



International Journal of Emerging Technologies in Computational and Applied Sciences (IJETCAS)

www.iasir.net

Identifying Communication Intelligence for Drug Adoption in India

¹D. Goswami*, ²N. Jain, ¹D. R. Agarwal

¹ Institute of Technology Management University, Gurgaon,

²India Management Development Institute, Gurgaon, India

Abstract: Most of the researches on drug adoption concentrate on suppliers' environment of new drug development and diffusion. Very little research considers on understanding of intention of drug usage through physician-patient interactions. This research investigates link between drug adoption and drug usage intention through communication intensity of physicians and patients within their drug usage relationships in India. A conceptual framework supports communication strategies to be developed based on disease complexities (type of disease and patients' lifestyle), physicians' self-confidence in the drug effectiveness and marketing incentives offered by pharmaceutical firms. An unstructured repertory grid survey involving fifteen physicians and a structured retrospective survey with two thousand patients at hospitals located in National Capital Region (NCR) were conducted to show the effects of firms' communication for drug usage. Data mining technique is used to analyse the data. The results show with increased marketing and word-of-mouth communication drug adoption for challenging disease also improves. An implication for managers is that both marketing and word-of-mouth communication operate through the firm's communication programming.

Keywords: Pharmaceutical branded drugs; communication strategies; intelligent framework; drug adoption

I. Introduction

Increasing R&D expenditure and strategic collaborations with international manufacturers in pharmaceutical industry in India in recent years indicate a shifting emphasis of the industry from high-volume generic drugs to high-value branded drugs (Porter and Lee 2013). However, despite these efforts, the rate of increase of sales of branded drugs is not very significant in the country (Dadhich and Upadhyay, 2011). Previous research seeking to explain the drug adoption level has primarily focused on the socio-economic conditions of the patients (Rogers RG, Hummer RA et al. 2000; Goldman Dana and Smith James P. 2002), while overlooking the development of communication infrastructure, in determining branded drug adoption for treating hypertension (Denig and Petra et al. 2007). Examining behavioural intentions of physicians linking cognition with communication intelligence address the challenges that branded drug adoption face (Gonul and Carter et al. 2012). This study addresses the limitation in healthcare supply chain where relationship among stakeholders i.e. patient, doctors and firm has not been optimized in an emergent market like India.

Theories related to branded drug adoption recognize the importance of relationship and communication among multiple stakeholders. For example, modern social capital theory accrues to firms' engagement in social relationships with influential stakeholders to gain access to needed resources (Lin 2001). Information diffusion theory explores the role of communication technologies to create awareness among the adopters and to persuade them about the usefulness of a new product (Roger, 1995). Although literature abounds examining the relationship between communication and new product adoption in healthcare (Ranjan, 2009), there is paucity of research on strategic communication network formation in Indian medical community for treating hypertension. The present study uses data mining technique to check if there is any patient related influence in ARB branded extension adoption. Secondly, the study shows how with increased complexity of diseases, communication intelligence is required to support new brand acceptance. For the first time, the study shows how reparatory grid and cognitive map can be used to explain the findings of data mining technique. The mixed mode research provides opportunity to identify factors for drug adoption in developing a framework that can be used in other emergent market as well. The remainder of this paper is organized as follows. Following this introduction, the next section of this paper presents literature review, methodology empirical results and discussion and future directions.

II. Literature Review

Indian pharmaceutical firms are now emerging as third-world multinationals with capabilities that could potentially challenge even multinational companies (MNCs) from the developed world (Chittoor and Ray 2007). Indian pharmaceutical industry is a destination for top tiered pharmaceutical MNCs of the world due to highly skilled task force, cheap labour and state of the art facilities. However, Indian pharmaceutical industry remains fragmented with over 23,000 companies (Ramani 2012). Concentration occurs at the top-end of the industry: the ten largest Indian pharmaceutical companies, with international marketing presence, control 36% of the market (Haley et al. 2012). Due to highly competitive market, success of internationalized pharmaceutical firms in

branded medicine segment is highly uncertain due to lack of intelligent communication practices or cognitive conflicts among decision makers for new prescriptions. Gorini *et al.* (2011) also supported the theory that human cognitive abilities are limited and cannot consider all the information available. One of the popular qualitative approach, phenomenological methods (Husserl, 1970; Moustakas, 1994), instrumental in dealing with confounding issues can be applied for an inquiry on physician's intention for drug adoption for both simple (for example treating hypertension) and complex diseases (like cancer). This paper continues with a presentation of the variety of qualitative analysis techniques, focusing on communication intensity of physicians and patients within their drug usage relationships.

To have insight on huge patient data in hospital repository, data mining techniques, as summarized in table 1, is applied to model large amount of data summarizing it into useful information or knowledge (Romero C. *et al.*, 2008). Nowadays, large amount of medical data / patient history is collected by health care organizations but lack intelligent tool (Kaur and Wasan 2006) for developing a decision model for their physicians.

