# Symmetry in Social Construction during ERP Implementation: A Systems Security Perspective

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**ABSTRACT**

*The principle of symmetry* in enterprise resource planning (ERP) systems implementation holds that the researcher should deploy impartial explanation in cases of success as in cases of failure. This article examines the symmetry intrinsic in social construction within the various stages of the ERP development life cycle, from initiation to implementation. Discourse on symmetry focuses on whether social constructs are able to influence ERP implementation positively (success) or negatively (failure) and whether this exposes ERP systems to information security risk. The theoretical lens of social construction of technology (SCOT) theory, a theory premised on social interaction between agents and technology artefacts, is applied for this purpose. The research was quantitative with a survey having been conducted on information technology (IT) and information security (IS) practitioners. Results of the study highlight the significant role social construction plays because of the direct linkage it has with the implementation of information security controls in ERP systems. The research delineated five social constructs, namely positional influence, reward influence, coercive influence, expert influence and referent influence. For purposes of this research and on the sampling criteria applied, the construct 'expert influence', a typology of social construction, is shown to be more domineering than other typologies of social construction and is seen as providing symmetrical balance between governing ERP security (success) and risk (failure). Implications of these results for theory and practice are discussed in the main article.

## 1. Introduction

*The principle of symmetry* in enterprise resource planning (ERP) systems implementation holds that the researcher should deploy impartial explanation in cases of success as in cases of failure. Often, research in the discipline of information systems addresses the notion that there are many competing theories regarding success and failure of information technology (IT) projects such as ERP implementation. These competing theories have the potential to provide different explanations. This article adopts a social constructivist stance and focuses specifically on the sociological factors that ostensibly tip the balance between implementation outcomes and ERP success or failure. The argument proposed is that sociological factors are capable of providing the necessary symmetry intrinsic in the ERP implementation process. The balance or imbalance of this symmetry could consequently lead to success or failure of ERP systems. Of equal concern to this argument is that consequences of a skewed symmetry (imbalance) brought about by sociological factors during ERP implementation have consequences that impact on ERP information security.

This is the reason why researchers and particularly information security (IS) researchers should pay attention to the sociological factors in ERP implementation that have a bearing on ERP information security risk. Social constructivists would argue that the occurrence of problems of ERP failure or success is governed by sociological factors, meaning that the *principle of symmetry* grows in relevance to what otherwise may be perceived as technical problems.

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## 2. ERP Implementation and Security Concerns

The underlying interest regarding the implementation of security control in ERP systems at the implementation stage is that the implementation process and outcomes have often differed from one organisation to the next. This has created scenarios where security controls of similar ERP systems have varied across organisations. The primary differentiator amongst various ERP implementation projects has been based on the kind of social interaction (the influence of social agents) demonstrated amongst project team members (Marnewick and Labuschagne, 2005). Of importance to information security practitioners are firstly social construction, seen as the overarching variable in social interactions that induce variations in ERP implementation projects, and secondly, ERP implementation in ERP information systems security.

While the study of social construction and behavioural outcomes of social agents remains an inherently exciting domain within the cognitive sciences, the article extends its benefit to ERP information systems security. This is significant considering that many research studies indicate that the success of ERP implementation projects is impacted by social aspects (Doherty and Fulford, 2005).

Social construction of technology (SCOT) theory (Bijker, Hughes, and Pinch 1987) is the theoretical lens applied in this research on the conceptualisation of the interaction by security practitioners during ERP implementation. Various constructs that pertain to social interaction are explored. The discourse determines the nature of social constructs which possibly provide symmetry for the adoption of security controls during ERP implementation. The result is aimed at giving a basis for and the development of a generic framework for understanding and managing social construction, which in turn would lessen the burden of information security risk exposure on ERP systems. The main research questions are therefore outlined as follows:

- Does social construction provide the required symmetry in ERP implementation?
- Can an imbalance in this symmetry affect ERP information security?

In trying to answer and discuss the context and the question raised, this article is divided into six sections. Section 1 has introduced and established the context for the key theme. Section 2 is a literature review on ERP systems security. Section 3 deals with the socio-organisational context and social exchange theory is used as a lens. A framework is proposed for analysing the effects of power, dependency and exchange relations towards ERP system security. The penultimate sections (4 and 5) introduce the methodology and the empirical results are discussed, while Section 6 concludes the article.

## 3. ERP Implementation

### 3.1 Definitions of ERP Systems

According to Sprecher (1999), an ERP system can be defined as "*a software solution that addresses the enterprise needs of an organisation, taking the process view to meet organisational goals by tightly integrating all corporate functions".* ERP systems are expressly designed to tightly integrate business processes across organisations.

