Management of IT Security in Organizations

What Makes It Hard?

Konstantin (Kosta) Beznosov

Laboratory for Education and Research in Secure Systems Engineering
Department of Electrical and Computer Engineering
University of British Columbia
IT Security is Critical
IT Security is Costly

organizations worldwide spent in 2007

$1.55 trillion on IT

7-9% on IT security

$108 billion

Forrester Research

Cyber crime market worldwide

$105 billion

John Viega, McAfee
Outline

• overview
• methods
• results
  • tasks & tools
  • IT security vs. general IT
  • challenges
  • interactions
• opportunities for future research
HOT Admin: Human Organization and Technology Centred Improvement of IT Security Administration

Purpose

- **Tool evaluation**: methodology
- **Tool design**: guidelines & techniques

Work Plan

- **Field study**
- **Models**
- **Techniques & Methodologies**
- **Validation & Evaluation**

sponsors and partners

- **Entrust**
- **NSERC CRISNG**
- **SAP**
Human Organization and Technology Centred

Human

Organizational

Technological

hotadmin.org
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Methods Summary

• data collection
  • online questionnaire
    • demographics
  • in situ semi-structured interviews
    • two interviewers
  • participatory observations
    • 75 hours in academic organization IT department
    • policy development and IDS deployment

• data analysis
  • qualitative description
    • constant comparison, inductive analysis
    • coding: selective, open, axial, theoretical
Interviewer:
Do you think that there's a difference between security-related tasks and other IT tasks? Can you talk about what makes security different?

Participant:
Well a very glib answer would be that they are different because security involves making things more difficult for people rather than not. Like I said, that's a glib answer and not necessarily completely true but the element of truth in that is that typically if there is a security problem, the solution is to get people to stop doing that - whatever it might be. If someone wants to run a file-sharing program on the computer - well, no, don't do it because it opens us up to X Y and Z. That leaves them bored and frustrated. Or, don't go to that website, well but I want it, and like I said those are very glib answers and only cover certain cases where you are telling people don't do the thing that involves exposing us to problems.

A lot of the time the other IT stuff, the non-security related IT stuff tends to be helping people get their work done in a more or less immediately visible way. I can't get my e-mail or, here's how. I can't print, here's how. Checking mail this way sucks. Well let me take three months and get a good web mail program. The server went down for the third time today, okay; let me spend three months getting a better server and redundant servers and things like this.

Security hinders users

Security vs. Usability

IT helps users
### Stories from interviews

"...I do my own risk assessment for everything I've responsible for. Unfortunately in my opinion not enough people understand risk management."

"in my experience these are some of the things that can happen and these are some of the potential situations you'll have to deal with"

"The security coordinators take it to the data guardian and explain what the risks are."

### open codes

- Personal assessment of risk
- People do not understand risk management
- Explain security risks

### axial codes

- Different perceptions of risk

#### Memos: ideas, relationships

- The security coordinators take it to the data guardian and explain what the risks are."
recruitment

challenges

• overworked
• secrecy culture
• backstage

approaches

• professional contacts
• practical benefits
• gradual recruitment
• gatekeepers

“Hello... I’m sorry but I must decline this opportunity. We don’t discuss our security administration with anyone other than with the owners of the resources we’re securing.”

IT security manager who declined access to his department

34 interviews with 36 participants between July 2006 and March 2008
Industry Sectors

34 interviews

16 organizations

- Academic
- Finance
- Insurance
- Scientific services
- Manufacturing
- Retail/Wholesale
- Government Agency
- Telecommunications
- Non-for-profit Organization
- High-Tech
- IT Consulting

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Job Types

- **14** IT (with security tasks)
- **11** Security Specialist
- **5** Security Manager
- **5** IT Manager

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Analysis Themes

- tasks & tools
- IT security vs. general IT
- challenges
- interactions
- sub-optimal situations
- management model
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• project overview
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theme: tasks and tools

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André Gagné
Rodrigo Werlinger
David Botta
André Gagné
findings: no security admins!

- system analysts
- application analysts
- business analysts
- technical analysts
- system administrators

