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► To cite this version:

Jörg Becker, Sara Hofmann, Michael Räckers. Coverage of eGovernment Security Issues in Mass Media. 10th Electronic Government (EGOV), Aug 2011, Delft, Netherlands. pp.296-307, 10.1007/978-3-642-22878-0_25 . hal-01589073

HAL Id: hal-01589073

<https://inria.hal.science/hal-01589073>

Submitted on 18 Sep 2017

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Coverage of eGovernment Security Issues in Mass Media

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Abstract. Public administrations have introduced eGovernment systems for many years. However, citizens' willingness to use these applications is still rather small. As proved by surveys, one major reason for this lacking acceptance is security concerns. In this paper, we investigate the role of mass media in this process of creating mistrust towards eGovernment. In doing so, we analyse three different newspapers concerning their way of reporting on IT risks and security issues in eGovernment systems using the method of content analysis. It shows that their news coverage is indeed quite biased and emotional possibly influencing the readers' attitudes towards eGovernment systems. Different media effect theories predict various models of affecting the recipients' stance, some of which are applied in our analysis. The outcome of this research is a set of assumptions stating in which way the communication of security issues in eGovernment systems in mass media influences the audience's attitudes.

Keywords: eGovernment, mass media, media effect theory, IT risks.

1 Introduction

The public administration has increasingly been providing its services in the internet for years. 'eGovernment' shall facilitate the administration processes. It promises advantages for both, the administration as well as the citizens. On the side of the public authorities cost savings should be achieved and media breaks are avoided leading to lean processes. The citizens on the other side shall benefit from a faster processing of their requests, a facilitated handing in of documents, availability of the administration twenty-four-seven, and the abolition of waiting time. Typical eGovernment systems are for example electronic population registers and voting machines. However, despite the advantages, citizens hardly use these offerings in the internet. According to a survey, only 6% actually make use of eGovernment services [1]. The decisive obstacles are security concerns.

Where does this objection come from? Are there certain prevailing reservations with regard to security issues and IT risks in eGovernment systems and if so how are they formed? There are several factors influencing the citizens' opinion on eGovernment. Besides personal experience also the public opinion, which is mainly published via mass media, plays a crucial role in creating trust or distrust towards

these systems. In which way does this published opinion affect the citizens' attitudes? This link between the presentation of IT risks in eGovernment systems and the population's concerns has hardly been investigated. Therefore the present work contributes to close this gap by analysing how security issues of eGovernment systems are presented in the media and by deducing impacts this presentation could have on people's attitudes. The research question of the present work is:

How are IT risks of eGovernment systems presented in mass media?

In order to answer this question, different media are analysed according to certain criteria. Renowned media effect theories are applied to these findings in order to derive assumptions on how the public is influenced by the media coverage in IT risks in eGovernment systems.

The paper is organised as follows. In section 2 we give an overview of the current literature on risks in information systems and the most important media effect theories which describe the influence media consumption has on the recipients. Based on this theoretical background, in the following section we derive our hypotheses to be tested and present the material which will be analysed. Section 4 and 5 contain the presentation of our results as well as their interpretations. In the final section we will draw some conclusions and point out at further research to generalise our findings.

2 Related Work

2.1 Risks in Information Systems

Even within the domain of IT security there is no unambiguous definition of risk. Often the literature does not explicitly distinguish between threats and the damage they cause, which are two main components of risks. The third important constituent of a risk is the probability of a possibly occurring damage. With regard to the research conducted, here the risk of a threat is perceived as the probability of an occurrence of damage and the amount of damage that might be caused by the threat [2].

Threats describe ways in which vulnerabilities can be exploited to cause damage. They can, for instance, arise due to programming mistakes or due to the user's ignorance of security configurations which for example allows for attacks of Trojan horses or worms. However, nowadays most of the security gaps can be exploited remotely. In 2008, more than 75% of the newly discovered vulnerabilities could be taken advantage of from afar [3].

Damage occurs when one or more protection objectives are derogated. These objectives aim at protecting information respectively data. They include the restriction of data access (integrity and confidentiality) and the exclusive permit for authorised users to access them (authenticity). Furthermore, it needs to be assured that authorised users can use the desired data (availability). After having accessed or modified the data it is often necessary to relate these actions to the user who has executed them (auditability or non-repudiation) [4].

