Business Analytics Continuance in Software Development Projects – A Preliminary Analysis

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Abstract. This paper investigates factors affecting business analytics (BA) in software and systems development projects. This is the first study to examine business analytics continuance in projects from Pakistani software professional's perspective. The data was collected from 186 Pakistani software professionals working in software and systems development projects. The data was analyzed using partial least squares structural equation modelling techniques. Our structural model is able to explain 40% variance of BA continuance intention, 62% variance of satisfaction, 69% variance of technological compatibility, and 59% variance of perceived usefulness. Technological compatibility and perceived usefulness are the significant factors that can affect BA continuance intention in software and systems projects. Surprisingly the results show that satisfaction does not affect BA continuance   intention.

Keywords: Business Analytics, Information Systems, Software Development

1   Introduction

Around the world businesses are collecting a range of data to achieve greater competitiveness. Business analytics (BA) provide insight to data with help of business knowledge to support decision-making processes. Recently, BA received considerable attention in various industries to achieve and maximize business and gain competitive advantage [23, 26]. BA can be defined as *the techniques, technologies, systems, practices, methodologies, and applications that analyze critical business data to help an enterprise better understand its business and market and make timely business decisions* [11]. BA is about leveraging value from data deemed the new oil [1]. All types of analytics (e.g. BA, data analytics, mobile analytics, text analytics, web analytics, network analytics) rely on data mining, statistics and artificial intelligence techniques and natural language processing [11]. According to IDC report [18], in 2017 the BA software market was 54.1 billion dollars and it will increase 11.2% until 2022. BA helps to improve firm's agility and performance as well as generate greater competitiveness for

an organization [4, 12]. In software development analytic guide practitioners in decision making throughout the software development process [22]. According to Ashrafi et al. [4] BA enhance information quality and innovative capabilities. Quality information contribute to timely decision and better adaptability to the environment. Aydiner et al. [5] highlighted that BA helps to improve business process performance and resulting into firm performance influences. In the con- text of software project organization agility is always challenged. It is evident that software projects are inherently complex as they have to dealt with technological challenges as well as organizational issues [7, 29]. Jaklic et al. [21] call for studies to explore how BA better fits with user expectations; whereas other suggest studies to understand the behavioral decisions of BA users regarding the (continuous) use of BA in organizational contexts [6, 14, 16].

This paper aims to examine how expectations from BA by members of soft- ware development teams affect their perceptions and continuous use of BA. Therefore, we are seeking to answer the following research question: What are the factors that affect BA continuance in software development projects? We used the expectation-confirmation model [8] as our theoretical frame-work to hypothesize on the behaviors of employees in software development projects vis- 'a-vis their expectations from BA investments made by their organizations. We collected data from software and system project participants in Pakistan.

2   Research Model and Hypotheses

This study objective was to investigate factors that affect BA continuance in software development projects in Pakistan from the user's point of view. The chosen strategy was to use the appropriate expectation-confirmation model (ECM) [8] as a basis for the designing the empirical research. ECM is based in Expectation Confirmation Theory (ECT) that is extensively used to gauge consumer satisfaction and post-purchase behavior. Bhattacherjee [8] presents ECM in the information systems field and elaborated the cognitive beliefs that influence users' intentions to continue using information systems. The existing studies shows that ECM is extended and validated in various context such as online shopping, healthcare and understanding business analytics continuance in agile information system development projects [6, 9, 19, 27, 28]. We use ECM as the theoretical foundation to investigate continuance intention to use BA in software and systems projects. Figure 1 summaries our conceptual model of this study.

User satisfaction can be referred to the affective attitude towards a particular computer application by an end user who interacts with the application directly [15]. According to Bhattacherjee [8] satisfaction influences IS use and a key determinant in post adoption behavior. Therefore, our hypothesis is:

- H1: Satisfaction has a positive effect on BA continuance intention to use.

Confirmation is the degree to which the actual use experience confirms their initial expectation [8]. It means that user actual use experience meets initial anticipation or expectation; which leads to user's satisfaction.
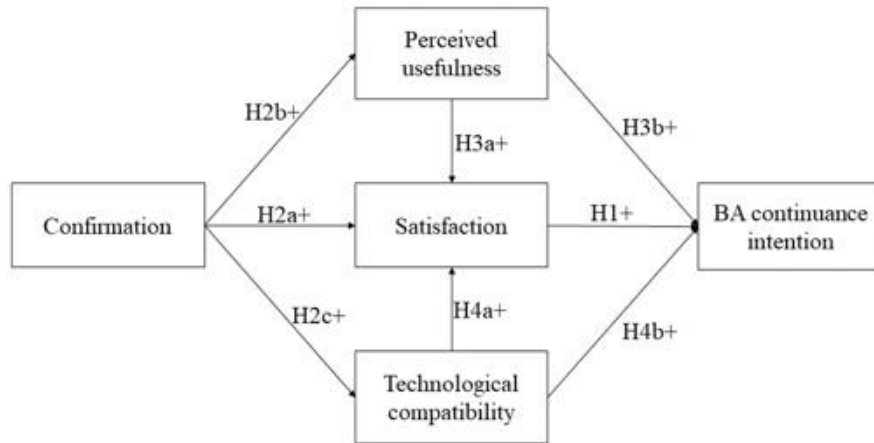

Fig. 1. Conceptual model for BA continuance in software and services projects in Pakistan.

