organizational data and processes [11]. On the positive side, Shadow IT can be very efficient and effective when used instead of the formal and standard systems in place [20, 21]. Shadow IT is usually situated at the organization borders where it fills the existing gap between users and the solutions provided by the IT department [22]. This is typically business and IT alignment domain which should reveal the organizational capability to fulfil business needs with IT capabilities [23]. That means that IT should be the enabler of business objectives and should strive achieving them in the most efficient way [24]. The lack of alignment between business and IT creates an ideal environment for Shadow Users for the creation of the Shadow Innovations.

3 Research design

This paper utilizes a triangulation approach that combines three different methods in order to improve accuracy and strengthen our findings.

Firstly, we wanted to collect insights from real-life examples where Shadow IT has been implemented. As currently, Shadow IT studies in the innovation context are scarce, we wanted to study one case in depth that would provide us rich understanding

of the phenomenon. Single case studies allow researchers to get unique and deep insights of the case under study, especially if the case is extreme, unique, or revelatory [12]. The organization that we studied was an appropriate case as it openly adopted Shadow IT by incorporating it within its information systems (IS) policies. Organization is a medium size international company that has 1,500 employees.

Secondly, we aimed to understand the practitioner's perspective about the Shadow IT topic. We used qualitative method which was appropriate given the high degree of uncertainty surrounding the phenomenon under study. That means, not enough was known a priori about Shadow IT usage and its impact on Shadow Innovations to quantitatively measure it or pre-specify its outcomes. Therefore, qualitative method provided a very rich understanding of the underlying mechanisms, activities, and behaviors that define Shadow IT use actions by Shadow Users. This involved the collection and analysis of empirical data using a qualitative research approach. Qualitative research is defined as "the use of qualitative data such as interviews, documents and participant observation data to understand and explain social phenomena" [25]. [25] observed that qualitative research methods are designed to help researchers understand people and the social and cultural contexts within which they live. [26] also notes that "interviews can be useful tools for unpacking motives and experiences".

Thirdly, as we wanted to leverage the generalizability of our findings we created an online focus group by using Twitter platform. With this approach we were able to target and involve high number of CIOs (already members of the highly visited CIO web portal).

3.1 Data collection

We conducted semi-structured interviews for the single case study (1 interview with CIO and 1 with Vice President of IT) and the interviews with executives (15 interviews) that were selected from different organizations: large firms (40%), security companies (20%), governmental agencies (20%), and independent experts (20%). Out of 15 interviewee, 12 were CIOs and 3 were IT executives (1 IT director, 1 VP of IT and 1 Chief Technical Officer - CTO).

For the focus group study we used Twitter as a platform where any CIO was able to post its comments. We had 65 different CIOs that posted at least one tweet (post on Twitter) with a total of 320 unique tweets.

Interviews were designed as set of open ended questions with an idea to cover the Shadow IT topic in depth. Overall, the interviews duration was between 38 and 72 minutes, with an average of 53 minutes. Interviews were conducted between February 2013 and September 2014. All interviews were recorded except one (interviewee declined to be recorded – notes were taken).

4 Results

In this section, we will present the results.

4.1 Single case study

Results from the single case study clearly pointed out that Shadow IT is an important source of innovation. For interviewee (C1): *“Shadow IT is innovative. We are pioneering new ways for employee to do their Job. Their job tasks are no more restrictive by the IT tools deployed by IT.*

With shadow IT, the methods of collaboration with outside clients, the ability to share files and use mobile devices to communicate whilst integrating with our infrastructure anywhere are innovative ways of how employees are doing their jobs. Their jobs can be done anytime, anywhere and most of the time by any devices are all possible because of Shadow IT tools and services.” However, as pointed out by (C2) Shadow IT needs to be promoted and encouraged with the organization as by doing so new innovation solutions will appear: *“With the proliferation of social media and rich media contents, creation and distribution of media assets are now done beyond the confines of an IT local infrastructure. To allow employees to work beyond the boundaries of the local infrastructure and systems, Shadow IT will need to be encouraged. This will further enable the IT organization within a media organization to collaborate with shadow IT clients to build innovation IT solutions to meet users/clients expectations.”*

