Project based Learning to Support Enterprise Business Analytics Education

The Role of Cross Functional Groups to Enhance Cognitive Outcomes

Biswadip Ghosh
Dept. of Computer Information Systems, Metropolitan State University of Denver, Colorado, U.S.A.

Keywords: Business Analytics, Project based Learning, Cognitive Outcomes, Motivation Theory.

Abstract: Enterprise business analytics (BA) tools have gained significant attention as a viable option for manipulating large data sets during complex business decision making. However, the cross-functional, boundary spanning nature of these applications make them particularly difficult to learn for users, who predominantly work in functional silos. A typical enterprise BA project involves aggregating large datasets from multiple functional areas, discovering relationships in the data and building models to help visualize and evaluate the selected key performance indicators (KPI). However, most BA learning programs emphasize tool procedural or skill based knowledge, which does not allow end users to understand the broader scope of enterprise analytics project implementations. Cross functional group project based learning programs are needed to provide real world experiences, increasing the end user's motivation to learn and enhancing their cognitive outcomes. There is also a need to create validated models to assess the outcomes of these learning programs. This research study develops and conducts an innovative project based learning program among the users of a leading ERP vendor's analytics tool and collects survey data to confirm the benefits of such group project based learning programs in enhancing the participant's motivation to learn and improving their cognitive outcomes that emphasize cross functional concepts.

1 INTRODUCTION

Organizations generate enormous amounts of operational data that contain valuable patterns, relationships and business information. In seeking improvements in their decision-making processes, more and more organizations are turning to data-driven decision making (Gartner, 2013). Business analytics (BA) applications are specialized tools for data analysis, query, and reporting that support organizational decision-making (Chaudhuri, Dayal and Narasayya, 2011). These tools enable interactive access and manipulation of data in order to gain valuable insights and can support management decision making processes across a broad range of business functions.

The organizational benefits of BA is mainly gained by transcending the immediate focus for achieving functional optimizations, that are "silo"-ed and localized. This is accomplished by utilizing BA applications that can aggregate cross functional datasets extracted from other enterprise systems such as Enterprise Resource Planning (ERP) or external big data sources, to create new organization wide capabilities. Examples include supply chain management (SCM) integrated with customer relationship management (CRM) for KPI's (Key Performance Indicators) that support "360 degree views" (IBM, 2014). Successful BA implementations require: (i) a holistic approach that span multiple functional areas of the business, (ii) identification and modelling of suitable KPI's in the chosen BA tool, (iii) adoption of data lifecycle management practices for collection, cleaning, aggregation and refresh activities, (iv) learning programs to help users leverage BA technology to manipulate large data sets and operationalize analytics algorithms and (v) effective end-user support. Organizational benefits can vary significantly depending on the level of training and insight of the business leaders, who are the ultimate stakeholders of the BA applications (Bose, 2009).

There are three targeted goals of most end-user learning programs (Gupta, Bostrom, Huber, 2010): (1) skill-based goals (tool procedural) that target the user's ability to use the system, (2) cognitive goals

Ghosh B..
Project based Learning to Support Enterprise Business Analytics Education - The Role of Cross Functional Groups to Enhance Cognitive Outcomes.
DOI: 10.5220/0005341600050013
In *Proceedings of the 7th International Conference on Computer Supported Education* (CSEDU-2015), pages 5-13
ISBN: 978-989-758-108-3
Copyright © 2015 SCITEPRESS (Science and Technology Publications, Lda.)

(tool conceptual or business procedural) that focus on the use of the system to solve business problems and (3) meta-cognitive goals that focus on building the individual's beliefs regarding their own abilities with the system. The typical BA end-user learning programs are focused on skill-based procedural outcomes. Such programs do not allow the users to grasp the cross functional knowledge needed to identify the relationships in the data and select "holistic" KPI's, which transcend the domains of their functional work area (Gupta, Bostrom and Huber, 2010). Instead focusing the learning program on cognitive outcomes (rather than skill-based outcomes) could build business-conceptual "big picture" knowledge that allows the users to apply the BA tool to solve enterprise wide business problems (Macris, 2011).