Table1. Data Mining (DM) approaches in healthcare industry

Researchers	Knowledge Resources	Knowledge Types	DM Tasks	DM Applications
Jayanthi (2009)	Healthcare- Conceptual paper	Pharmaceutical industry	Clustering; Association; Classification and prediction	Drug Development, Discovery, Clinical trials
Lavrac <i>et al.</i> (2007)	Healthcare-Research paper	Health-care providers database; The out-patient database and medical status database	Classification ; Clustering	Clustering Methods: Agglomerative; Classification;
Hwang <i>et al.</i> (2008)	Healthcare-Research paper	Knowledge Measurement Conversion and Transfer	Knowledge Dependency Modeling	Sequential pattern Analysis
Antonelli <i>et al.</i> (2013)	Healthcare-Research paper	out-patient + medical status ; Data analysis framework	Disease Management; Clustering	Multiple-level clustering; DBSCAN algorithm
Abdullah A. <i>et al.</i> (2013)	Healthcare-Research paper	Diabetic treatment ; predicting mode in different age group	Treatment management; Regression model; Oracle data Miner	Support vector machine
Ting-Ting Lee <i>et al.</i> (2011)	Healthcare-Research paper	Hospital Information system; Clinical data modeling	Disease management; Artificial neural network and Regression Analysis	SPSS for stepwise logistic regression; Statistica 8.0 for Artificial Neural network

The social influence in form of positive word of mouth (WOM) communication intensifies physician –physician interaction (Tulikaa, 2011; Lee and Koo 2012) supporting consumer satisfaction i.e. adoption (Webber 2011; He and Bond 2013) while when negative WOM transactions happen (Gheorghe and Liao 2012) rejection or brand switches is cognitive outcome. This study using principles of attitude model (Ajzen 1991) focuses to analyze consumer / adoptee's characteristic (Ronteltap *et al.* 2007) necessitating a communication infrastructure for success of new brand marketing in hypertension and cancer disease segment.

III. Approach / Research Design

Researcher used repertory grid and cognitive maps to provide solution to the complexity of diverse issues of decision making as summarized in table 2.

Table 2: Application of cognitive map and repertory grids in qualitative research methodology

Sr. No.	Models in Healthcare	Methodology	Application	Year, Ref
1	Cognitive Map	Bipolar construct; fuzzy estimation	Decision –support	2008;(6)
2	Cognitive Map	Conflict path; feedback loop	Business -process redesign	1999; (7)
3	Cognitive map	cognitive map and semantic influence	Political Environment	2014; (8)
4	Cognitive map	Venn Diagram; Dimension classification	Chronological development International Business	1997; (9)
5	Mental model	Triangulation of method- using variance theory, process theory	Business to Business decision making	2014, (10)
6	Cognitive map	Hierarchical clusters	Group-Decision Support System	2004 (11)
7	Cognitive Map	adjacent matrix , inference process	Online community voluntary behaviour	2007 (12)
8	Causal Map	Multi-Criteria Decision; Analysis techniques	Decision Support	2011 (13)
9	Repertory Grid	Computer based and Paper based	Interpretation and analysis	1980 (14)

10	Repertory Grid	Content and structure of construct	Interpersonal skill of nurses	1989 (15)
11	Repertory Grid	focus group; generalized Procrustes analysis	food product technologies	2007 (16)
12	Repertory Grid	Analysis , Validity Reliability	interpretive; software engineering	2009 (17)
14	Repertory Grid	Content Analysis, generalized procrustes analysis	tourist food consumption	2013 (18)
15	Repertory Grid	Systems Thinking Hierarchy (STH)-model-Repertory Grid Maps	Student's thinking ; Ecological complexity	2014 (19)
16	Repertory Grid	Positive and negative syndrome scale	Cognitive therapy model	2014 (20)
17	Repertory Grid	Likert scale Questionnaire	Clinical Mobile Learning System	2011 (21)

Implementing knowledge management framework, data mining is applied first on patient's data to check if medical decisions for simple disease like hypertension management is dependent on doctor-patient shared decision making. Further, using focus group interview, employing repertory grid technique, causal map is constructed to show how with increase in disease complexity scope of shared decision making increases.

A. Data mining method and its applications

The research objective has been targeted to propose a patient- centric medical solution for Indian healthcare settings using knowledge mining (Jiawei H. and Kamber M. 2000) technique. Fayyad et.al. (1996) define six main functions of data mining:

1. Classification is finding models that analyze and classify a data item into several predefined classes
2. Regression is mapping a data item to a real-valued prediction variable
3. Clustering is identifying a finite set of categories or clusters to describe the data
4. Dependency Modeling (Association Rule Learning) is finding a model which describes significant dependencies between variables
5. Deviation Detection (Anomaly Detection) is discovering the most significant changes in the data
6. Summarization is finding a compact description for a subset of data

The integration of information and communication intelligence in healthcare practice will support physicians' medical decision making (Lupiáñez-Villanueva et al. 2010). The exploratory research study is designed based on convenience sampling method. It is a non-probability sampling technique where subjects are selected because of their convenient accessibility and proximity to the researcher. Since physicians are easily available in hospitals, clinic or dispensaries with prior appointment survey can be conducted with ease. Therefore we preferred convenient sampling technique because it is fast, inexpensive, easy and the subjects are readily available.