ERP systems are also seen as being transformational in nature. They transform how functions are done in the organisation and people's roles, and integrate business processes and different departments. These changes impact the organisation's management model, structure, style, culture and people within the organisation (Whitman, and Mattord, 2003). Various studies show that without proper buy-in and consultation, change agents often resist this aspect of ERP implementation due to perceived role changes (Whitman, and Mattord, 2003). This often makes certain stakeholders resistant to change, which is revealed during social interaction. During ERP implementation, organisations usually undergo enormous changes that results in shifts in business design (Davenport, 1998; Miranda, 1999). Due to the transformational nature of ERP systems, the ERP implementation process not only impacts the IT department but in many instances also affects the entire organisation. ERP systems touch every aspect of the operations of an organisation that also include constituent groupings both inside and outside the organisation. This means that ERP implementation can be viewed as an organisational change process, rather than just a replacement of a piece of technology. It is for this reason that the ERP implementation process will often involve and constitute a considerable number of social agents across the entire organisation. These social agents that include information security practitioners therefore interact in such a manner as to safeguard interests pertaining to their duties and designations in the organisational change process. Each social change agent's interest often takes cognisance of their own understanding of suitability, design, functionality and control measures of the ERP system at various stages of ERP implementation. This interest and consideration is exemplified in **Table I**.

TABLE I: STAGES OF ERP IMPLEMENTATION

| **STAGE 1** Project preparation | **STAGE 2** Business blueprint | **STAGE 3** Realisation | **STAGE 4** Final preparation | **STAGE 5** Go live and support |
|---|---|---|---|---|
| Gain an understanding of the implementation process | Facilitate control identification workshops (discussions) | Assess configuration of automated controls for ERP | Monitor progress and report impact of remediation efforts | Deploy processes and tools that support continuous compliance |
| Review business case and assess alignment with the business strategy | Ensure that practical, testable and measurable control points are included in the blueprint | Review security implementation in ERP | Confirm that users are trained regarding their control responsibilities | Review the effectiveness of the control and security environment |
| Review project plan to understand project milestones and control checkpoints | Review external interface controls | Assess whether manual process controls have been documented | Review testing processes and results | Perform post go live review nod evaluate attainment of business case objectives |

**Table I** alludes to the different social change agents' interests and concerns across different stages of ERP implementation. This table refers to the ERP implementation stages that are part of the SAP's ASAP implementation methodology.

**3.2 Security Issues in ERP Implementation**

IBM Global Business Services (2007) acknowledges that many ERP implementations share common gaps that result in security risks which are subsequently identified as audit findings. Such risks include

> *i) the use of unmasked production data in development and/or test areas, ii) failure to identify business controls in the requirements and design resulting to re-work, iii) failure to identify and incorporate required IT security controls, iv) failure to identify and manage segregation of duties risks, v) inadvertent exposure to business sensitive information (e.g. user credit cards) and; vi) failure to manage privileged user access and default system user accounts (e.g. SAP_ALL).*

It is therefore of paramount importance that assurance of controls, data security and privacy be coupled with the design phase of the development life cycle of the ERP systems (Von Solms and Von Solms 2004). Von Solms and Von Solms (2004) also suggest that organisations should develop security strategies and policies that determine the manner in which administrative aspects of information security within ERP systems are managed. This, they note, is especially important during ERP implementation.

*3.2.1 Threats and Vulnerabilities in ERP Systems*

ERP systems integrate all data from different functions and departments in an organisation onto a single database. This means that security threats and vulnerabilities in one area impact the entire organisation. ERP security threats and vulnerabilities include theft, data tampering, information extortion, espionage, trespassing, human error and human failure (Turban, McClean, and Wetherbe, *et al.* 2002; Stair, and Reynolds, 2008). The fact that ERP systems also allow an organisation to integrate its own internal systems with external trusted partners' systems introduces new entry points and therefore external threats and vulnerabilities to business systems (Turban *et al.,* 2002).

*3.2.2 Controls in ERP Systems*

For ERP systems to mitigate against internal and external threats and vulnerabilities, proper controls must be put in place during the ERP implementation process. According to Turban *et al.* (2002), controls protect ERP systems against theft, data tampering, information extortion, espionage, trespassing, human error and human failure. Security policies must also be defined and the implementation of controls must be monitored during ERP implementations to ensure that practitioners actually adhere to and configure systems according to stipulated policies.