In a cross functional project based learning approach, the users are placed into small groups and asked to define and address a "real-life" business use case or scenario for the BA tools. The individuals learn from the knowledge of group members, who come from different functional areas to define a set of cross functional KPI's and build a logic driven model that can be used to measure the KPI's. They share and combine their individual learning to support building a "big picture of the organization" and the collective group discourse (Wang and Ramiller, 2009). They proceed to identify diverse sources of data from across the organization. Such a learning approach holds promise to address the difficulties of applying BA tools to improve business outcomes in individual processes without adversely impacting broader organizational performance (Chang and Chou, 2011).

The focus of the research on the assessment of technology mediated learning programs has been on how various factors such as types of tools, instructional methods, the target system and individual differences influences individual learning outcomes (Bostrom, et.al, 1990). Compeau, et.al. (1995) proposed a framework of key factors in the management of end-user training that highlights different phases of training such as initiation, formal and informal and post training and addressed the issue of transfer of learning to the workplace. Project based training, which emphasizes the casual transfer of knowledge among group members, blends the formal and informal phases. PBL participants learn from each other as well as from the program content (Marcris, 2011; Leidner and Jarvenpaa, 1995) and execute the learning program in a genuine setting. It has been difficult to assess cognitive outcomes of BA training during the learning period as benefits need to be measured over time, post learning, once the users are back on their jobs (Gupta, Bostrom and Huber, 2010). Published end user learning research does not report any suitable measurement models that can be used during the learning period to make cognitive outcome assessments, thus creating a gap in the research literature. The authenticity of the environment posed by project based learning, which demands participants execute genuine workplace tasks, supports the assessment of cognitive outcomes (Santhanam and Sein, 1995). Developing a framework to allow end users to self-assess the outcomes at the end of the training program holds promise.

2 RESEARCH GOALS

The goals of this research are to develop an innovative project based BA learning program that can enhance the participant's motivation to learn along with a measurement model (extended from the Technology Mediated Learning (TML) framework in Gupta, Bostrom and Huber, 2010) to explore the factors that contribute to higher cognitive outcomes. Using a field study among participants, who took part in an innovative project-based learning program, this study has the following research goals:

1. Ascertain the benefits of project based learning for BA tools on individual motivation and cognitive outcomes.
2. Build and validate a measurement model of end user BA learning that extends the TML framework by adding a construct for group interactions.
3. Validate that the above model can successfully predict the level of cognitive outcomes of the participants.
4. Understand the relationships between model constructs - individual motivation, group interactions and project based learning program characteristics on cognitive outcomes.

3 BACKGROUND THEORY

In the Technology Mediated Learning (TML) framework, the learning structures (or scaffolds) support the delivery of the learning content (Gupta, Bostrom and Huber, 2010). The learning structures together with the content impact the learning outcomes of the participants. Individual differences such as motivation, also play a role in how the learning program can impact each end-users' learning process and outcome (Gupta, Bostrom and Huber, 2010). Enterprise BA application users must grasp and integrate cross-functional knowledge so they can communicate and work cooperatively with users in other business functions (Wang and Ramiller, 2009). Based on situated learning theory, effective group learning programs must require that group members reflect upon their learning and contribute their experiences, observations and insights back into the group's collective discourse in a team-based collaborative setting (Wang and Ramiller, 2009). Such learning content also fosters joint work, the need for business problem solving and reflection and sharing of insights among the team members (Ryan and Deci, 2000).

Shared cognition theory focuses on individual learning within a social situation, allowing for social interactions that support the individual's cognitive development with help from more capable team members and peers. Each participant brings their own experience and expertise to share their knowledge with the team. There is a constant interaction and collaboration among participants that allows each individual to develop more improved skills in solving problems, than if they worked alone (Sharda, et.al., 2004). The joint experience allows each participant to explore the scenarios from other user's perspectives and helps them to create new meanings and explanations through shared understanding and practical use to perform specific tasks (Chang and Chou, 2011).

Motivation theory has also been often used to understand the individuals' IT adoption and learning behaviour (Ryan and Deci, 2000). Motivation theory suggests that individual behaviour is determined by two fundamental types of motivation: extrinsic (utilitarian) motivation and intrinsic (hedonic) motivation (Ryan and Deci, 2000). Extrinsic motivation refers to performing an activity because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself, such as improving job performance, pay, or promotion (Ryan and Deci, 2000). Extrinsic motivation has been found as significant predictors of BA tool adoption (Igbaria, Parasuraman and Baroudi, 1996). On the other hand, intrinsic motivation emphasizes the importance of having an enjoyable and playful learning experience (Sallam, et, al., 2011). Intrinsic motivation refers to performing an activity for no apparent reinforcement other than the process of performing the activity per se, such as participation in learning (Ryan and Deci, 2000). In the context of learning new technologies, extrinsic motivation emphasizes an individual's personal gain associated with the technology (Ryan and Deci, 2000).