Still, perception of Shadow IT in light of all the risks remains relatively negative and organizations tend not to unleash the potential behind Shadow IT and enable Shadow employees to be freer in the employee-IT relationships when it comes to leveraging shadow practices. Indeed, for (C1) companies are still reluctant to adopt Shadow IT *“because most of the products that are used in Shadow IT are consumer graded and the security modules that are in the free offerings are not sufficient for data security. Additionally, when users are involved in technology selection, business processes are not necessarily taken into consideration.”*

4.2 Interviews

From the interviews it became clear that Shadow IT is not really such a new phenomenon in itself as users were always trying to bypass IT to come up with their own solutions and tools enabling faster job processes. However, what has recently changed is the arrival of the new technologies such as cloud services, software-as-a-service tools, mobile apps that enabled people to be more innovative through the technology. For example, (A4) says that *“...the phenomenon is nothing really new...however we are witnessing a plethora of new tools and services. Hence, it is more about your job performance and how to optimize it using the innovative technologies available out there. But also, what is the role of IT in this new structure – how IT should be positioned: to allow or disallow?”*

For most of the interviewees the right question is how to expand the innovation teams to a wider population of all employees as good idea can come from any employee and not just from a limited number of people. (A9) argues that *“...in our organization we count over 50,000 employees and if I compare that number with a li-*

mitted number of people working in innovation labs, it is clear that the focus should shift to the entire organization.”

There was an overall consensus that this new way of approaching the Shadow IT clearly opens the doors to innovation from unexpected angles. In other words, any department, any employee may have hidden talents that can turn to be very innovative. One example came from (A2): *“we just had an employee from the financial department who had some very advanced IT programming skills...he came with a small application that automated a process where 6 people were previously involved to have it done....it saves us huge amount of time but also money...he was using unauthorized programs to build the App...but nobody really questioned that part”*.

4.3 Focus group

Overall, participants noted that the time for change has arrived and there is a need for IT departments to adapt to the new realities brought by the latest technological advances which can unleash and spark employee innovation. Clearly, Shadow IT should be driven, explained and encouraged by CIOs.

For (FG1) IT department is not innovating *“IT dept. today is still on run mode with lost resources just maintaining. NOT innovating”* and one possible reason for this non innovation driven direction is because there is a breakdown in the communication flow between different partners – e.g. (FG20): *“Shadow IT is clearly an indication of the breakdown in communication or trust w/IT”*. For (FG12) it is time so shed light on what Shadow IT is and what it can bring *“I argue CIOs should not prohibit shadow IT but rather shed a light on it”*. Another tweet from (FG32) pointed out the need to embrace and not to block the Shadow users.

Overall, there was a general consensus about the benefits of encouraging Shadow IT where majority of participants said that Shadow IT can spark the innovation which in this new context would come not only from one single department or lab, but could be generated and driven by a much larger group of people. One participant commented (FG62) *“SIT sparks innovation. And it is now available to anyone”* and another one (FG55) added *“security could be an issue. But benefits could be simply very high”*.

5 Discussion

Is Shadow IT an important source of innovation for firms? We tackled this research question by using three different methods: 1) single case study; 2) interviews and 3) focus group. By triangulating the findings from these three methods we can see that Shadow IT can be an important source of innovation for firms. There is a clear link between the Shadow Users (employees) and innovation process. While, these Shadow Users are considered to be benign non-malicious insiders threatening Information Systems (IS) and violating IS security policies with benevolent intentions [27], they can also be important and new source of innovation. Indeed, so far, organizations were typically mostly relying on their innovation departments or labs to produce innova-

tions. Interestingly, these user driven innovations benefit innovators (Shadow users) themselves. Hence, users tend to develop fundamentally different innovations because they will alone have benefits from using the innovation [28]. Typically, when Shadow user, for instance, creates a new excel-macro the first user of this newly innovated tool will be the Shadow user.