Hendrawirawan *et al.* (2007) state that sometimes controls are not implemented during ERP implementations because these are inherently complex. Besides the complexity of ERP systems control, empirical research suggests that other factors equally determine the level of security controls and attention to be given during ERP implementations (Hendrawirawan *et al.,* 2007). Several factors have been cited, such as the project running behind schedule, budget spillover and inadequate skills needed to implement information security controls.

## 4. Social Construction

Social constructionism perceives human interaction as consisting of social and interpersonal influences and includes shared social aspects of all that is psychosomatic (Gergen, 1985). Social constructionism regards human interaction as integral to environmental facets that are context and time specific and sees such interactions as *necessary* in creating, maintaining and/or destroying environmental facets (Owen, 1991). Baskerville (2005) has noted that organisations have usually concentrated more on the technical side of security and do not pay enough attention to social construction which plays a significant part in technology deployment and use (such as ERP implementation). A number of researchers are of the opinion that social construction is more critical to the success of technical projects (Alvarez and Urla, 2002). Empirical study (Markus, Tanis, and Van Fenema, 2000) reveals that many problems with ERP implementation are related to a misfit of the ERP system.

Research in the discipline of information systems security is increasingly on the role of social construction in information security policy development and uptake by social agents (Doherty and Fulford, 2005). O'Kane (2004) has pointed out that the focus during ERP implementations should shift from the "hard" elements to the "soft" socio-organisational issues that are human-centric, such as social interaction. Bijker, Hughes and Pinch (1987) have consequently formulated the SCOT theory.

### 4.1 SCOT Theory and ERP Implementation

The SCOT theory argues that social constructive factors have to be taken into account when technology is developed and deployed (Elle, Dammann, Lentsch, and Hansen, 2010). Advocates of SCOT, typically social constructivists, argue that technology does not regulate human action, but rather that human action shapes technology (Elle *et al.,* 2010). SCOT is seen as a rebuttal to technological constructivism (determinism). Technological constructivism as highlighted by Carlisle and Manning (1999) states the following ideas:

- that the development of technology is progressive, predictable, traceable and largely beyond social influences, and
- that technology has inherent effects, with a natural ceiling imposed by the laws of nature.

Social constructivists (Shapiro and Baker, 2001) have argued that how technology is used can only be understood by firstly understanding its social context. Contrary to technology determinism, SCOT argues the following:

- that human beings have always shaped technology and that the relevant social groups decide whether a technology is considered "workable" or not (Elle *et al.,* 2010); and
- that human beings make choices regarding present and emerging future technologies (Elle *et al.,* 2010).

SCOT would therefore hold that in the quest for understanding ERP implementation success or failure, the answer lies within the interactions of the social world. This is an especially significant revelation in ERP implementation and has resulted in a paradigm shift regarding technology implementations.

### 4.2 Social Constructivism and Influence on Information Security

Issues surrounding ERP and information systems security can be managed more effectively as long as there is an emphasis on social constructivism (Baskerville, 2005; Stair and Reynolds, 2008; Dhillon and Backhouse, 2001). Ein-Dor and Segev (1982) have expressed the opinion that the key to information and ERP security does not lie with technology but with people. Trompeter and Eloff (2001) concur with this argument and propose that although addressing information security at a technical level is important, "*the implementation must also take cognizance of …human considerations*". The social constructivist view on human interaction is that the interaction can only be understood within its overall social context. According to Trompeter and Eloff (2001), technology by itself is not capable of fixing all security issues. For technology to be effective in providing security, it has to be implemented and used by people effectively. This means that information security is "*not a technology issue, it is a people issue*" (Turban *et al.,* 2002).

The idea of influence within the interaction process is espoused as follows: In social interactions, "*Any individual is regarded as being influenced by the people around them, much more than by their own traits"* (Owen, 1991). Social influence is seen as a "*change in the belief, attitude, or behavior of a person (the target of influence), which results from the action of another person (an influencing agent)*". Usually it is the people who are close to or known to the target of influence that readily influence such a target by "*providing ready definitions and assumptions, along with tautological evidence that things are truly as they are*" (Owen, 1991).

*4.2.1 Positional influence*

Also known as legitimate influence, an influencing agent has the right to prescribe and influence direct control over other team members by virtue of his/her position or designation. At times, this influence is negatively related to leader effectiveness (Raven, 2008).

*4.2.2 Reward influence*

Studies have noted that reward may act as a motivator for influencing action (DeTienne, Dyer, Hoopes, and Harris, 2004). This sort of influence depends on the ability of the influencing agent to confer/give valued material rewards or incentives. Raven (2008) notes that personal approval by the influencing agent to whom the target of influence really esteems may result in reward influence.