- application programmers
- auditors
- IT managers
- security leads
- network leads

```
... what makes me [a security] analyst is that I'm also involved in developing the policies and procedures ... an analyst is also someone who's doing a certain amount of troubleshooting and someone who's, I guess, a little bit more portable in terms of what their daily responsibilities are going to be like.
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study participant

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findings: loosely coordinated teams

“\[I\ have\ a\ security\ team\ that\ I\ work\ with.\ They\ don't\ report\ to\ me\ but\ I\ actually\ work\ with\ them\ and\ they\ sort\ of\ are\ represented\ by\ the\ different\ areas.\]"

study participant

So what?
security is secondary for those who manage it

"I have a security team that I work with. They don't report to me but I actually work with them and they sort of are represented by the different areas."

study participant
findings: main kinds of responsibilities

maintain
- firewalls
- legacy systems
- records
- ...

respond
- security incident
- patch cycle
- troubleshooting
- ...

design
- wireless access
- filter script
- application security architecture
- ...

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findings: activity chain

- Monitor
- Be notified
- Prioritize
- Use/create documentation
- Solicit information
- Search
- Analyze
- Correlate
- Verify
- Choose/deploy response
- Report

So what?
- interdependence of activities
- just-in-time decision making
findings: skills

- pattern recognition
- inferential analysis
- use of tacit knowledge
- bricolage

Dictionary: “construction or creation from a diverse range of available things”

Origin: mid 20th century: French, from bricoler ‘do odd jobs, repair.’

So what?
- finding gaps in tool support
- tool improvement
- new usability testing methods

for more information

theme: IT security vs. general IT

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André Gagné

Kasia Muldner
differences along five dimensions

- Scope
- Troubleshooting Complexity
- Usability vs. Security Tradeoff
- Fast-paced Environment
- Negative Stakeholder Perception
usability vs. security

security practitioners are constantly balancing usability and security

“I think it [security and general IT] is different because you have to balance the usability of the system [with its] security. You can have a foolproof security system but it's not going to be very usable... the most secure system is when it's turned off, and behind locked doors”

study participant
perception and environment

• perception by stakeholders
  • Security practitioners (SPs) are perceived in a less positive light by organizational stakeholders.

• fast-paced technological environment
  “IT is a fast changing field and security is even faster”
  • (Only) SPs have to contend with active and continuous threats.
need for broader scope

SPs need broader **internal** scope than general IT

“... you really need to be able to look quite wide and deep. You need to be able to look within the packet in a lot of detail to understand how an intrusion detection system works... And at the same time you need to take a wide look to an organization to be able to determine ... the risks.... And that differs from IT where other groups can really be focused in one particular area”

**study participant**

SPs need broader **external** scope than general IT

Legislation (e.g., Sarbanes Oxley)
For more information:

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so what?

• reduce troubleshooting complexity
  • Tools supporting distributed nature of IT security
  • Tools for making tacit knowledge explicit

• influence stakeholder perception
  • Via management buy in [Siegel et al. 2006]

• mitigate need for usability-vs-security tradeoff
  • Shift in design culture [Smetter & Grinter 2002]
  • Stakeholder involvement during design process [Flechais & Sasse 2007]
theme: challenges

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related work has studied challenges in isolation

Rodrigo Werlinger
Kirstie Hawkey
challenges: technological

• vulnerabilities

• system complexity
  • A typical network could have firewalls, DMZs, proxies, switches behind the firewall, routers in front of the firewalls, mail servers and not enough people to look after the overall security of these interconnected devices.

• mobile access
  • Mobile user access makes it challenging to secure resources.
challenges: human

- security culture
  - Poor security practices result in difficulties to implement security controls.

- training
  - SPs lack the necessary training

- communication
  - Difficulties for SP’s to communicate risks and security issues due to the lack of common view among stakeholders.
challenges: organizational

- **Risk Assessment**: Difficult to estimate IT security risks
- **Business Relationships**: Misaligned security policies make it challenging to enforce standards within an organization
- **Security Low Priority**: Security is not a priority for many stakeholders
- **Task Distribution**: Distribution of responsibilities was an issue: “the decentralized nature does not help”...
- **Open Environment**
- **Tight Schedules**
- **Data Access**
- **Budget**
theme: interactions

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Rodrigo Werlinger
Kirstie Hawkey
analyzed interactions

1. performing security audits
2. defining security requirements for new projects
3. solving end-user security issues
4. implementing security controls
5. training and educating other specialists
6. mitigating new vulnerabilities
7. developing security policies
8. responding to security incidents
interactions during incident response

- **Managers**
  - Coordinate next steps during the investigation
  - Ask SP to take action on alarms

- **External IT organizations**
  - ISPs/ICP administration
  - Monitor Internet
  - Provide security consultancy
  - Share security knowledge (community of practice)

- **Security practitioners (SP)**
  - Respond to security incident

- **IT specialists**
  - Administrate network or systems
  - Administrate data bases
  - Forward alarms

- **End-Users**
  - Experience security incident
  - Suspect of a security incident

- **Other Stakeholders**
  - Redefine product
  - Contact clients or end-users
  - Revise contracts with customers
so what?

• how integrate information from different communication channels
• how provide customizable account structure
• how adapt reports to the recipient

- R. Werlinger, K. Hawkey, K. Beznosov “Security practitioners in context: Their activities and collaborative interactions” presented at Work in Progress poster session of the ACM SIG CHI conference, April 5-10, 2008, Florence, Italy.
what we are busy with now

• how sub-optimal situations arise

• design guidelines

• tool evaluation framework
Opportunities for Future Research

• Creating testable models for validating and extending findings

• Transforming guidelines into concrete tool refinements

• Evaluating tools refinements given the complex and distributed nature of IT security
Selected Project Publications