The third constituent of a risk besides the threat and the damage caused is the probability of damage, i.e. the probability that a threat actually exists as well as the probability that this existing threat will cause harm. Both probabilities depend on several factors. First, the attacker's motives play an important role as they will influence the persistency; second factor is the sophistication of the attacks, third the vulnerability of the affected system largely codetermines the success of an attempted attack [5].

eGovernment systems can be regarded as a subgroup of general IT systems [6]. Besides the risks related to the damage of assets worthy of protection, Evangelidis et al. (2002) define four other main generic risk factors of eGovernment: technological/implementation, social/human, financial and legal risk factors. According to their understanding risk does not only mean the damage of the assets worthy of protection but comprises all elements that can lead to the failure of an eGovernment project. This might, for instance, also include the risk of the citizens' lacking acceptance of eGovernment systems due to privacy and security concerns.

2.2 Media Effect Theories

In order to draw conclusions in which way citizens are influenced by the coverage of IT risks in newspapers we resort to some of the most prominent media effect theories. However, the impact of media on the recipients' attitudes is discussed controversially. There is not one single theory but a multitude of explanation attempts. The assumptions of media effect on the recipient have changed in the course of time. Nowadays media impact research is acknowledged as a complex, multi-factorial process which cannot be described generally but which has to distinguish sub-models. The *stimulus-response approach*, which dates back to the 1920s, assumes that a media stimulus is fired at a defenceless individual and will exactly cause the effect that the sender intended [7]. This rather simple explanation of media influence is based on the assumption that the sender is not subject to other influences which provide information contradictory to the received message. The stimulus-response approach is mainly popular because of its simplicity. However, in today's media research its assumptions are seen as too unrealistic. Nevertheless most of the further approaches use the stimulus-response theory in an alleviated form.

According to the *two-step flow theory*, which was developed in the 1940s, it is not the media which affect the recipients but other people in their social environment, the so called "opinion leaders" [8]. The impact of media depends on conditions that lie in the social context, i.e. beyond the media. However, it is remarked that in industrialised societies everyone is exposed to media and their influence and thus the distinction between opinion leaders who consume media communication and the rest of the society that does not is untenable. Despite this criticism the two-step flow model is rather popular even today.

A significant finding in the late 1950s and early 1960s was that mass media do not cause a change of attitudes but rather enforce already existing opinions. According to the theory of *cognitive dissonance and selective exposure* individuals tend to actively look for information which support their beliefs [9]. Thus they will only consume those media offerings that accord with their opinion. This approach is nowadays

mainly applied in advertising campaigns, which cannot motivate the consumers to buy products but can serve as retrospective legitimization of purchase decisions.

In 1970, the theory of the *knowledge gap* was developed, which stated that the knowledge communicated by media is used differently by different parts of the population. “[S]egments of the population with higher socioeconomic status tend to acquire this information at a faster rate than the lower status segments, so that the gap in knowledge between these segments tends to increase rather than decrease.” [10] The effect is not caused by the medium itself but by a consumer’s socio-economic status. The knowledge gap theory is nowadays often applied in connection with the proliferation of the internet, e.g. in the field of eInclusion [11].

Shortly after the emergence of the knowledge gap model, the so called *agenda setting* approach was introduced. It does not deal with the question whether media influence *what* people think about certain topics but *which* topics they think about [12]. Accordingly, those topics that are ranked highly in media presentation are also regarded as important by the recipients. However, it is not clear whether certain topics are important for the recipients because media report on them or whether media merely pick up common topics in order to address the wishes of their target groups.

The assumption of the *spiral of silence* theory, which was set up in the 1970s, is that people are anxious to avoid social isolation [13]. Individuals observe their environment through their direct social context and indirectly via mass media. Whereas the former conveys to them which opinions cause isolation in public, mass media draw a picture of the assumed majority opinion. According to the spiral of silence theory, people tend to conceal their opinion when it differs from the assumed majority opinion due to the fear of social isolation. People who believe to represent the majority opinion, on the contrary, are likely to express their opinion openly. This behaviour will lead to a spiral in which finally the opinion assessed as dominant becomes the actually dominant opinion.

Even though the above mentioned media effect theories differ with regard to their conclusions they are all subject to the same arguments of criticism. First of all there is no general procedure how to ‘measure’ the effect of media. There is no scale to categorise attitudes or behaviour. A second point of criticism is that there are no long-term studies which analyse how media affect a recipient’s attitudes. The conducted studies were all laboratory experiments creating an artificial situation. In addition the number of probands was very small so that no significant results were obtained.

