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Locus of Control: A Framework for Use in the Field of Information Systems

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Abstract

The information systems work environment challenges IS professionals with a seemingly continuous maelstrom of novelty, dynamism, uncertainty, and ambiguity. Social learning theory proposes that the locus of control (LOC) construct should operate most strongly under these conditions. However, with few exceptions, LOC remains largely underutilized in the IS literature. The authors review previous LOC research and propose a framework and specific recommendations for the use of LOC in IS research.

Keywords: Locus of control, information systems, IS research

Introduction

The aspect of personality that perceives whether some type of reward or reinforcement is contingent on preceding behavior, or independent of it, is known commonly as "locus of control." Rotter (1966) the first to theorize locus of control (LOC), proposed that people in some situations perceive that they have control over their rewards and reinforcements through their own behavior or performance, while others perceive that they have no control over their rewards and reinforcements, rather, they receive their rewards at the hands of others more powerful that themselves, by luck, chance, or fate. These two perceptions form opposite ends of a continuum within which all of individuals may be classified.

LOC became popular as the subject of hundreds of articles, theses and dissertations by the mid-1970s. Since the concept has its origins in social learning theory, most of these publications occurred in the psychological or sociological literature. The use of LOC also became popular in the fields of education and health and medicine. It has seen little use, however, in fields related to IS. This paper reviews previous LOC research and proposes a framework and specific recommendations for the effective use of LOC in IS research.

Review of LOC Literature

The sociological and psychological literature contains the most abundant use of LOC, with much of the work occurring in the field of applied, occupational and organizational psychology. Surprisingly, however, most of the literature that uses LOC in research on computers and information technology occurs in the educational literature. There seem to be only a few studies in IS that use LOC. The studies discussed in this paper are selected to illustrate the use of LOC in conjunction with other constructs with a view to its use in IS research.

Self-Efficacy and Achievement Need

In a study of the effects of need for achievement, need for affiliation, and collectivism in Asian culture, Ang and Chang (1999) demonstrated that domain-specific LOC scales are better predictors of behavior for domain-specific goals. Pandey and Tewary (1979) found that the achievement values and internal LOC of business loan applicants contribute positively to entrepreneurship. Rotter's general scale was used to measure LOC, and entrepreneurship was measured by performance in a real-life loan application interview. In their study on the antecedents of performance and goal-setting, Phillips and Gully (1997) found that internal LOC has a positive effect on self-efficacy, which, in turn, has a positive effect on goal-setting. The latter two studies,

perhaps unfairly, characterize internals as the "good guys" who set higher goals, have higher performance, are entrepreneurial go-getters, have higher levels of self-efficacy – employees everybody wants.

Motivation

Phillips and Lord (1980) hypothesized that contingent financial rewards would shift an individual's LOC to external control, which would affect a decrease in intrinsic motivation. Their findings were weak, producing the expected results only in situations specifically related to pay, but not in general situations for external LOC. Overall, the study reported that LOC had very little explanatory power over the variance in intrinsic motivation. In regard to motivation, it has also been proposed that computer games are highly motivating for end-users because they produce a mixed-control environment, with the computer initiating some actions, the user initiating others (Gentner, 1992; Katz and Offir, 1994). In this case, the "mixed control environment" fits the situational definition of LOC originally proposed by Rotter.

Stress

Most studies seem to be based on the model that an individual's perceived lack of control over their environment contributes to perceptions of stress. Bernardi (1997) found that, among undergraduate students, those with internal LOC perceived stress as leading to higher achievements. In a study of graduating college seniors, Spector and O'Connell (1994) were able to predict reports of job stressors and strains one year after graduation. Their findings indicated that LOC was most strongly related to the stressor of autonomy, and to a lesser extent of role stressors and interpersonal conflict. Roberts and Lapidus (1997) found that internal LOC moderated between situational stressors and felt stress. In another study related to the stress theme, Crable, et al. (1994) studied the effects of cognitive appraisal, LOC and levels of exposure on computer anxiety. Although they reported no significance in regard to LOC, it may have been related to their use of Rotter's general scale, along with three very domain-specific measures of computer anxiety, cognitive appraisal and level of exposure.