*4.2.3 Coercive influence*

Coercive influence refers to the application of negative influences and can be manifested when an influencing agent has the ability to inflict punishment, for instance demotion or withholding other rewards.

*4.2.4 Expert influence*

The source of expert influence dwells primarily on valued skill, knowledge, experience, or judgement that the target of influence might feel they do not possess when compared with the agent of influence. This sort of influence is characterised in areas where these skills are deficient and is highly specific and limited to areas where the agent of influence has solid training.

*4.2.5 Referent influence*

This sort of influence attracts others with the aim of building loyalty and is derived from the charm, charisma and interpersonal skills of the agent of influence. Opportunities for interpersonal skills are strengthened and nurtured, and often subordinates aspire to and emulate this.

**4.3 The Constructs**

Based on the previous discussions, SCOT identifies *influence* as the independent variable which in turn shapes how ERP systems are implemented. The independent variables that were tested against SCOT in this research are:

1. Positional influence (PosInf)
2. Reward influence (RewInf)
3. Coercive influence (CoInf)
4. Expert influence (ExInf)
5. Referent influence (RefInf)

## 5. Framework

Based on the discussions in the previous section, the following framework is proposed that exemplifies influence interaction and the effect this has on ERP implementation. This framework is illustrated in **Figure I** below.

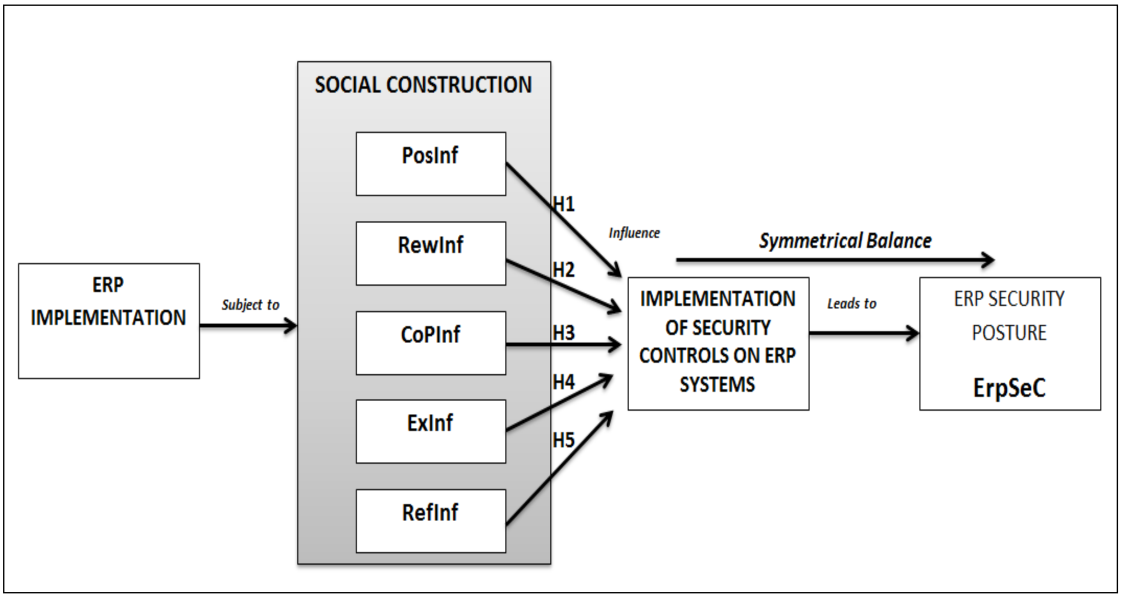


**Figure I.** *Social construction of ERP systems and exposure to information security risk*

The model depicts typologies of influence as independent variables and ERP security posture (**ErpSeC**) is the dependent variable. Based on the framework above, the following hypotheses were deduced:

- HI: *Positional Influence* (PosInf), a social construction mechanism, will provide the required symmetry in ERP implementation.
- H2: *Reward Influence* (RewInf), a social construction mechanism, will provide the required symmetry in ERP implementation.
- H3: *Coercive Influence* (CoInf), a social construction mechanism, will provide the required symmetry in ERP implementation.
- H4: *Expert Influencer* (ExInf), a social construction mechanism, will provide the required symmetry in ERP implementation.
- H5: *Referent Influence* (RefInf), a social construction mechanism, will provide the required symmetry in ERP implementation.

The research work therefore set out to test the above hypotheses regarding the ERP implementation process. The next section outlines the methodology and methods used to test the above hypotheses.