Due to this plethora of media theories, which in parts proclaim complete opposites, it is difficult to draw substantiated conclusions. Media certainly have effects on their audience but can explain changes in attitudes and behaviour only to a certain extent. Media effects are just possible when the boundary conditions allow for them.

A further theory that has to be considered is the news value theory stating that to every event a certain news value is assigned, which represents its worthiness of publication. News values are derived from combining several characteristics like simplification and sensationalism. This means, for instance, that complex events are presented in a simplified way and that there are more reports on dramatic and scandalising events because they draw the readers’ attention more intensely [14].

3 Research Methodology

In the research conducted here the communication of IT risks of eGovernment systems in mass media was analysed based on the theoretical considerations addressed in the previous sections. eGovernment is a rather young application area of information systems. However, it affects the matters of all citizens. Especially the connection between the application of eGovernment systems and the population's concerns has hardly been investigated. The contribution of the present work is to close this gap by analysing how risks of eGovernment systems are presented in the media and by deducing impacts this media coverage could have on people's attitudes. The underlying research question is:

How are IT risks of eGovernment systems presented in mass media?

In the following this research question will be transformed into a catalogue of hypotheses, which were at first derived from the theoretical foundation presented in the previous sections and were later on complemented by a first review of the material to be analysed. We divided our hypotheses into the four categories *triggers of articles*, *topics of articles*, *assessment of risks*, and *quality newspapers and tabloids*. As it is difficult to obtain television or broadcast material ex post only print media were included in the investigation.

Triggers of articles:

As with most topics newspapers mainly deal with IT risks in eGovernment systems when there are events that 'trigger' the reporting. On the one hand, these triggers can be 'neutral' or 'positive' events as in the case of the introduction of a new eGovernment system. On the other hand, these events can be 'negative' as in the case of an attack on a system. According to the news value theory shocking events are more worthy of publication. Thus, it may be assumed that in newspaper articles IT risks in eGovernment systems are mainly linked to 'negative' events.

Hypothesis 1: Newspapers do not report on risks in eGovernment systems continuously over time but especially when specific negative events happen, i.e. for instance when attacks occur.

Topics of articles:

What are the topics of articles dealing with IT risks in eGovernment? Are there specific topics that newspapers put an emphasis on and are there in return certain topics that are neglected? According to the above mentioned news value theory it is likely that a negative event is the key issue of an article on IT risks. When describing IT risks is there a balanced description of disadvantages and advantages of eGovernment systems?

Hypothesis 2: The key issues of articles dealing with risks in eGovernment systems are specific events of damage.

Hypothesis 3: In articles dealing with risks in eGovernment systems the advantages of such systems are neglected.

Assessment of risks:

How do newspapers assess IT risks in eGovernment systems? Is there a clear tendency in the assessment or does the assessment vary depending on the circumstances? Because of its very nature – eGovernment systems often deal with sensitive data of the entire population – it might be that risks are always judged as serious independently of the circumstances. This assessment could be emphasised by the use of polemic language and by a non-objective reporting.

Hypothesis 4: Risks in eGovernment systems are in most cases presented as high, i.e. either the probability or the amount of damage or both are judged as high.

Quality newspapers and tabloids:

In which way does the reporting in quality newspapers and tabloids differ? Tabloids are renowned for reducing events to entertaining elements, exaggerating and using colloquial polemic language [15]. Therefore it is likely that all assumptions of the hypotheses 1-4 hold even more strongly in tabloids.

Hypothesis 5: In tabloids all criteria mentioned in the hypotheses 1-4 are intensified in contrast to quality newspapers.

The sampling units are issues of *Süddeutsche Zeitung (SZ)*, *Frankfurter Allgemeine Zeitung (FAZ)*, and *BILD*; all of them are newspapers that are published in Germany. With 442,000 issues sold the *Süddeutsche Zeitung* is the nationwide newspaper with the highest circulation. Its political positioning is considered as liberal [16]. The second largest nationwide newspaper is the *Frankfurter Allgemeine Zeitung* with about 365,000 issues sold daily. As its political positioning is regarded as rather conservative [17] the *FAZ* and the *SZ* represent opposite editorial directions and thus cover the spectrum of journalistic positioning concerning controversial topics. With a circulation of about 3.03 million issued sold daily and more than 12 million readers [15] the *BILD* is the most read newspaper in Germany. It reaches about 20% of the German population. It is characterised by emotional and selective reporting and offers a composition of facts, service elements (like weather forecast or television programme), sports and entertainment including sex and crime.