Computer-Related Attitudes

Two studies by Woodrow (1990, 1991) on computer attitudes and computer literacy of student teachers contradicted hypotheses that positive computer attitudes and computer literacy were related to internal LOC as measured by the achievement LOC scale developed by Lefcourt. Woodrow surveyed student teachers enrolled in an elective computer course for educators. Not only did Woodrow find that externals had more positive attitudes, but she also reports that this finding was only significant for the females in this study. It is possible that this study did not account for the specificity-generality characteristic of the construct; namely, that the situation may not have been novel or ambiguous enough for LOC to "power up." It is also possible that the subjects perceived the situation itself as being externally controlled, which, if true, could have produced the results encountered by Woodrow. Hawk, in a study of organizational behavior, may have suffered a similar fate in his study on computer attitudes of information systems users (Hawk, 1989). Hawk, using Valecha and Ostrom's (1974) revised version of Rotter's general LOC scale, reported that LOC was significant only when user involvement was low, when user involvement was high, the difference between internal and external was insignificant. Another recent study by Perrone and Lester (1998) using Rotter's general scale, found no correlation between LOC and negative computer attitudes.

Computer Literacy

Using several methods to measure computer literacy, Wesley, et al. (1985) found that externals responded better to computer-assisted instruction than they did to text-based instruction, but internals showed no preference for the two on one of two computer literacy scales. Although it is not surprising that an externally oriented person would prefer the externally controlled environment of computer-assisted instruction, Wesley postulated afterward that the four sessions of computer-assisted instruction was not enough to show a difference in computer literacy among the internals. Kay (1990) in a later study on computer literacy and LOC, believed that Wesley's results would have been better with the use of more criterion-specific (domain-specific) measures for LOC. Kay developed a criterion-specific measure, the Computer Locus of Control (CLOC) that produced significant correlations between LOC and computer literacy.

Performance

In a study of software developers, Rasch and Tosi (1992) demonstrated significant performance-related effects using Rotter's general scale. Likewise, Kren (1992) also demonstrated positive effects of internal LOC on performance. In a literature review,

Pocius (1991) observed that personality traits related to introversion-extraversion seem to operate strongly in human-computer interactions, including performance-related interactions. Conceptually, performance appears to be linked to a strong relationship between internal LOC and reward-based motivation.

Problems with Previous Use of LOC

Rotter (1975) conceptualized locus of control (LOC) as *both* a situational and personal variable. This arose from frequent observations that variance in expectancies following reinforcement appeared to co-vary with both the type of situation and as a characteristic of the person receiving reinforcement. The individual perceives groups of similar situations as being either internal or external control situations. Therefore, based on prior experience, the individual possesses either an internal or external orientation to that particular situation.

Not all research that has used LOC has been conducted in a manner consistent with its origins, which may have been the cause of inconsistent results (Rotter 1975, Mirels 1970, Levenson 1973, and Lefcourt, et al. 1979). The most frequent problem was the failure to treat reinforcement as a separate variable. LOC is about an individual's perception of control *of reinforcement.* It is inappropriate to use the variable in studies that have no component of reinforcement, uncontrolled reinforcement, or unmeasured reinforcement (as in Katz, 1994).

