
MEDIATION EFFECTS OF SUBJECTIVE VARIABLES: CRITICAL ASPECTS IN AN E-PORTFOLIO IMPLEMENTATION

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Abstract: The paper describes a preliminary analysis of an e-Portfolio's implementation among a students' small target group. This e-Portfolio's System (prototype version) has been developed at Giunti Labs and customised at University of Bologna as part of a common project named Alma Two (Adaptive Learning Management Assets for Advanced Learning Methodology-driven Architecture). The theoretical framework of our analysis focused the Technology Acceptance Model (TAM), developed by Davis (1989) and extended by other researchers (Venkatesh & Davis, 2000; Venkatesh et al., 2003). The TAM postulated that the acceptance of new technology is influenced by the perceived usefulness and the perceived easy of use.

Keywords: technology acceptance, attitude toward use, perceived usefulness

Objective and hypothesis

The main goal of this study is to analyse an e-Portfolio's implementation by considering the effects of different psychosocial constructs as: perceived usefulness, perceived ease of use, attitude toward use, use behavioural intentions and actual use in the course of pre and post-implementation. In general we expected a relevant influencing role of attitude toward use and behavioural intention on actual use. We precisely expected that:

- the attitude toward use mediates the effects of perceived usefulness on behavioural intention, (Hp1),
- the attitude toward use mediates the effects of the ease of use on behavioural intention (Hp2),
- the behavioural intention of use mediates the effects of attitude on actual use (Hp3),
- the behavioural intention of use mediates the effects of perceived usefulness on actual use (Hp4),
- finally, by considering various usability problems during the starting period of implementation and the brief length of the experiment we didn't expect significant differences between T1 and T2 (Hp 5).

Method and procedure

We used a repeated measures experimental design (pre- post) within subjects. Participants received an anonymous identification code to allow their acknowledgment between T1 and T2. The implementation had a length of 36 days and in the middle of this period a meeting to check usability difficulties was organized. A self-report questionnaire was administered before (T1) and after (T2) the e-Portfolio implementation. Scales adapted from different versions of TAM (Davis, 1989; Malhotra & Galletta, 1999) were used to measure dependent variables as: perceived usefulness, defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989; p. 320); perceived ease of use, defined as "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989; p. 320); the behavioural intention of use defined as the degree to which a person intends to perform a specific behaviour (Davis et al., 1989); the attitude toward use defined as "the degree of evaluative affect that an individual associates with using the target system in his or her job" (Ajzen & Fishbein, 1977), finally the actual use, the user's behaviour performed.

Subjects

36 students (75% females; mean age = 26) of the first year of master degree in Organizational Psychology were involved in the implementation as naïve users of the e-portfolio system. Their participation was not on a voluntary basis; in fact the students attended the Workshop about e-Portfolio, as compulsory task of their academic curricular plan.

Main results

The perceived Ease of Use scale obtained a Cronbach alpha reliability of .87 at T1 (before implementation) and .85 at T2 (after implementation). The Perceived Usefulness scale obtained a Cronbach alpha of .90 at T1 and .94 at T2. The Behavioural Intention scale obtained a Cronbach alpha of .92 at T1 and .98 at T2. The Attitude toward Use scale obtained a Cronbach alpha of .84 at T1 and .92 at T2. With reference to Actual Use scale (Cronbach alpha = .63), we had reduced to two items because the intercorrelation with the other scale's items was not good.

For the mediation analysis the role of each of the mediators were assessed independently, as well as simultaneously. The pre-implementation data didn't show mediation effects, but post-implementation results seemed most informative. With reference to Hp1 (Table 1), the first step of the regression analysis showed that perceived usefulness significantly affected on the behavioural intention of use ($\beta = .72$, $p < 0.001$). Secondly, the regression analysis showed that perceived usefulness significantly affected on the attitude toward use ($\beta = .83$, $p < 0.001$). Thirdly, the regression analysis showed that the attitude toward use mediates the effects of perceived usefulness on the behavioural intention ($\beta = .81$, $p < 0.001$). When the attitude toward use was entered as mediator between perceived usefulness and behavioural intention, the direct effect of usefulness on the behavioural intention became not-significant ($\beta = .05$, $p = .79$).

With reference to Hp2 (Table 2), we expected that the attitude toward use mediates the effects of ease of use on behavioural intention. The first step of the regression analysis showed that the perceived ease of use significantly affected on the behavioural intention of use ($\beta = .36$, $p < 0.05$). Secondly, the regression analysis showed that perceived ease of use significantly affected on the attitude toward use ($\beta = .47$, $p < 0.01$). Thirdly, the regression analysis showed that the attitude toward use mediates the effects of perceived ease of use on the behavioural intention ($\beta = .87$, $p < 0.001$). When the attitude toward use was entered as mediator between the perceived ease of use and the behavioural intention, the direct effect of ease of use on behavioural intention became not-significant ($\beta = -.04$, $p = .73$).

With reference to Hp3 (Table 3), we expected that the behavioural intention of use mediates the effects of attitude on actual use. The first step of the regression analysis showed that the attitude significantly affected on the actual use ($\beta = .33$, $p = 0.05$). Secondly, the regression analysis showed that the attitude significantly affected on the behavioural intention of use ($\beta = .85$, $p < 0.001$). Thirdly, the regression analysis showed that the behavioural intention of use mediates the effects of the attitude on the actual use ($\beta = .82$, $p < 0.01$). When the behavioural intention of use was entered as mediator between the attitude and the actual use, the direct effect of attitude on actual use became not-significant ($\beta = -.34$, $p = .22$).