4 RESEARCH MODEL

The research model is displayed in Figure 1. The research constructs along with research hypotheses are defined in the following subsections.

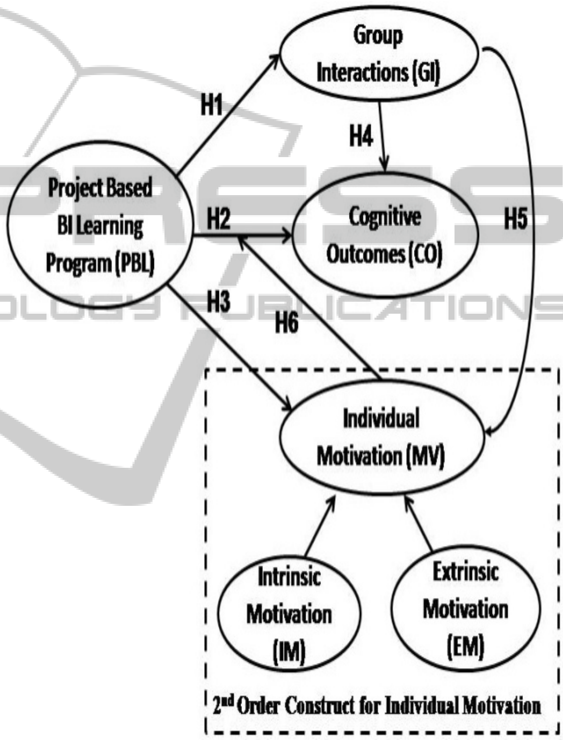

Figure 1: Research Model.

4.1 Cognitive Outcomes (CO)

Cognitive outcomes (CO) focus on the mental awareness and judgments of the participants. If cognitive outcomes are emphasized in the learning program, then the participants build the capability to apply their learning in real world scenarios (Gupta, Bostrom and Huber, 2010). They grasp the path to apply the acquired knowledge of BA tools and methods towards effective modelling and analysis of businesses scenarios so that appropriate KPI's can be selected and calculated from organizational data. Cognitive outcomes also include the growth of self confidence to allow the transfer of the learning to new situation that require understanding the

SCITEPRESS SCIENCE AND TECHNOLOGY PUBLICATIONS

interactions of multiple parts of a complex organization.

4.2 Project based Learning (PBL) Impacts CO

Project based learning (PBL) content refers to instructional methods that encourage users to work together to accomplish shared goals, beneficial to all (Marcris, 2011; Alavi, Wheeler and Valacich, 1995; Leidner and Jarvenpaa, 1995). PBL is a constructivist approach that engages participants in solving real world problems. Learning structures refer to the scaffolds that support the delivery of the content. Learning from peers is an important component in project based learning as "*peers contribute to task orientation, persistence and motivation to achieve*" (Leidner and Jarvenpaa, 1995). To mimic real-world problems, which are typically ill-structured, the assigned projects should be loosely defined initially to require the groups to collaborate extensively in order to characterize the project scope. When the project groups are given a great deal of autonomy to design and build their BA project, it forces the participants to grasp integrative knowledge so that they can communicate and cooperate closely with other members (Chang and Chou, 2011). Collaborative project based learning (PBL) content refers to the presence of these characteristics of collaboration – joint work, the need for business problem solving and reflection and sharing of insights among the team members (Alavi, Wheeler and Valacich, 1995). The learning program must also put forward and emphasize a rigorous and proven methodology to launch the group efforts on a strong foundation. This way, the groups understand the process to navigate the typical pitfalls of a BA project - conflicting goals, contexts, obstacles and unknowns. The content and structure of the PBL program influences group work, therefore, we state:

Hypothesis #1: Project Based Learning (PBL) has a Significant Positive effect on the Level of Group Interaction (GI).