Another problem occurs in research intended to make accurate predictions of achievement behavior or performance. Much of the research on this topic is performed on subjects in highly structured, familiar, or unambiguous situations. The inconsistency encountered in such research seems to be related to the nature of LOC as pertaining to *generalized expectancies*. If the situation is too familiar, generalization is not necessary in order for the subject to perceive control of reinforcement, and hence, proceeds with behavior learned from a previous familiar situation (Woodrow, 1990; Woodrow, 1991). LOC operates most strongly in situations that are novel or ambiguous to the participant. Solberg (1998) for instance, reported that LOC has a significant effect on employees' ability to cope with technology changes. A negative example of this phenomenon has occurred frequently in research conducted on student grade-earning behaviors. The farther the students progress in school, the more familiar they become with what is required to earn grades, the less individual LOC is a factor in the earning of grades. This aspect of LOC makes it attractive for research in the novel and ambiguous IS environment.

Problems have also arisen from the commonly held notion that "internal" is good behavior, and "external" is bad behavior. Although this may be true in some situations, it is certainly far short of truism (Phillips and Gully, 1997; Pandey and Tewary, 1979). The value placed by western culture on individual characteristics like individualism, self-determination, high achievement, and related "internal-like" attributes makes it easy for a researcher to make this assumption (Woodrow, 1990; Hawk, 1994). The distribution of scores on the LOC scale is normal (Rotter, 1975,) which means that it is consistent with theory to propose, rather than there being two types of people, that any given person may be of a mixed orientation that is dependent on the situation. Further difficulty has arisen from the apparent existence of "externals" that think and behave as "internals." This discovery led to a differentiation between "defensive" and "passive" externals (Hamsher, et al., 1968) and hence, a new multidimensional scale (Levenson, 1973). "Passive" externals behave more like the common notion of externals, but "defensive" externals behave in manners more consistent with internals (Giles, 1986).

Woodrow (1990) and Hawk (1994) identified additional problems related to the nature of the original instrument itself. The original scale consisted of items designed to test the beliefs of individuals in a variety of situations. Subsequent research tended toward a focus on specific situations, often of ambiguous social desirability. In the years that followed, this problem has been remedied by the development of situation-specific LOC scales, such as Spector's (1988) "Work Locus of Control" scale (WLOC) and Kay's (1990) "Computer Locus of Control" scale (CLOC). In similar vein, the scale has been criticized for lacking dimensionality, which, it was proposed, may be remedied by the creation of subscales for specific sub-concepts (Mirels, 1970; Levenson, 1973; Lefcourt, et al., 1979).

Framework

A proposed nomological framework for LOC is presented (Figure 1) below. The antecedent and posterior constructs depict categories of variables that are purposely broad to include classes of phenomena rather than specific phenomena or constructs. Indeed, the categories depicted are not exhaustive, but illustrative, serving only as a starting point for further research. The organizational phenomena are placed in the top half of the diagram, and the individual phenomena are placed in the bottom half of the diagram.
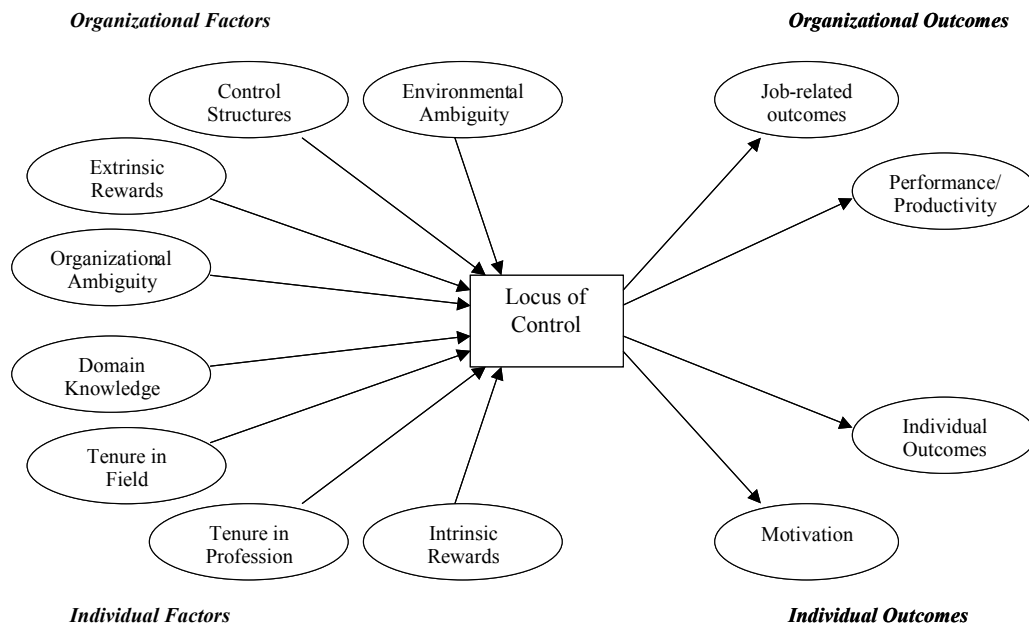
Figure 1. Nomological Framework of Phenomena Related to Locus of Control