The literature highlighted that confirmation is positively related to satisfaction [8, 25]. The same logic applies to BA use. Therefore, we hypothesized the following:

- H2a: Confirmation has a positive effect on satisfaction with BA use.
- H2b: Confirmation has a positive effect on perceived usefulness of BA use.
- H2c: Confirmation has a positive effect on technological compatibility.

Perceived usefulness is users' perceptions of the expected benefits of using an information system [13]. ECM elaborated that usefulness factor influence the user's satisfaction within system, which could be similar for BA because of its claimed benefits (e.g. visualize the data quickly and assist in decision making etc.). Therefore, we hypothesis that:

- H3a: Perceived usefulness has a positive effect on satisfaction with BA use.
- H3b: Perceived usefulness has a positive effect on BA continuance intention.

Technological compatibility is the degree to which an innovation is considered as being consistent with the existing values, needs and past experience of potential adopters [24]. According to Chen et al. [10] organizations more likely to use big data analytics when their existing values and work practices are compatible.

- H4a: Technological compatibility has a positive effect on satisfaction with BA use.
- H4b: Technological compatibility has a positive effect on BA continuance intention.

3   Methodology

To achieve our research goal, we chose quantitative research approach. An online questionnaire data collection technique helps to cover a large sample of participants from a population of interest. The target respondents for this study were BA practitioners in Pakistani software and services companies. We contacted respondents directly through phone calls and emails. An online questionnaire adapted to the context of BA in Pakistan was developed based on ECM. All of the variables related to ECM model five factors were measured using a five-point Likert-type scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The online questionnaire was piloted, made the necessary corrections and distributed to the targeted population. In total we received 186 respondents.

We run the descriptive analysis on the data and then carried out Harman's single factor test to determine if the variance can be explained by a single factor. We achieved a score of 47% that is less than the threshold value of 50% indicating that there is no threat of common method bias (CMB). To evaluate our proposed model, we used Partial Least Squares Structural Equation Modeling (PLS-SEM).

4   Results

We collected data from 186 respondents belonging to diverse domains. 41% of the respondents identified themselves as software developer. 27% of the respondents selected telecommunication as their job, whereas 15% belonged to e-commerce industry. 6% of the respondents are working as IT-Consultants, and 4% are working in a government organization. The remaining 7% worked in various other sectors.

We consider the loading factors of the items, composite reliability and Cronbach alpha scores of the constructs. For individual items to be reliable the loading factor should be at least 0.7 and for construct reliability, the composite reliability and Cronbach alpha scores should be greater than 0.6 [20]. Further, Average Variance Extracted (AV E) is used to validate if a construct sufficiently explains the variance of its items i.e. greater than 0.6 [17]. The reliability and validity score show that loading factor each individual item is well above the threshold of 0.7. Similarly, the Cronbach alpha, composite reliability and AVE score are also meeting the minimum threshold criterion.

In evaluation of the structural model, the underlying model should exhibit no collinearity among the constructs to reflect the absence of bias [20, 17], i.e., the p-value of the predicates should be less than 5%. To gauge the predictive accuracy of the model, we consider R2 score. Threshold scores of 0.25, 0.5 and 0.75 are used to indicate weak, moderate and substantial predictive accuracy of the model. The findings of the structural model evaluation are summarized in Table 1. Analysis of the path coefficients of our structural model reveals that perceived usefulness and technological compatibility

significantly effects BA continuance intention. We also identified that perceived usefulness is affected by confirmation whereas satisfaction is influenced by confirmation, perceived usefulness. However, technological compatibility does not influence satisfaction. Surprisingly, satisfaction does not affect BA continuance intention.

Table 1. Summary of the structure model evaluation

Hypothesis	Path Coefficients	p-values	Hypothesis Validation
H1: Satisfaction → BA continuance	0.022	0.816	Not Supported
H2a: Confirmation → Satisfaction	0.181	0.029	Supported
H2b: Confirmation → Perceived Usefulness	0.768	0.000	Supported
H2c: Confirmation → Technological Compatibility	0.831	0.000	Supported
H3a: Perceived Usefulness → Satisfaction	0.831	0.000	Supported
H3b: Perceived Usefulness → BA continuance	0.295	0.006	Supported
H4a: Technological Compatibility → Satisfaction	0.049	0.579	Not Supported
H4b: Technological Compatibility → BA continuance	0.363	0.000	Supported

5   Conclusion

The study examines Pakistani software professionals in software and systems development projects expect from BA as well as investigate individual intentions to continue using BA technologies adopted by their companies. ECM model helps us to show that confirmation of expectations about perceived usefulness and technological compatibility are contributing factors of BA continuance intention in software and systems projects in Pakistan. This study findings highlighted that BA continuance is influenced by the various factors as shown in Table 1. The results indicate that it is essential for managers to ensure their team members perceive the BA adopted as useful to their jobs and technological compatible with existing technologies used in current work. The findings are aligned with the existing literature such as [17]. In the recent past, there has been a tremendous increase in the use of machine learning applications in a multitude of domains [2, 3]. It will be interesting to investigate the usage of BA tools specifically in the context of machine learning projects. The theoretical contribution of the study is to extends body of knowledge at organizational level. The practical implication of the study for managers is that they need to pay more attention to technological compatibility and perceived usefulness factors to ensure BA continuance.

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