BA applications can offer several benefits that include improving timeliness and quality of the decision making process, providing actionable information delivered at the right time, enabling better forecasting, helping streamline operations, reducing wasted resources and labor/inventory costs, and improving customer satisfaction (Chaudhuri, Dayal, Narasayya, 2011; Yeoh and Koronios, 2010 and Negash, 2004). The repeated interaction between participants in the project groups creates a set of norms, trust and mutual understanding that bind the participants together and facilitate better interactions, both during and post learning (Chang and Chou, 2011). These project interactions allow the members to exchange practical knowledge and fill in the gaps in their understanding of the BA application and cross functional impacts. The knowledge sharing and repeated group interactions fostered by the PBL program during the collaborative group project promotes greater cooperation, bridges gaps in understanding and increases cognitive learning outcomes (Chang and Chou, 2011). The users learn the practical use of BA tool and methods by participating in genuine real world experiences.

Hypothesis #2: Project Based Learning (PBL) has a Significant Positive Effect on the Level of Cognitive Outcomes (CO).

Problem based learning that uses authentic, complex scenarios created an impetus for learning in order to apply that knowledge to solve the problem assigned (Uribe, Klein and Sullivan, 2003). Group projects require individuals to cooperate and work together but have significant learning benefits of efficiency and productivity (Baskin, Barker and Woods, 2005). Such projects allow individuals to learn to face authentic situations, to share multiple perspectives and support each other to accomplish a greater outcome by imposing control over individual behaviours to meet the group's expectations of performing group assigned roles. Group projects become agents of socialization and control and act as a motivational tool (Baskin, Barker and Woods, 2005). Therefore, we expect that if individuals perceive these benefits of project based learning, they may become more motivated to learn and effectively utilize BA applications.

Hypothesis #3: Project Based Learning (PBL) has a Significant Positive Effect on the level of Individual Motivation (MV).

4.3 Group Interactions (GI)

Group theories suggest that many factors can influence the outcomes of group-based learning (Sharda, et.al., 2004). This includes group characteristics, such as composition (level of homogeneity and heterogeneity), amount of group cooperation and the nature of group communications. Group influence has been found to emanate from a variety of sources (Agarwal, 2000; Lewis, Agarwal and Sambamurthy, 2003), including co-worker, supervisor, and friends. In working organizations, co-workers and supervisors are influential in determining technology acceptance behavior (Schmitz and Fulk, 1991).

For successful cognitive outcomes, group interactions must be optimized along with training content and delivery structures (Sharda, et.al, 2004). In collaborative group learning, the team members share goals and learn together by working jointly and solving the problems posed by the project. The group interactions play a critical role in the learning environment through the size and heterogeneity of the team. The more diversity in the team, there is more likely to be integration of knowledge from multiple functional areas. Research has shown that when team members are from differing backgrounds, the discussions and knowledge sharing is more intense leading to create more group decisions (Sharda, et.al., 2004). Group interactions impact learning outcomes by developing diverse knowledge and building broader perspectives that span business functions (Seethamraju, 2008).

Hypothesis #4: The Level of Group Interaction (GI) has a Significant Positive Effect on the level of Cognitive Outcomes (CO).

Group interactions (GI) comprise factors such as if team members shared diverse view points and if such interactions were valued as well as the nature of cooperation and the level of dialog achieved within the team. Greater cooperation and dialog among a diverse team allows them to build identification giving them a broader vision to further enhance cross functional learning (Chang and Chou, 2011). In group based training programs, team members from different functional areas work together and influence each other's motivation by voicing demands for contributions. The level of interaction within the group also facilitates individual engagement with the learning program.

Hypothesis #5: The level of Group Interaction (GI) has a Significant Positive Effect on the level of Individual Motivation (MV).

4.4 Individual Motivation (MV)

Individual differences influence the formation of mental models, which represent the outcomes of the learning process (Gupta, Bostrom and Huber, 2010). "States" (such as motivation) are general influences on performance that vary over time and include temporal factors such as motivation level and interest level while "traits" (such as preferred learning style are static aspects of information processing affecting a broad range of outcomes over time (Bostrom, Olfman and Sein, 1990).