It should be noted at this point that, although the direct and moderating effects of LOC are well known, little has been done to confirm what are the antecedents to LOC and how they operate. Much of the research is older (pre- 1985) in the fields of child and social psychology, and focuses on demographic antecedents to children's LOC (as in Watkins, 1982). The citations in Table 1, which are a fairly representative sample of the LOC literature, illustrate the extent of this last statement – LOC is used almost exclusively as an independent variable. Because LOC is known to have significant effects on outcomes in certain job situations, knowledge pertaining to the individual and organizational antecedents to LOC could be a powerful tool for both researchers and practitioners. The proposed framework will include individual and organizational antecedents based on both theory and literature.

The organizational environment provides a rich situational context for LOC. Reward and reinforcement at the organizational level consists primarily of pay raises, promotions, peer recognitions, and supervisor evaluations. The organizational and work environments are also a source of novelty and ambiguity in that policies and practices are often subject to revision and reinterpretation without notice or prior communication. It is, therefore, postulated that: 1) the presence and administration of extrinsic rewards will be related to the individual's perception control, 2) degree of organizational and environmental novelty and ambiguity will be related to the individual's perception of control, and 3) the presence and administration of organizational control structures will be related to the individual's perception of control.

The individual also brings a complex set of factors that will have an effect on LOC. Many IS professionals seek intrinsic rewards such as personal fulfillment and satisfaction gained by the mastery of new technology and achievement of technological goals. An individual's prior experience in the domain, including factors related to tenure in the field or area, and tenure in the profession provide a background from which the individual may form generalized expectancies to a situation at hand. Therefore, it is postulated that, 1) the individual's fulfillment of intrinsic rewards will be related to perception of control, 2) an individual's prior experience in the domain will be related to perception of control, 3) an individual's tenure in the field or area will be related to perception of control, and 4) an individual's tenure in the profession will be related to perception of control.

The factors posterior to LOC represent behaviors and beliefs that may be either generalized from previous research, or theorized based on an understanding of the effects of LOC. A variety of job-related behaviors and outcomes have been demonstrated in previous research (Kren, 1992; Storms and Spector, 1985; Rasch and Tosi, 1992) that may also be expected to occur among IS professionals. Individuals who believe that rewards are contingent on performance or job-related behaviors best represent the "internal" orientation. Therefore, it is postulated that internal LOC will be positively related to job performance and productivity.

In a manner consistent with the antecedent effects of intrinsic rewards on LOC, the achievement of individual outcomes may also be postulated as an effect posterior to internal LOC. Therefore, it is postulated that internal LOC will be positively related to the

achievement of individual outcomes. It is also consistent with theory, and has been demonstrated in prior research that internal LOC has a positive effect on motivation. Therefore, it is postulated that internal LOC will have a positive effect on motivation.

Recommendations

The following recommendations are provided for researchers interested in examining LOC as it relates to IS issues.