## 6. Methodology

The research involved the use of a survey as the research method. Remenyi, Williams, Money and Swartz (2005) define a survey as "… *the collection of a large quantity of evidence usually numeric, or evidence that will be converted to numbers, normally by means of a questionnaire*". The main objective of the use of a survey was to collect specific facts and estimates from a sample of respondents, to enable the researcher to make accurate predictions about relationships between the factors underlying the study.

According to Hussey and Hussey (1997), various units of analysis may be used. The unit of analysis used in this research was the body of IS and IT practitioners who are individuals involved in ERP implementations. Hussey and Hussey (1997) describe a body of individuals as a group of people and organisations, for example a working group or a department.

### 6.1 Data Analysis

Based on the responses obtained from the questionnaires received, data analysis was conducted. This process involved making sense of the responses from the questionnaires and was confined within the constraints of the underlying research problem and objectives. Data analysis was done by using SPSS, a statistical software that utilises syntax of mathematical processes to help researchers make sense of collected data.

**6.2 Reliability Analysis**
According to Foster (1998), whenever data analysis is conducted, it is imperative that reliability and validity of the measurement instrument be evaluated. There are various ways of assessing reliability of a scale such as *internal consistency* methods. These methods focus on measuring the consistency of respondents' answers to questions that relate to an underlying construct or scale.

The internal consistency methods are further divided into average inter-item correlation, average inter-total correlation, split-half correlations, Cronbach's alpha and the Kuder-Richardson coefficient (De Vaus, 2002). This study utilised internal consistency prescribed by the Cronbach's alpha method. The rules of Cronbach's alpha dictate that the measurement instrument can only be reliable with positive values of 0.7 or more. **Table II** presents summarised results for the reliability analysis of all five constructs.

TABLE II : RELIABILITY

| **Reliability Statistics** | | |
|---|---|---|
| **Construct** | **Cronbach's Alpha** | **Number of Items** |
| *Positional Influence* (PosInf) | .955 | 5 |
| *Reward Influence* (RewInf) | .976 | 4 |
| *Coercive Influence* (CoInf) | .994 | 4 |
| *Expert Influence* (ExInf) | .765 | 5 |
| *Referent Influence* (RefInf) | .874 | 4 |

The analysis was conducted by grouping all variables pertaining to the various influence typologies. Cronbach's alpha for all constructs was greater than 0.7, which indicates that the instrument used to measure these constructs was consistent.

**6.3 Test of Validity**
For the purposes of this study, construct validity was further scrutinised. This involved estimating the existence of inferred underlying characteristics (such as referent influence) based on behaviour. As postulated by De Vaus (2002), a construct becomes validated when relationships within items of the measurement instrument are established in line with theoretical understanding about the construct.

## 7. Results and Discussion

A total of 100 questionnaires were sent to IS/IT practitioners working in organisations that represented varied industries across the Gauteng province of South Africa. A total of 56 questionnaires were returned (with 1 questionnaire captured as incomplete), denoting a response rate of 55%. Close to 70% of the respondents were less than 40 years of age. Industries where the sample was taken ranged from vehicle and transport to those that represented the retail sector. The highest response rate was obtained from practitioners working in the banking and financial service sector. This is shown in **Table III** below.

TABLE III : LOCATION

| | Organisation Type | | | |
|---|---|---|---|---|
| | *Industry* | *Frequency* | *Valid %* | *Cumulative %* |
| Valid | *Vehicle & transport* | 11 | 20.0 | 20.0 |
| | *Bank & financial services* | 17 | 30.9 | 50.9 |
| | *Consumer & retail* | 10 | 18.2 | 69.1 |
| | *Information technology/telecommunications* | 5 | 9.1 | 78.2 |
| | *Insurance* | 8 | 14.5 | 92.7 |
| | *Manufacturing or trading* | 4 | 7.3 | 100.0 |
| | Total | 55 | 100.0 | |
| Missing | **System** | 1 | | |
| **Total** | | **56** | | |

**7.1 Experience and Qualification**

**Table IV** espouses cross-tabulation data that profiled the respondents' qualifications against the number of years' experience the respondents had in ERP implementation. Findings reveal, significantly, that those who had reasonable experience in ERP implementation (between 5 and 10 years' experience) also had good academic qualifications (bachelors degree). It was also significant to note that very few of the respondents had a Grade 12 qualification.