The investigated time period is 1st January, 2008 to 31st December, 2009. It did not seem logical to analyse material that dates back many years because eGovernment is a rather new development. Practical reasons for this time span were that the investigated media were fully available. The sample was determined in two steps: Firstly, all articles whose title or subtitle contained certain keywords as well as their truncated forms were chosen (the English translation of these keywords can be found in Table 1). These keywords were derived from theoretical considerations on IT risks and by scanning exemplary issues of the *Süddeutsche Zeitung*. The *Süddeutsche Zeitung* and the *Frankfurter Allgemeine Zeitung* could be scanned electronically. The *BILD* had to be scanned manually. In the second step all the articles that were found were read and it was checked whether they dealt with IT risks in eGovernment even if just marginally.

Table 1. Keywords used in article research.

administration	criminal	hacker	net	spy out
attack	damage	hardware	non-repudiation	state
authentication	danger	information	online	threat
authorisation	data	integrity	password	Trojan
availability	denial	internet	PC	virus
brute force	eavesdropping	IT	phishing	voting
buffer	Elster (electronic	key logger	risk	weakness
computer	tax revenue portal)	LAN	social engineering	web
confidentiality	government	malfunction	software	worm

For analysing how newspapers report on eGovernment risks, we applied the content analysis to our sample. Content analysis is an empirical methods often used in social science in order to analyse both the manifest as well as the latent content of communication. Therefore categories are developed in which the material to be analysed is coded. For further information cf. [18] and [19].

4 Presentation of Results

For presenting the results of the research conducted we aggregated the outcomes of the coding phase. In the period from January 1st, 2008, to December 31st, 2009, altogether 79 articles were identified that specifically deal with IT risks in eGovernment systems. The *Frankfurter Allgemeine Zeitung* published 31 articles (39.2 %), the *Süddeutsche Zeitung* 27 articles (34.2%) and the *BILD* 21 (26.6%).

Triggers of articles:

77 of the 79 articles, which are 97.5%, refer to a specific event that happened in that time. Only two articles did not refer to such an event. An event is regarded as negative if a protection objective is directly threatened or harmed. 42 (54.5%) of the current events the articles referred to could directly be classified as negative. In the remaining 35 articles (45.5%), which mentioned an event, this event was not immediately assessed as negative. Thus, this hypothesis cannot be verified at first sight. However, most of the non-negative incidents indirectly base on a negative event. The court decisions on voting machines, for instance, only took place as these machines were said to be insecure. Thus, when including these ‘second-order’ negative events, 72 articles, which is 93.5%, refer to negative events, and only five articles base on non-negative ones (these are articles that were triggered by upcoming or happened elections). Taking that perspective, hypothesis 1 can be considered as verified.

Topics of articles:

The key topics of the 79 articles, which mention IT risks in eGovernment systems, vary significantly (cf. Table 2). We identified 21 categories of main topics. The key issues of 47 of the 79 articles (59.5%) are specific events of damage like attacks on government websites, the loss and theft of computers or the exposure of sensitive data. The remaining 32 articles (40.5%) do not mainly deal with such specific events. Although the results are not unambiguous there is a clear tendency and hypothesis 2 can thus be verified. 42 of the articles contain a further sub-topic. When including these ‘second-order’ events of damage, 62 articles (78.5%) deal with specific incidents of damage and only 17 articles (21.5%) do not discuss such incidents in detail.

Table 2. Distribution of the ten most frequent key issues.