Domain-Specific Scale

The original, general LOC scale had been criticized for lacking dimensionality and specificity (Lefcourt, et al., 1979; Mirels, 1970; Levenson, 1973). Due to its nature as a situational variable, LOC loses predictive power in situations that are too specific, that is, familiar and unambiguous to the participant. Therefore, it is appropriate to develop an LOC scale that is specific to a *domain,* but not necessarily to specific situations in a domain. As a response to calls for the development of domain-specific measures of LOC, Spector (1988) developed the Work Locus of Control scale for use in organizational settings. Spector's scale, which fared better than Rotter's general scale in work settings, is widely used to predict work behavior. As mentioned previously, Kay (1990) produced significant results with a domain-specific LOC scale for computers.

Within the IS domain, there appear to be several sub-domains that present opportunity for the development of domain-specific instrumentation; for instance, programming, analysis and design, IS usage, IT work environment, to name a few. Therefore, it is recommended that domain specific scale(s) be used for IS research.

Reward and Reinforcement

Previous research appears to have suffered by neglecting to account for reinforcement as a separate variable. The theoretical origin of LOC, indeed, the nature of the construct itself, defines it as a measure of an individual's perceived *control of reinforcement*. Reward and reinforcement, to an IS professional, may take several forms beside monetary reward. The literature indicates that reward and reinforcement as two general categories to consider. The usage and mastery of technology is itself a highly intrinsically rewarding activity. Recognition of peers and colleagues for jobs well done is a good example of an extrinsic reward sought by IS professionals. Therefore, it is recommended that, when using LOC, reinforcement be accounted for as a separate variable.

Situational Novelty and Ambiguity

The field of IS may be in a class all by itself with regard to novelty and ambiguity. The work environment of the IS professional often changes on a daily basis. New technology becomes available even before the "old" technology is implemented. An IS professional's skill set may become obsolete even despite a regular program of training and updating if the speed of technology innovation outpaces the IS professional's training program. Because LOC operates most powerfully under conditions of novelty, uncertainty, and ambiguity, and least powerfully under familiar, controlled, "laboratory-like" conditions, it is positioned well for *in vivo*, or field research. Therefore, it is recommended that LOC be considered as a construct for studies that have a component of situational novelty or ambiguity, or for *in vivo*, or field research.

Opportunities for Research and Practice

The opportunities for research are related to the nature of LOC, specifically, its suitability for the study of novel and ambiguous situations. Domain-specific instrumentation should be developed and employed in IS research in order to achieve optimal results. LOC is not predicted to perform well in tightly controlled laboratory environments, such as may be found in an experiment. However, it does seem to be well suited for the uncontrolled conditions encountered in fieldwork, where a quasi-experiment, survey, or other less intrusive method may be more appropriate. Both researchers and practitioners may benefit from knowledge about the antecedents to LOC. Knowledge of the antecedents may help researchers interpret the conflicting results in previous research. Practitioners may benefit in that such knowledge may be applied to positively influence employee LOC, and hence, achieve desirable work-related outcomes such as motivation and performance.

Conclusion

Clearly, in the right situation, LOC may be a powerful addition to a research project. The problems related to the use of this variable may be avoided with a little care and understanding of its origin in the field of social learning theory. The use of domain-specific measures of LOC, such as Spector's WLOC or Kay's CLOC, would fare better than the general measures used in many previous studies. Knowledge pertaining to the antecedents to LOC could yield significant insights for both researchers and practitioners. Given the nature of LOC to operate most strongly in conditions of novelty and ambiguity, it is reasonable to expect that in studies of IS, particularly in field and *in vivo* studies, which often are, by comparison to familiar, tightly controlled, laboratory-like studies, more novel and ambiguous, LOC may be used to great effect.