TABLE IV : EXPERIENCE AND QUALIFICATION

| Highest Education Qualifications * Years of Experience in ERP Implementation Cross-tabulation | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | Years of Experience in ERP Implementations | | | | | Total |
| | | Less than 2 years | 2 to 5 years | 6 to 10 years | 11 to 15 years | More than 15 years | |
| Highest level of education | *Grade 12 (matric or Std 10)* | 1 | 1 | 1 | 1 | 0 | 4 |
| | *Postmatric diploma or certificate* | 2 | 6 | 8 | 0 | 0 | 16 |
| | *Bachelors degree* | 1 | 3 | **14** | 3 | 0 | 21 |
| | *Postgraduate degree* | 0 | 0 | 7 | 4 | 3 | 14 |
| Total | | 4 | 10 | 30 | 8 | 3 | 55 |

**7.2 Success of Implementation**
Respondents were also asked to rate the ERP implementation projects that they had been involved in and how successful those projects were. Only 28.6% had been involved in successful ERP projects. The responses are presented in **Table V** below.

TABLE V : SUCCESS OF ERP IMPLEMENTATION

| **The ERP implementation I was involved in was successful** | | | | | |
|---|---|---|---|---|---|
| | | *Frequency* | *%* | *Valid %* | *Cumulative %* |
| Valid | Disagree | 26 | 46.4 | 47.3 | 47.3 |
| | Neutral | 13 | 23.2 | 23.6 | 70.9 |
| | Agree | 16 | 28.6 | 29.1 | 100.0 |
| | Total | 55 | 98.2 | 100.0 | |
| Missing | System | 1 | 1.8 | | |
| Total | | 56 | 100.0 | | |

**7.3 Testing of the Hypotheses**
In this section the hypotheses stated previously are revisited and tested as follows:

- **HI:** *Positional Influence* (PosInf), as a social interaction mechanism, will influence how controls are implemented when ERP systems are placed.

We conducted a correlation test to establish the relationship between the independent variables PosPO (*Positional Influence)* and the dependent variable ErpSeC (*ERP security posture*). The purpose was to determine the *Pearson correlation coefficient* (two-tailed test) using SPSS and from the correlation coefficient deduce the nature of relationships between the variables. The SPSS output provided a matrix shown as **Table VI** below.

TABLE VI : CORRELATION BETWEEN POSITIONAL INFLUENCE (POSINF) AND ERP SECURITY POSTURE (ERPSEC)

| | | | **ErpSeC** | **$PosInf_1$** | **$PosInf_2$** |
|---|---|---|---|---|---|
| | | | Information security control | My role/position impacts the ERP implementation | I have a legitimate right, considering my position, to expect that my suggestions be carried out |
| **ErpSeC** | Information security policy | Pearson correlation | 1 | | |
| | | Sig. (2-tailed) | | | |
| **$PosInf_1$** | My role/position impacts the ERP implementation | Pearson correlation | .283* | 1 | |
| | | Sig. (2-tailed) | .036 | | |
| **$PosInf_2$** | I have a legitimate right, considering my position, to expect that my suggestions be carried out | Pearson correlation | .073 | .608** | 1 |
| | | Sig. (2-tailed) | .595 | .000 | |
| *. Correlation is significant at the 0.05 level (2-tailed). | | | | | |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | | | |
| b. Listwise N=55 | | | | | |

SPSS results for **Table VI** show that the understanding of information security controls (ErpSeC) is related to role/positional influence over the implementation process. $r$ = .283* with p < .05. This can be interpreted to mean that the higher the role/influence, the greater the degree of security control over ERP. In scenarios where practitioners might have a high degree of influence over projects, but little knowledge of security, this might detrimentally affect ERP security. The null hypothesis can be rejected.

- **H2:** *Reward Influence* (RewInf), as a social interaction mechanism, will influence how controls are implemented when ERP systems are placed.

To test the above hypothesis, SPSS output generated **Table VII** below.

TABLE VII: CORRELATION BETWEEN REWARD INFLUENCE (REWINF) AND ERP SECURITY POSTURE (ERPSEC)

| | | | **ErpSeC** | **$RewInf_1$** | **$RewInf_2$** |
|---|---|---|---|---|---|
| | | | Information security control | I have an ability to withhold organisational rewards | I can influence the salary increase of a team member |
| **ErpSeC** | Information security control | Pearson correlation | 1 | | |
| | | Sig. (2-tailed) | | | |
| **RewInf 1** | I have an ability to withhold organisational rewards | Pearson correlation | .104 | 1 | |
| | | Sig. (2-tailed) | .450 | | |
| **RewInf 2** | I can influence the salary increase of a team member | Pearson correlation | .070 | .873** | 1 |
| | | Sig. (2-tailed) | .610 | .000 | |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | | | |
| b. Listwise N=55 | | | | | |

Results from **Table VII** above show that there is no relationship between rewards/incentive schemes and information security control implementation (ErpSeC and RewPO). The null hypothesis holds.
The null hypothesis also holds for the following hypothesis:

- **H3:** *Coercive Influence* (CoInf), as a social interaction mechanism, will influence how controls are implemented when ERP systems are placed.