With reference to Hp4 (Table 4), we expected that the behavioural intention of use mediates the effects of perceived usefulness on actual use. The first step of the regression analysis showed that the perceived usefulness significantly affected on the actual use ($\beta = .47$, $p = 0.01$). Secondly, the regression analysis showed that the perceived usefulness significantly affected on the behavioural intention of use ($\beta = .72$, $p < 0.001$). Thirdly, the regression analysis showed that the behavioural intention of use mediates the effects of the perceived usefulness on actual use ($\beta = .46$, $p < 0.05$). When the behavioural intention of use was entered as mediator between the perceived usefulness and actual use, the direct effect of the perceived usefulness on the actual use became non-significant ($\beta = .16$, $p = .43$).

Therefore, each hypothesis shows that the mediator accounts completely a relation between the predictor and the outcome, consistent with a complete mediation model. With reference to Hp5, by considering various usability problems during the starting phase of implementation we expected not significant differences between T1 and T2. The results of an analysis of variance with repeated measures (pre and post) within subjects showed that all means of variables decreased after implementation (Table 5). Then Hp5 was not confirmed.

Discussion and Conclusion

The main goals of our study were: 1) to test mediation effects of psychosocial factors on using e-Portfolio, 2) to evaluate the differences between T1 and T2 on the level of the psychosocial dependent variables by taking into account also various usability problems during this brief period of implementation. All the specific hypothesis related to the first goal were confirmed. In particular, the mediation effects showed a critical role of attitude and behavioural intention. Then we can say that different kinds of attitudes influence the actual use of e-portfolio. But the hypothesis related to the second goal were not confirmed. In fact, while we didn't expect differences between T1 and T2, the implementation produced not only changes in attitudes but they were also in an unexpected direction. Probably the usability problems had a critical decreasing role on the technological acceptance of our students who, as naïve users, had a lot of problems in learning the basic procedures to use the e-portfolio. Moreover, the facts that the course had ePortfolios as its subject and that problems of usability have been moderated half-way, might restrict the possibilities to generalize the research results. By considering these results it is possible to conclude that the psychosocial factors play a role in activating learning. Therefore, focusing on motivational and technical training activities might represent an important pre-condition to make most effective the implementation and to overcome the usability problems of naïve users. In fact, it would be appropriate to reflect on both motivational aspects and learning time, therefore the eventual possibility to embed a period of a intensive technical training about storage and classification of contents to improve the technological acceptance of our students.

Tables

Table 1. Mediation analysis of the perceived usefulness effects on behavioural intention by the attitude toward use.

Variable	<u>Behavioural Intention</u>	<u>Attitude toward Use</u>	<u>Behavioural Intention</u>
Perceived Usefulness	.72***		
Perceived Usefulness		.83***	
Perceived Usefulness			.05
Attitude toward Use			.81***
	R ² = .51	R ² = .70	R ² = .72
	R ² = .50	R ² = .69	R ² = .70
	F = 33.85; p < 0.001	F = 73.33; p < 0.001	F = 39.62; p < 0.001

Table 2. Mediation analysis of the ease of use effects on behavioural intention by the attitude toward use.

Variable	<u>Behavioural Intention</u>	<u>Attitude toward Use</u>	<u>Behavioural Intention</u>
Ease of Use	.36*		
Ease of Use		.47**	
Ease of Use			-.04
Attitude toward Use			.87***
	R ² = .13	R ² = .22	R ² = .73
	R ² = .10	R ² = .20	R ² = .71
	F = 4.75; p < 0.05	F = 73.33; p < 0.01	F = 41.22; p < 0.001

Table 3. Mediation analysis of the attitude toward use effects on actual use by behavioural intention.

Variable	Actual Use	Behavioural Intention	Actual Use
Attitude toward Use	.33*		
Attitude toward Use		.85***	
Attitude toward Use			-.34
Behavioural Intention			.82**
	R ² = .11	R ² = .73	R ² = .32
	R ² = .08	R ² = .72	R ² = .28
	F = 3.90; p < 0.05	F = 84.63; p < 0.001	F = 7.07; p < 0.01

Table 4. Mediation analysis of the perceived usefulness effects on actual use by the behavioural intention.

Variable	Actual Use	Behavioural Intention	Actual Use
Perceived Usefulness	.47**		
Perceived Usefulness		.72***	
Perceived Usefulness			.16
Behavioural Intention			.46*
	R ² = .22	R ² = .51	R ² = .33
	R ² = .20	R ² = .50	R ² = .29
	F = 9.06; p < 0.01	F = 33.85; p < 0.001	F = 7.62; p < 0.01

Table 5. Analysis of variance with repeated measures (pre and apost) within subjects.

Variable	Pre-Implementation (T1)		Post-Implementation (T2)		ANOVA	
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>	<u>F</u> (34)	<u>η</u> ²
Ease of Use	4.34	1.16	4.06	1.27	1.58	.043
Perceived Usefulness	4.56	1.06	3.88	1.37	8*	.20
Behavioural Intention	5.72	1.02	4.96	1.58	9.42*	.22
Attitude toward Use	5.45	.60	4.96	.86	14***	.29

* p < .05. *** p < .001.

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