Motivation theory has been used often to understand individuals' IT use and learning behaviour (Van Der Heijden, 2004; Tharenou, 2001). Motivation theory suggests that individual behaviour is determined by two fundamental types of motivation: extrinsic (utilitarian) motivation and intrinsic (hedonistic) motivation (Alavi, Wheeler, and Valacich, 1995). In the context of project based learning programs, the individual characteristics from the TML framework is measured using individual motivation as states and individual learning style as traits. (Note: individual learning styles is used as a demographic variable and is not part of the research model of this study

Hypothesis #6: The level of Individual Motivation (MV) Moderates the Relationship between Project based Learning (PBL) and Cognitive Outcomes. (CO).

5 DATA COLLECTION

The study involved a 4 week face to face learning program for a leading vendors BA tools. There were 74 participants in the 4 week program and they were provided 2 hours/week of instruction about analytics methods, principles and case studies as part of the theoretical portion of the learning program. This was coupled with a practicum that required the participants to use the CRISP-DM (www.crisp-dm.eu) methodology to define and implement a business analytics project. As the methodology requires the involvement of business users to help define user scenarios, the participants were given access to a BA consultant and clients in the energy industry. A large data set was extracted from the client company's ERP system and provided to the participants to work with. The data set contained financial, production (OPEX), materials, exploration project management (CAPEX), human resources, and operational maintenance, training and safety data.

The 74 participants were divided into small groups (4-5 members) and assigned a BA project scope, such as human resources, supply chain, financial management and energy exploration. The first objective of the participants was to thoroughly understand, from a business perspective, what their assigned business customer really wanted to measure and accomplish with the BA project. The participants documented the business use cases and made decisions on how to utilize the data set to support the KPI's deemed necessary by the business user. The groups then designed and built BA dashboards that displayed the functional variables and relationships (in the data). They designed quantitative KPI models to add “what-if” scenarios with the BA tools. Contacts in the client energy company and the BA consultant were available during the entire duration of the project to answer questions and review project scope and designs. Three formal face to face review meetings were arranged to review dashboard projects at weekly intervals with the BA consultant to establish a realistic performance expectations.

The project work was supplemented with lectures on various topics such as business analytics models and case studies, requirement gathering and documentation, dashboard design, data modelling and management, and project management. The sequence and content of the 4 week project based BA learning program is listed in Table 1. A survey was administered at the end of the 4th week after the projects were submitted by the groups.

Table 1: Ba learning program schedule.

Wk	Theoretical Topics	Practical Group Work
1	1. BA Case Study (Ghosh and Scott, 2011) 2. Business Use Cases & Requirements 3. CRISP-DM 4. Data Visualization	1. Analyze Case Study and Understand nuts and bolts of a BA Project 2. Use Visualization Tool on data sets to understand data relationships.
2	5. Key Performance Indicators (KPI) 6. Modelling approaches 7. Information Lifecycle and Data Quality	3. BA Tool training 4. Identify suitable KPI for the use cases 5. Build logic based model
3	8. Data management and storage options (ETL) 10.Predictive Analytics and data Relationships	6. Identify Input data and sources 7. Data Storage Design 8. Build and test prelim project & user reviews
4	11. Unstructured data, Text Mining, Big Data, Real Time Analytics 12. BA project Feasibility	9. Add “what-if analysis” model to BA project 10.Build, test, final project 11. Project Retrospective

6 ANALYSIS AND RESULTS

The demographic data of the participants is listed in Table 2. It shows that the preferred learning style of the participants was “learning by doing”, followed by “learning by thinking and watching”. All of these learning styles are supported by the group project based learning format used in this BA program. Some of the participants commented on the group interactions and the need to interact to define the projects.

The survey data was analyzed with SPSS to ascertain measurement validity of the multi item survey constructs. The constructs – Group Interactions (GI), Intrinsic Motivation (IM), Extrinsic Motivation (EM) and Cognitive Outcomes (CO) were modelled as reflective, while the Project Based Learning (PBL) construct was modelled as formative. The Individual Motivation (MV) construct was modelled as a second order construct using the IM and EM constructs. The measurement model, the paths and relationships among the constructs were tested with Smart-PL structured equation modelling (SEM) software to test the hypotheses.

Table 2: Survey Demographics (Total =74 responses).