SPSS results show that coercive pressure/influence actually might have detrimental results (opposite movement/direction where, $r = -.005$). Data, however, shows a very slim chance of this happening ($p = .974$).

TABLE VIII: CORRELATION BETWEEN COERCIVE INFLUENCE (COINF) AND ERP SECURITY POSTURE (ERPSEC)

| | | | **ErpSeC** | **CoInf1** | **CoInf2** |
|---|---|---|---|---|---|
| | | | Information security policy | I can apply pressure to influence the outcome of project | I am able to allocate to others undesirable job assignments |
| **ErpSeC** | Information security control | Pearson correlation | 1 | | |
| | | Sig. (2-tailed) | | | |
| **CoInf1** | I can apply pressure to influence the outcome of project | Pearson correlation | -.005 | 1 | |
| | | Sig. (2-tailed) | .974 | | |
| **CoInf2** | I am able to allocate to others undesirable job assignments | Pearson correlation | -.003 | .982** | 1 |
| | | Sig. (2-tailed) | .980 | .000 | |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | | | |
| b. Listwise N=55 | | | | | |

The following hypothesis was also tested as follows:

- **H4:** *Expert Influence* (ExInf), as a social interaction mechanism, will influence how controls are implemented when ERP systems are placed.

The Pearson correlation coefficient or r = .419** significant at p = .001 shows that there is a strong relationship between the perception of the valued skill, knowledge and experience and how this influences the interaction and therefore the direction in which security controls are to be implemented.
This is shown in **Table IX** below.

TABLE IX : CORRELATION BETWEEN EXPERT INFLUENCE (EXINF) AND ERP SECURITY POSTURE (ERPSEC)

| | | | **ErpSeC** | **ExInf1** | **ExInf2** |
|---|---|---|---|---|---|
| | | | Information security control | I have sufficient knowledge to perform my role | I am able to provide others with project-related advice |
| **ErpSeC** | Information security control | Pearson correlation | 1 | | |
| | | Sig. (2-tailed) | | | |
| **ExInf1** | I have sufficient knowledge to perform my role | Pearson correlation | **.419**** | 1 | |
| | | Sig. (2-tailed) | .001 | | |
| **ExInf2** | I am able to provide others with project-related advice | Pearson correlation | .366** | .656** | 1 |
| | | Sig. (2-tailed) | .006 | .000 | |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | | | |
| b. Listwise N=55 | | | | | |

Finally, the last hypothesis was test as follows:

- **H5:** *Referent Influence* (RefInf), as a social interaction mechanism, will influence how controls are implemented when ERP systems are placed.

Results show that the notion of charisma and appreciation of others cannot be overlooked as this seems to be related to how security controls are both understood by all parties and consequently implemented. This is a sort of "*veiled influence*" in the sense that it indirectly influences others in a more pleasant way while avoiding active resistance. This interpretation is based on the results of Table X below which shows r = .364** significant at p = .00. The hypothesis can therefore be accepted.

TABLE X : CORRELATION BETWEEN REFERENT INFLUENCE (REFINF) AND ERP SECURITY POSTURE (ERPSEC)

| | | | **ErpSeC** | **RefInf1** | **RefInf2** |
|---|---|---|---|---|---|
| | | | Information security control | I make others feel valued | Others want to act in a way to merit my admiration because they admire my personal qualities |
| **ErpSeC** | Information security control | Pearson correlation | 1 | | |
| | | Sig. (2-tailed) | | | |
| **RefInf1** | I make others feel valued | Pearson correlation | .364** | 1 | |
| | | Sig. (2-tailed) | .006 | | |
| **RefInf2** | Others want to act in a way to merit my admiration because they admire my personal qualities | Pearson correlation | .165 | .606** | 1 |
| | | Sig. (2-tailed) | .230 | .000 | |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | | | |
| b. Listwise N=55 | | | | | |

**7.4 Discussion**

The following model extends the conceptual model recreated earlier with the tested relationships. This is shown in **Figure II** below. **Figure II** shows that during ERP implementations, ERP systems security posture is prone to risk exposure that originates through social construction with the predominating typology being expert influence (ExPo). Arguably, the expert's opinion during ERP implementation as stated by respondents is greatly valued (H4 is .419** *recorded as having the highest influence*) and would ultimately shape the outcome of the ERP implementation project.