Frequency	Key issue	Specific event of damage
10	Reflections on (un)constitutionality of voting machines	No
9	Attack on government website/computer	Yes
8	Loss of sensitive data/computers/peripheral devices/other self-inflicted mishaps	Yes
6	Theft of computers from authorities	Yes
5	Attack on enterprise (website/server/computer) or NGO	Yes
4	Exposure of sensitive data	Yes
4	Attack on/theft of military data	Yes
4	Cyberwar	No
4	Malfunction of eGovernment software/hardware	Yes
4	Functionality of voting machines	No
21	Other	

Merely in 11 articles (13.9%) the advantages of the mentioned eGovernment system respectively the use of the discussed devices were mentioned. The ratio of the sentences which discuss these advantages and the sentences which address IT risks is 0.43 on average. This means the articles (and only those which mention advantages at all) discuss IT risks of eGovernment systems about 2.3 times more ‘intensely’ than their advantages. In addition the positive assessment of the mentioned advantages is generally weak. None of the advantages is characterised as ‘high’. Four of the 11 articles describe the advantages in a way that can be characterised as ‘medium’, three see the advantages as ‘low’ and the remaining four articles present advantages without any comment or describe them in a way which neutralises any positive assessment. Based on the findings, it can be concluded that advantages of

eGovernment systems do not play an important role in articles that mention IT risks in such systems. Therefore hypothesis 3 is verified.

Assessment of risks:

In 32 articles the probability of damage or the amount of damage (or both) are presented as high (40.5%). 18 articles (22.8%) assess them as medium, 6 articles (7.6%) present risks as low and the remaining 23 (29.1%) do not assess them or neutralise the assessment by counterarguments. Thus, there is a clear tendency to assess risks as elevated. However, the majority of articles do not present risks as particularly high. Therefore hypothesis 4 can be verified partly, but not without reservation. Even though not being the majority, 40% of the articles assessing risks as high still represent a considerable amount of articles.

Quality newspapers and tabloids:

For identifying differences between quality newspapers and tabloids, the results of hypotheses 1-4 were contrasted for both media types, i.e. on the hand the *Süddeutsche Zeitung* and the *Frankfurter Allgemeine Zeitung* and on the other hand the *BILD*. Hypothesis 1 held for tabloids at least in the same way as for quality newspapers. The assumptions of hypotheses 2 and 3 were significantly intensified in tabloids. The statement of hypothesis 4 was not intensified in tabloids. However, in general, it can be said that tabloids intensify most of the hypotheses.

5 Interpretation

First of all, it is striking that newspapers report on IT risk and security issues in eGovernment systems relatively infrequently. Only 79 articles of three different newspapers deal with this topic within a period of two years. Thus, it can be concluded that this topic does not play a very important role for the citizens respectively the readers of the newspapers. When taking into account the *agenda setting* approach, which argues that the topics discussed in media determine the 'agenda' of the recipients, it can be concluded that IT risks in eGovernment systems are not a topic the recipients are strongly aware of.

As people are not interested in the risks of eGovernment systems it is likely that they are not interested in eGovernment systems at all, which has also been proved by several surveys [1]. The low relevance of IT risks in eGovernment in the media is also reflected in the temporal distribution of the articles. Newspapers only publish articles when specific events happen. Thus, in general this topic is not discussed.

The underlying events of the articles are in most cases incidents which can be assessed as negative and if that is not the case they often have a negative context (e.g. the declaration of a data commissioner is based on the loss of sensitive data). In accordance with the *stimulus-response* model, which assumes a direct media effect, the readers of such articles are more likely to automatically link risks in eGovernment to negative incidents than in the case of continuous reporting on such IT risks or when discussing them in connection with non-negative events. Advantages, which would have moderated the negative presentation of eGovernment systems, are hardly

mentioned in articles on IT risks. Thus, an objective reporting on this topic, which contrasts risks and advantages, does not take place.

A media effect theory which can give hints to the different effects of tabloids and quality newspapers on consumers is the *knowledge gap* hypothesis. It states that the levels of knowledge of higher educated and of lower educated parts of society will further differentiate as the former are able to process information more quickly and will therefore create new knowledge more easily. This effect could be further intensified by the different levels of detail in objective reporting on IT risks in eGovernment (or on any topic in general) of quality newspapers and tabloids. Quality newspapers, which mainly address people with a higher degree of education, inform about these IT risks and especially the threats or security issues in a more detailed and objective way than tabloids. Hence, the readers are offered more background knowledge. This broader information content increases the knowledge of readers of quality newspapers more strongly than readers of tabloids, which provide less information on the actual incidents. Hence, the knowledge gap between people with a higher degree of education and people with a lower one might increase due to the different styles of reporting.