Variable	Mean	Standard Deviation
Hrs/week on Project	4.43 hours	1.74 hours
Preferred Learning Styles	Learn by Doing (48); Learn by Thinking (27), Learn by watching (22); Learn by Feeling (7) (*Note: Some users Selected multiple learning styles*)	
BA Project Scope	Human Resources (19); Supply Chain (21); Financial Controlling (22), Energy Exploration Operations (12)	
Participant Comments about Project Experience	1. Needs more definition; 2. Defining the scope of what to accomplish made it difficult; 3. Interesting project. 4. Most difficult part was dealing with the messy data. 5. Project was frustrating and at first, then we figured it out; 6. Working with 3rd party was difficult; 7. Smaller groups would allow faster design. 8. Group work was very helpful.	

In PLS, validation is done using the composite reliabilities (CR) and average variance extracted (AVE) from the measurement model. The CR should be greater than 0.7. The AVE measures the variance captured by the indicators relative to measurement error and it should be greater than 0.5. Moreover, the square root of each construct’s AVE needs to be greater than the correlation of the construct to the other latent variables to demonstrate discriminant reliability. As seen from Table 3 and 4, the composite reliabilities for all measures were high ranging from 0.7045 to 0.9088. Moreover, the AVE values are above 0.5 and the square root of the AVE of each construct is greater than the correlation of that construct with other constructs, respectively (Table 3). Consequently, evidence for internal consistency and reliability of the measurement model are supported by these results (Tables 3 & 4).

SCIENCE AND TECHNOLOGY PUBLICATIONS

Table 3: Latent Variable Correlations & Square Root of AVE (in bold).

	EM	GI	IM	CO	PBL
EM	**0.8184**				
GI	0.4327	**0.7824**			
IM	0.6217	0.4748	**0.9088**		
OUT	0.5838	0.4488	0.6275	**0.8054**	
PBL	0.6233	0.6068	0.6270	0.7019	**0.7045**

Smart-PLS, v2.0, was used to test the 6 research hypothesis in the model. A bootstrap re-sampling procedure was conducted using 200 samples and path coefficients were re-estimated using each of these samples (Chin, 1998). The results of the hypotheses testing is shown in Table 5 and indicate support for 5 hypothesis at the 99% confidence level. The hypothesis H4 (Group Interactions with Cognitive Outcomes) was only supported at the 95% confidence level (not at 99% confidence).

Table 4: Measurement Model Reliability, R-square.

Construct	AVE	Composite Reliability	R-Square	Cronbach Alpha
GI	0.6122	0.8873	0.3682	0.8439
IM	0.8260	0.9047	n/a	0.7895
EM	0.6698	0.8143	n/a	0.6907
CO	0.6488	0.8805	0.6344	0.8189
PBL	n/a	n/a	0.4964	n/a
MV	n/a	n/a	0.4931	n/a

Table 5: Hypothesis Testing (99% significance).

Hypothesis	Path	StdErr	T-Stat	Sig
H1: PBL -> GI	0.6254	0.0651	9.3268	YES
H2: PBL -> CO	0.4385	0.2777	1.9690	YES
H3: PBL -> MV	0.4419	0.1175	3.8873	YES
H4: GI -> CO	0.3447	0.2589	1.6956	NO*
H5: GI -> MV	0.3215	0.1498	2.2727	YES
H6: PBL * MV-> CO	0.2516	0.0576	2.5270	YES

*- hypothesis H4 significant at 95% confidence

The results of the PLS analysis finds evidence to support the notion that project based BA learning programs promote strong group interactions that drive to increase participant motivation. The contents of the learning program, such as the use of authentic real-world scenarios, the involvement of external business people and the diversity in the participant backgrounds supports building higher cognitive outcomes of the participants. The level of individual motivation is also found to moderate this relationship between PBL and cognitive outcomes. The level of group interactions also increases the level of cognitive outcomes (at the 95% confidence level).

7 CONCLUSIONS

Many organizations find that data-driven decision making is difficult to implement due to reasons such as poor quality and incompatibilities of transactional data, complicated algorithms to process the data and the end-user time involvement necessary for learning to use the analytics techniques and tools. Business analytics (BA) applications have gained significant attention as a viable option to incorporate the use of large sets of data to address the challenges of making complex business decisions. Market leading BA tools have the potential to facilitate data driven decision making by allowing easier data manipulation, visualization and processing. However, the complexity and diversity of BA tools and their functional boundary spanning nature make their learning difficult at the individual level. Recent research has found that individual motivation and group support as important determinants that influence an individual's decision to learn and use BI tools.