Our research reveals that Shadow IT is an important driver of innovations within an organization. From the single case study, where we analyzed a global firm which openly adopted Shadow IT use, we could see that encouraging employees to propose and suggest their innovative processes led to creating new benefits to the entire organization. This was achieved through an active promotion of Shadow practices where strong alignment between different stakeholders was created in order to have the process secured from end to end. And benefits were manifold. Not only employee's creativity was unleashed but also IT benefited from this end user empowerment as IT department in the newly created environment was much more consultative and became a much stronger gatekeeper for all processes related to Shadow practices. Furthermore, external customers had seen positive effects as tools or services they were using in their organizations, with the new Shadow IT approach, are now marked as allowed. This opened new and more efficient ways for communicating increasing productivity and enabling fast job tasks execution.

Interviews with IT executives were particularly useful as they revealed that Shadow IT phenomenon is currently in a strong expansion with a plethora of new products, services or tools. And it is not a question anymore how to prevent the Shadow use but rather how to cooperate and free employees innovation. It is evident that organizations in order to stay competitive or to keep their competitive advantage need to innovate, and one possible direction is to rely on the entire population of employees.

Focus group approach provided a bit higher level of the relationship and risks behind Shadow IT. It is clear that for innovation to happen it has to be further encouraged and this process should be top-down driven. IT department needs to be strongly involved in this transformational process. On the other side, it was also pointed out that Shadow IT is still relatively an unknown phenomenon despite the fact it is nothing really new. And when something is unknown it tends to bring certain risks that are actual risks. Mostly, it relates to how to efficiently handle security challenges behind these "external" systems or processes use such as, for instance, cloud services [29]. More than anything it is the question of trust. In cloud context the question is "*who would trust their essential data out there somewhere?*" [30]. Same applies to Shadow IT where risks related to such practices could also be very high and may diminish all the positive effects behind the innovation idea.

Overall, there should be a very strong alignment across the entire organization before any Shadow IT practices are implemented. Past research showed that users innovate as they expect benefits [28] or due to their expertise and knowledge [31, 32]. In Shadow IT, users innovate as they have to fulfill their job needs by doing the job faster and more efficient. To achieve that Shadow users mostly use greynet (communication applications such as Skype), content apps (e.g. PDF tools) or various tools (e.g. Facebook chat) to satisfy these job needs [33].

Finally, how to approach Shadow IT user driven innovation process is already a burning topic as it is not a question anymore whether organizations should promote, encourage and implement the phenomenon, but rather, how to do it. As not only, if done smartly, the already pending risks may be decreased, but above all, organizations may spark innovation from unexpected places and people. Conclusion

Our research investigated the Shadow IT being and important source of innovation for firms. The study offers novel insights on the role of Shadow users in the organizational innovation process and how they contribute to new innovations by using Shadow IT. We provide several theoretical directions that could benefit from could build upon our theoretical findings. Also, practitioners may benefit from the study as it offers interesting insights on the role that Shadow IT may have when encouraged, promoted and implemented in the entire organizational ecosystem where innovations may come from unexpected places and people.

References

1. Baldwin, C., Hienert, C., Von Hippel, E.: How user innovations become commercial products: A theoretical investigation and case study. *Research Policy* 35, 1291-1313 (2006)
2. Luthje, C., Herstatt, C., Von Hippel, E.: The dominant role of "local" information in user innovation: The case of mountain biking. (2003)
3. Shah, S.: Sources and patterns of innovation in a consumer products field: innovations in sporting equipment. Sloan Working Paper (2000). (Accessed:)
4. Franke, N., Shah, S.: How communities support innovative activities: an exploration of assistance and sharing among end-users. *Research Policy* 32, 157-178 (2003)
5. Lettl, C., Herstatt, C., Gemuenden, H.G.: Learning from users for radical innovation. *International Journal of Technology Management* 33, 25-45 (2006)
6. Shah, S., Tripsas, M.: The accidental entrepreneur: The emergent and collective process of user entrepreneurship. *Strategic Entrepreneurship Journal* 1, 123-140 (2007)
7. Oliveira, P., von Hippel, E.: Users as service innovators: The case of banking services. *Research Policy* 40, 806-818 (2011)
8. Jeppesen, L.B., Molin, M.J.: Consumers as co-developers: Learning and innovation outside the firm. *Technology Analysis & Strategic Management* 15, 363-383 (2003)
9. Haefliger, S., Jäger, P., Von Krogh, G.: Under the radar: Industry entry by user entrepreneurs. *Research Policy* 39, 1198-1213 (2010)
10. Strong, D.M., Volkoff, O.: A roadmap for enterprise system implementation. *Computer* 37, 22-29 (2004)
11. Oliver, D., Romm, C.T.: ERP systems in universities: rationale advanced for their adoption. Idea Group Publishing, Hershey, PA (2002)
12. Dubé, L., Paré, G.: Rigor in information systems positivist case research: current practices, trends, and recommendations. *MIS quarterly* 597-636 (2003)
13. Rentrop, C., van Laak, O., Mevius, M.: Schatten-IT: ein Thema für die interne Revision. *Revisionspraxis—Journal für Revisoren, Wirtschaftsprüfer, IT-Sicherheits- und Datenschutzbeauftragte* 68-76 (2011)