Although it could not be verified that newspapers assess the IT risks of eGovernment systems as high, in most cases there is a clear tendency to do so. This is achieved by both explicit arguments and a polemic choice of words. If again a *stimulus-response* effect is assumed the recipients of newspapers will adopt the idea of eGovernment systems representing high risks. This might explain why such systems are not used.

It is striking that tabloids, which are known for their polemic communication, do not assess IT risks as especially negative. However, this might be due to the fact that there are many articles of the journalistic form 'news', which report in a short and objective way leaving out assessing expressions [20]. Nevertheless, the mere mention of events without referring to possible consequences or explaining limitations of the amount of damage allows for readers' interpretations. This 'non-mentioning' of further details can therefore create more negative associations from the readers' point of view than a more detailed reporting would have done. Again, the neglected coverage on IT risks in eGovernment systems shows the low importance that is assigned to this topic by the *BILD* and – according to the *agenda setting* approach – also by its readers. Apparently, IT risks in eGovernment systems do not possess a high *news value* as they are hardly included in people's personal experiences and therefore remain vague and abstract.

Moreover, as mentioned above, the most decisive obstacle for citizens to use eGovernment applications are security concerns. If a generally existing fear concerning data security and privacy is assumed, the *cognitive dissonance* respectively *selective exposure* hypothesis would imply that these citizens would consume those articles which confirm their opinion and even intensify it. Another aspect of the *cognitive dissonance* and *selective exposure* theory explains that people try to get their actions confirmed by consuming those messages that attest them a right behaviour. It is likely that this is the case with IT risks in mass media, too. When people do not want to use eGovernment systems because of security concerns and they later on read about incidents in these systems they will get confirmed that it was sensible not to use them.

Another theory leading to a negative attitude towards eGovernment systems due to the media coverage of IT risks is the *spiral of silence*. As media report on IT risks in eGovernment systems rather negatively, a dismissive attitude towards eGovernment systems will be assumed to be prevailing. Critics of eGovernment systems might further contribute to this negative attitude whereas supporters of such systems might fear to express their opinion openly. Therefore, the negative attitude towards eGovernment systems might finally become the prevailing one.

6 Conclusions and Further Research

In conclusion, it can be stated that the presentation of IT risks in eGovernment does not play a very important role in media coverage – but for users of eGovernment-Services, i.e. the citizens [21]. If, however, newspapers present this topic they will assess it in a rather negative way. This is achieved – not necessarily intentionally – by discussing IT risks in eGovernment systems mostly when negative incidents occur. Furthermore, the key issues of such articles are in most cases a negative event. Advantages of the discussed systems are rarely mentioned and in the cases they are, they are assessed as rather marginal. However, this is limited to the scope of the investigation, mass media in Germany.

Generally, all media effect theories assert that the negative reporting on IT risks in eGovernment has an impact on the audience. However, according to the assumed media effect model these impacts vary significantly. In accordance with the *stimulus-response* model the recipients of such negative reporting are directly influenced and also form a negative attitude towards eGovernment systems. Less drastic influences are, for instance, suggested by the *cognitive dissonance* or *selective exposure* theory, which merely assume the fortification of already existing attitudes. This approach asserts furthermore that citizens who did not use eGovernment applications get confirmed that they decided correctly when later on reading articles on IT risks in eGovernment systems. The *spiral of silence* approach states that the opinion which is assumed to be prevailing – in this case a negative attitude as communicated by the media – will also become the actual dominant opinion. Another point of view is taken by the *knowledge gap* hypothesis, which assumes that due to the differing levels of detail in media which address people with a higher degree of education on the one side and media addressing people with a lower degree of education on the other side, the discrepancy of knowledge between these two social groups is intensified.

However, the conclusions presented here are only assumptions which were derived from applying media effect theories to the findings of the analysed material. Therefore, the next step would be to check these assumptions empirically. This could be achieved by carrying out an experiment where the actual effect of different newspaper articles on the readers is investigated or by an enquiry. These results could, for instance, be used for public administrations promoting eGovernment systems more effectively. In order to analyse a broader data base and to generalise our findings, it would be sensible to extend our research to IT systems in general and not to limit ourselves to eGovernment systems. Another aspect arising for further research is the change of the coverage of IT-Risks through the use of social media and social networking sites like Facebook and others. This definitely will have an effect on the

cosume of news and stories and actually additionally leads to a change in the mass media landscape. Both effects of change have to be investigated in the future.

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