This study aims to contribute to the body of knowledge by developing an innovate project based learning program for BA tools and building a model to measure the effect of the PBL program on individual motivation and cognitive outcomes of the participants. The developed PBL program allows users to learn the concepts of BA collectively and is supported by a market leading BA tool. The unique features of the program are (1) use of actual real world client data and (2) availability of client business users to allow the participants to collect analytics business requirements, (3) the functional diversity of group members and (4) the iterative approach to the project development using periodic reviews. A validated model of measuring BA cognitive outcomes from PBL is a product of the study.

7.1 Future Work

While this study was done in a face to face learning setting, much of today's end user learning occurs online. The author plans to extend the study to an online learning setting with the same BA learning program to assess cognitive outcomes. The generalization of the research model to the online environment will allow its use for Massive Online Courses (MOOC) and provide a vehicle for measuring cognitive outcomes of the participants. MOOCs represent a new educational delivery opportunity, whose potential pedagogical impact needs to be researched (Fox, 2013). According to a

SCITEPRESS SCIENCE AND TECHNOLOGY PUBLICATIONS

Gartner survey (Gartner, 2013), business analytics and analytics were a CIO's top technology priority in 2012 and 2013 and it is expected that the global market for BI tools would reach $14 billion in 2013. The term "Big Data" is used to refer to the emergent field of analytics using data being created external to the company. Currently 4 EB of data are created each day and this number is doubling every 3 years. Recent IBM estimates suggest that 4.4 million big data analytics jobs related to collecting and processing such data made available through the internet will be created by 2015 (IBM, 2014). The possibility to efficiently deploy effective BA learning to a much wider community by supplementing online content with real world project experience presents unique prospects.

REFERENCES

Agarwal, R. 2000., Individual Acceptance of Information Technologies in Framing the domains of IT management: Projecting the future through the past, Pinaflex Publishers, ISBN 97818936709, pp. 85-104.

Alavi, M., Wheeler, B.C. and Valacich, J.S. 1995. Using IT to Reengineer Business Education: An Exploratory Investigation of Collaborative Tele Learning, *MIS Quarterly* 19(3), pp. 293-312.

Baskin, C., Barker, M. and Woods, P. 2005. When group work leaves the classroom does group skills development also go out the window*?, British Journal of Educational Technology* 36 (1), pp. 29-31.

Bose, R. 2009. Advanced Analytics: Opportunities and Challenges, *Industrial Management & Data Systems*, 109(2), pp. 155-172.

Bostrom, R.P., Olfman, L. and Sein, M.K. 1990. The Importance of Learning Style in End-User Training, *MIS Quarterly* 14(1), pp. 101-119.

Chang, H.H. and Chou, H.W. 2011. Drivers and effects of Enterprise Resource planning post-implementation learning, *Behaviour and Information Technology* 30 (2), March-April, pp. 251-259.

Chin, W.W. 1998. , Issues and Opinions on Structural Equation Modeling, *MIS Quarterly* 22(1), pp. 7-16.

Chaudhuri, S., Dayal, U., and Narasayya, V. 2011. An Overview of Business Analytics Technology, *Communications of the ACM*, 54(8), pp. 88-98.

Compeau, D., Olfman, L., Sein, M. and Webster, J. 1995. End-user training and learning, *Communications of the ACM*, 39 (7), pp. 24-26.

Fox, A. 2013. From MOOCs to SPOCs, *Communications of the ACM*, 56 (12), pp. 38-40.

Gartner, 2013. Gartner Executive Program Survey of More Than 2,000 Cios Shows Digital Technologies Are Top Priorities in 2013, in: Book Gartner Executive Program Survey of More Than 2,000 Cios Show.

Ghosh, B., Scott, J. E. 2011. Antecedents and Catalysts for Developing a Healthcare Analytic Capability. *Communications of the Association for Information Systems*, Volume 29, article 11, pp. 1-11.

Gupta, S., Bostrom, R.P. and Huber, M. 2010. End-User Training Methods: What we know, Need to Know, The DATABASE for Advances in Information Systems 41(4), pp. 9-39.

IBM, "IBM narrows Big Data Skills Gap by Partnering with More than 1,000 Global Universities", http://www-03.ibm.com/press/us/en/pressrelease/41733.wss Accessed on June 24, 2014.

Igbaria, M., Parasuraman, S., and Baroudi, J.J. 1996., "A Motivational Model of Microcomputer Usage", Journal of management information systems, pp. 127-143.