14. Györy, A., Cleven, A., Uebernickel, F., Brenner, W.: Exploring the Shadows: IT Governance Approaches to User-Driven Innovation. In: ECIS, pp. 222. (Year)
15. Warkentin, M., Willison, R.: Behavioral and policy issues in information systems security: the insider threat. *European Journal of Information Systems* 18, 101-105 (2009)
16. Puhakainen, P., Siponen, M.: Improving employees' compliance through information systems security training: an action research study. *Mis Quarterly* 34, 757-778 (2010)
17. Silic, M.: Dual-use open source security software in organizations – Dilemma: Help or hinder? *Computers & Security* 39, Part B, 386-395 (2013)
18. Silic, M., Back, A.: Information Security and Open Source Dual Use Security Software: Trust Paradox. *Open Source Software: Quality Verification*, pp. 194-206. Springer (2013)
19. Silic, M., Back, A.: The Influence of Risk Factors in Decision-Making Process for Open Source Software Adoption. *International Journal of Information Technology & Decision Making* 1-35 (2015)
20. Behrens, S., Sedera, W.: Why do shadow systems exist after an ERP implementation? Lessons from a case study. In: 8th Pacific Asia Conference on Information Systems, Shanghai, China. (Year)
21. Harley, B., Wright, C., Hall, R., Dery, K.: Management Reactions to Technological Change The Example of Enterprise Resource Planning. *The Journal of Applied Behavioral Science* 42, 58-75 (2006)
22. Behrens, S.: Shadow systems: The good, the bad and the ugly. *Communications of the ACM* 52, 124-129 (2009)
23. Henderson, J.C., Venkatraman, N.: Strategic alignment: Leveraging information technology for transforming organizations. *IBM Systems Journal* 32, 4-16 (1993)
24. Luftman, J., Kempaiah, R.: An Update on Business-IT Alignment: "A Line" Has Been Drawn. *MIS Quarterly Executive* 6, (2007)
25. Myers, M.D., Avison, D.: Qualitative research in information systems. *Management Information Systems Quarterly* 21, 241-242 (1997)
26. Hardman, J.: An exploratory case study of computer use in a primary school mathematics classroom: new technology, new pedagogy?: research: information and communication technologies. *Perspectives in Education: Research on ICTs and Education in South Africa: Special Issue* 4 23, p. 99-111 (2005)
27. Willison, R., Warkentin, M.: Beyond deterrence: an expanded view of employee computer abuse. *MIS quarterly* 37, 1-20 (2013)
28. Von Hippel, E.: *The sources of innovation*. Springer (2007)
29. Takabi, H., Joshi, J.B., Ahn, G.-J.: Security and Privacy Challenges in Cloud Computing Environments. *IEEE Security & Privacy* 8, 24-31 (2010)
30. Armbrust, M., Fox, A., Griffith, R., Joseph, A.D., Katz, R., Konwinski, A., Lee, G., Patterson, D., Rabkin, A., Stoica, I.: A view of cloud computing. *Communications of the ACM* 53, 50-58 (2010)
31. Lüthje, C., Herstatt, C.: The Lead User method: an outline of empirical findings and issues for future research. *R&D Management* 34, 553-568 (2004)
32. Lüthje, C., Herstatt, C., Von Hippel, E.: User-innovators and "local" information: The case of mountain biking. *Research Policy* 34, 951-965 (2005)
33. Silic, M., Back, A.: Shadow IT—A view from behind the curtain. *Computers & Security* 45, 274-283 (2014)