The findings shown in **Figure II** below confirm and echo those of Bijker, Hughes and Pinch (1987), who were of the view that expert recognition and hence opinion wield influence which transcend organisational facets while stressing that "*every social act is an exercise of influence, every social relationship is an influence equation and every social group or system is an organisation of influence".*

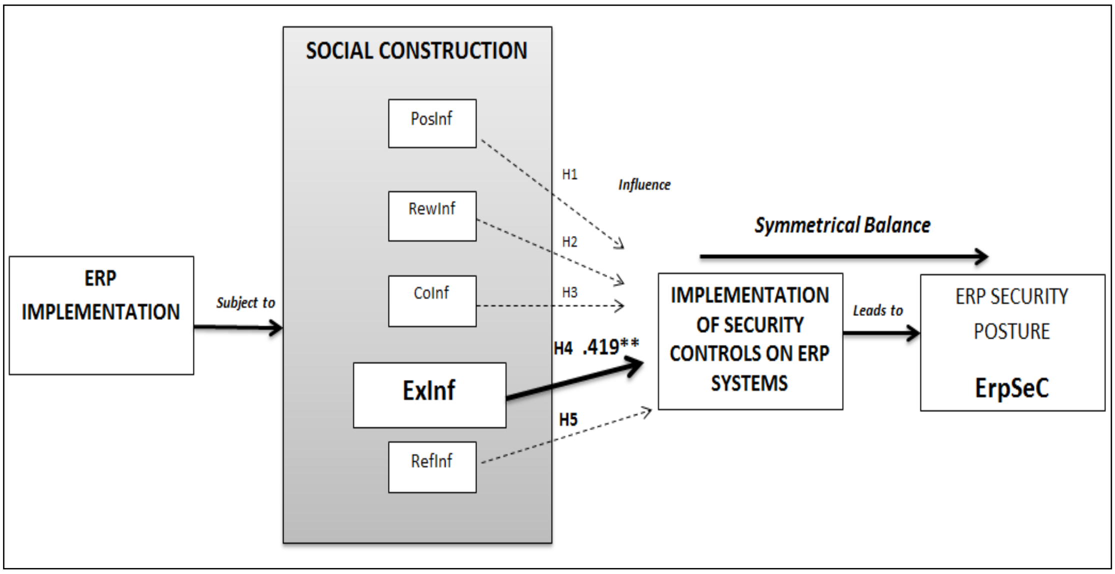


**Figure II.** *The effect of social construction on ERP systems and exposure to security risk*

From the profile of respondents who are ideally degree holders with between 5 and 10 years' experience, it is evident that such an opinion matters. It can be argued that when security practitioners demonstrate expertise, they tend to be trusted and respected. The ideas they postulate are often valued and others will seek leadership and directions in areas where they feel uncertain. This will ideally lead to a sound security posture for the organisation.

Conversely the majority of respondents feel that incentives, rewards and coercion play little, if any, role. As the data reveals, these influences can have an almost negative effect.

As a form of social interaction, reward influence tends to be less emphasised by respondents, possibly because experienced security practitioners (with five years' or more experience) tend to be satisfied with monetary/financial rewards, thus losing its inherent appeal. Security practitioners might place more effort on referent influence possibly because in a workplace, a person with charm often makes every other practitioner in the project implementation process feel good, so such a person might have a lot of influence. Although on its own charm referent influence does little to influence the adoption of security controls, such skills are useful in providing less resistance when such controls are introduced.

ERP implementation teams are built around technology and software expertise and as a result ERP training programmes lack social skills such as charm and persuasion. Empirical data notes that these are useful.

### 7.5 Implication for Theory

This research contributes to the development of an understanding of the social complexity of ERP implementations and specifically the influence of social construction towards the adoption of security controls. This is very significant considering that there is a dearth of academic research studies in this field. Much of the available literature has concentrated on the actual implementation of ERP systems and not on socio-organisational information security factors that affect ERP implementations. The "soft" side of ERP system security is often overlooked. This is the gap the study has attempted to fill.

### 7.6 Implication for Practice

This study offers organisations practical insights regarding the role of social construction in projects perceived as technology centric. It aims at providing insight to practitioners of information systems security into the importance of social interaction and skills, particularly around ERP implementation projects.

## 8. Conclusion

In this article SCOT's social constructs of influence were examined and the focus was on how the effects of the various typologies of social construction expose ERP systems to security risk. SCOT was the theoretical lens applied in the study and exemplified how social agents interact. It is envisaged that by understanding social construction during ERP implementation, a better way of managing this variable could lead towards lessening the exposure of ERP systems to security risk. This will assist organisations in formulating appropriate pragmatic strategies to pay closer attention to the important phenomenon of social construction and its role in ERP security which would otherwise escape the attention of security practitioners.

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