Leidner, D.E. and Jarvenpaa, S.L. 1995. The use of Information Technology to enhance Management School education: A theoretical view. *MIS Quarterly* 19(3), pp. 265-291.

Lewis, W., Agarwal, R., and Sambamurthy, V. 2003. Sources of Influence on Beliefs About Information Technology Use: An Empirical Study of Knowledge Workers*, MIS Quarterly*, 27(4), pp. 657-678.

Macris, A.M. 2011. Enhancing Enterprise Resource Planning users' understanding through ontology-based training. *Computers in Human Behavior*. 27(4), pp. 1450-1459.

Negash, S. 2004., Business Analytics, *Communications of the Association for Information Systems*, 13(1), pp. 177-195.

Ryan, R.M. and Deci, E.L. 2000. Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions, *Contemporary Educational Psychology* 25, pp. 54-67.

Santhanam, R. and Sein, M. 1995. Improving End-usr Proficiency: effects of Conceptual Training and Nature of Interaction. *Information Systems Research* 5(4), pp. 378-399.

Sallam, R.L., Richardson, J., Hagerty, J., and Hostmann, B. 2011., Magic Quadrant for Business Analytics Platforms", in Book Magic Quadrant for Business Analytics Platforms, Gartner.

Schmitz, J., and Fulk, J. 1991., Organizational Colleagues, Media Richness, and Eletronic Mail: A Test of the Social Influence Model of Technology Use, *Communication Research*, 18(4), pp. 487-523.

Seethamraju, R. 2008. Enhancing Student Learning through ERP Business Simulation Game, *Proceedings of the AIS SIG-ED IAIM Conference*.

Sharda, R., Romano Jr., N.C., Lucca, J.A., Weiser, M., Scheets, G., Chung, J.M. and Sleezer, C.M. 2004. Foundation for the Study of Computer-Supported Collaborative Learning Requiring Immersive Presence, *Journal of Management Information Systems* 20(4), pp. 31-63.

Tharenou, P. 2001. The Relationship of Training Motivation to Participation in Training and Development, *Journal of Occupational and Organizational Psychology*, 74(5), pp. 599-621.

Uribe, D., Klein, J.D. and Sullivan, H. 2003. The Effect of Computer Mediated Collaborative Learning on Solving ill-Defined Problems, *ETR&D* 51(1), pp. 5-19.

Van Der Heijden, H. 2004., User Acceptance of Hedonic Information Systems, *MIS Quarterly*, pp. 695-704.

Wang, P. and Ramiller, N.C. 2009. Community Learning in Information Technology Innovation, *MIS Quarterly* 33(4), pp. 709-734.

Yeoh, W., and Koronios, A. 2010., Critical Success Factors for Business Analytics Systems, *Journal of computer Information systems,* 50(3), pp. 23.

APPENDIX

The Survey Instrument is below:

Average hours/week spent on Project_____
Business Function ___________________
PJ1-The project methodology was well defined from the beginning
PJ2-I believe the project was a complex and authentic business scenario
PJ3-The project gave me a lot of autonomy and freedom
PJ4- The project required joint work and problem solving
PJ5- The project required the sharing of diverse and multi-functional insights
CO1-I mastered cross functional knowledge, which transcends just knowing the technical skills
CO2- I was able to identify learning strategies that I can use in future projects
CO3-I am confident that I can do another business analytics project in the future
CO4- The project improved my appreciation of the value of using business analytics tools
GI1-There was a lot of teamwork and cooperation in my group
GI2- My contributions were valued by my group members
GI3-I learnt from the knowledge shared by my group members
GI4-My group engaged in a lot of dialog and discussion
GI5-I learned from the different functional perspectives shared by group members
IM1-I worked hard on the project as I wanted to learn as much as I could
IM-2-I worked hard on the project as the project game me a lot of personal satisfaction
IM3-I worked hard on the project as it was very challenging
EM1-My team mates motivated me to work harder on the project
EM2-I worked harder on the project as I did not want to let my team mates down
EM3-I worked harder on the project only to get a better evaluation.

When I learn …. (Rate the following from 1-4):
I like to deal with my feelings _____
I like to think about ideas ______
I like doing things ___
I like to listen and watch _____

SCITEPRESS
SCIENCE AND TECHNOLOGY PUBLICATIONS