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Table 1. Summary of Empirical Research Cited

Authors	Year	Dependent Variable(s)	Independent Variables	Subjects	Results
Ang, Rebecca and Chang, Weining	1999	need for achievement, need for affiliation	locus of control, individualism-collectivism	students	.148 R-sq in NACH, .198 R-sq in NAFF
Bernardi, Richard	1997	perception of stress, performance	locus of control	newly hired juniors at big 6 acct firms	LOC is not related to college or personal stress, internals perceive stress as positive, .223 R-sq in college stress for males, not a factor for females, "twice" the variation of general life stress for females and is not a factor for males
Crable, E. A., et al.	1994	computer anxiety	LOC, prior computer experience	business students	LOC failed to achieve significance.
Giles, Brian A.	1986	participation in continuing education	LOC	engineers	Internal LOC was more likely to participate in continuing education
Hawk, Stephen R.	1989	computer attitude	LOC, user involvement	CBIS users in 18 organizations	When user involvement is low, internals have better attitudes than externals. When user involvement is high, there is no difference between internal and external.
Katz, Y. J. & Offir, B.	1994	computer attitudes, learning motivation	LOC, computer games	grade-school students	Students with internal LOC, and computer games in mathematics courseware developed more positive computer attitudes than students with external LOC and no games.
Kay, Robin H.	1990	computer literacy	computer LOC	students	.72 r in basic skills, .77 r in software skills, .69 r in awareness, .62 r in programming
Kren, Leslie	1992	performance	participation, incentives, locus of control as moderator	business students	Internals outperform externals when incentives are present, externals outperform internals when no incentives are present. Internals outperform externals when participation is present, no difference when performance is low.
Pandey, Janak and Tewary, N. B.	1979	entrepreneurship	LOC, achievement values	Northern Indian loan applicants	LOC and achievement values are positively related to entrepreneurship in business loan applicants.
Perrone, Anthony and Lester, David	1998	confidence in computer use	LOC	undergrads	no correlation between LOC and negative attitude toward computers.

Authors	Year	Dependent Variable(s)	Independent Variables	Subjects	Results
Phillips, James S. and Lord, Robert G.	1980	motivation	LOC, competence information	male undergrads	Feelings of competence seemed a stronger influence of intrinsic motivation than LOC caused by contingent pay
Phillips, Jean and Gully, Stanley M.	1997	self-efficacy	LOC, goal orientation, ability, achievement need	undergrads	LOC is positively related to self-efficacy.
Rasch, Ronald H. and Tosi, Henry L.	1992	effort, performance	LOC, many others	software developers	LOC, by path analysis, has 0.11 effect on performance, no significant effect on effort.
Roberts, James A and Lapidus, Richard S.	1997	stress	stressor, LOC as moderator	salespeople	internals cope w/ stress better than externals
Solberg, L. A.	1998	coping	LOC, age, computer anxiety	Norwegian employees in five organizations	Age, computer anxiety and locus of control explain 3% to 5% of the variation in coping.
Spector, Paul E. and O'Connell, Brian J.	1994	job stressors, job strains	LOC, negative affectivity, Type A.	graduating seniors	longitudinal study. LOC, with other variables, is a significant predictor of job stressors and strains.
Storms, P. L. & Spector, P. E.	1987	interpersonal aggression, sabotage, withdrawal	LOC, organizational frustration	mental health employees	Persons with an external locus of control are more likely to respond to frustration with counterproductive behavior than persons with an internal locus of control.
Watkins, David	1982	LOC	Family and personal background variables	Filipino children	Reported differences in the relationship of sex and LOC between Filipino and Western children
Wesley, Beth E. et al.	1985	acquisition of computer literacy	LOC	preservice elementary teachers	internals scored higher on comp literacy pretest. No difference between internal and external after two hours of instruction.
Woodrow, Janice E.	1990	computer attitudes	LOC	preservice elementary teachers	computer novices w/ external have more positive attitudes than internals.
Woodrow, Janice E.	1991	computer literacy	LOC, computer attitudes	preservice elementary teachers	LOC is not significant in the prediction of computer literacy.