Seven years after Greving and Petitt et al. (2007) article however, there is still scant attention being paid to this critical aspect of drug adoption scale development using physician-patient communication relationship. The problem is further compounded when confounding issues persists while studying emerging market like India. The importance of shared decision making to increase cancer treatment efficiency has been identified in recent past (Olson and Bobinski et al. 2012; Frongillo and Feibelman et al. 2013; Thorne and Oliffe et al. 2013). Therefore studying the communication dynamics employing causal maps, to have insight on provider-consumer partnership thereby improving cancer treating drug adoption, becomes imperative. The patient characteristic was evaluated by data mining (Lee et al. 2011). In this paper, the application of data mining technique is discussed such as Classification, Association Analysis and Outlier Analysis in healthcare.

IV. Methodology and Data Collection

Data Modeling technologies and applications

Data mining has two primary objectives of prediction and description. Prediction involves using some variables in data sets in order to predict unknown values of other relevant variables (e.g. classification, regression, and anomaly detection). Description involves finding human understandable patterns and trends in the data (e.g. clustering, association rule learning, and summarization) as noted in earlier research summarized in table 7.

Methodology for data mining

Association analysis

Association analysis is the discovery of association rules showing attribute-value conditions that occur frequently together in a given set of data. Association analysis is widely used for market basket or transaction data analysis. The methodology for association rule is described briefly.

More formally, association rules are of the form $X \Rightarrow Y$, i.e., " $A_1 \wedge \dots \wedge A_m \longrightarrow B_1 \wedge \dots \wedge B_n$ ", where A_i (for i to m) and B_j (j to n) are attribute-value pairs. The association rule $X \Rightarrow Y$ is interpreted as database tuples that satisfy the conditions in X are also likely to satisfy the conditions in Y "(Jiawei H. and Kamber M. 2000).

In the health care system it can be applied as follows:-

(Symptoms) (Previous--- history) ----- > (Cause---of--- disease)

Rule Induction Method has the potential to use retrieved cases for predictions and can be used to predict the significant characteristic from a large set of population under study. The following example will predict whether the person is hypertensive based on the data taken from Table 3.

Table 3. The attributes which can cause hypertension

<i>Age</i>	<i>Gender</i>	<i>Alcoholic</i>	<i>Smoker</i>	<i>Hypertensive</i>
60	M	Y	Y	Y
75	M	Y	Y	Y
40	M	N	Y	Y
40	F	Y	Y	Y
56	F	N	N	N
34	M	Y	Y	Y
45	M	N	Y	Y

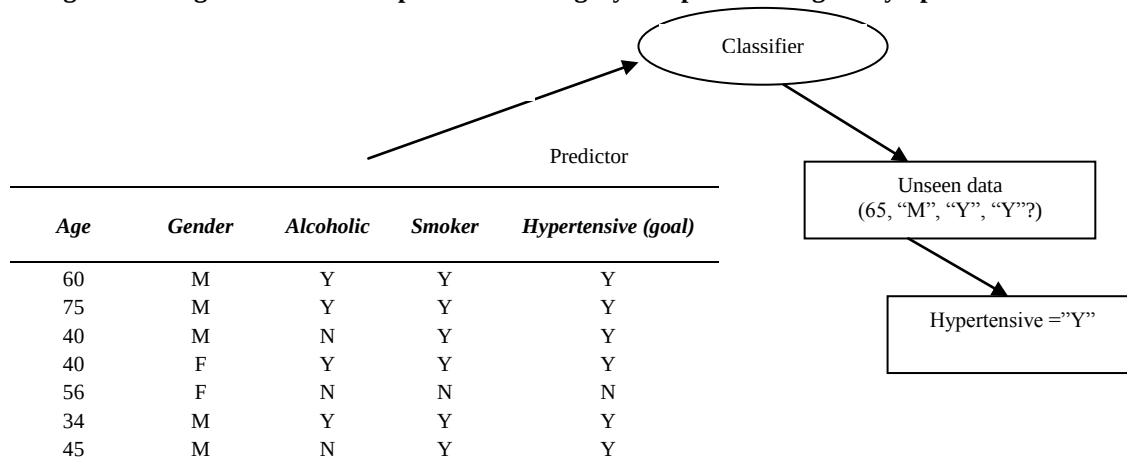
The association rules that can be generated and we can predict whether the patient is *hypertensive* or not depending on whether he is a *smoker*, an *alcoholic* or *both*. The support factor of the association rule shows that 1% of the persons are “*alcoholic*” and “*smoker*” is suffering from hypertension and confidence factor shows that there is a chance that 50% of the persons who are “*alcoholic*” and “*smoker*” can suffer from hypertension.

Classification

Classification is the process of finding a set of models (or functions) which describe and distinguish data classes or concepts, for the purposes of being able to use the model to predict the class of objects whose class label is unknown. The derived model may be represented in various forms, such as classification (IF-THEN) rules, decision trees, mathematical formulae, or neural networks. Classification can be used for predicting the class label of data objects. Given below is an example where we can apply the Classification Technique to predict whether the patient with the given symptoms will suffer from a particular disease or not. This data mining technology has currently presented a platform for consultant physician to use computer based prescription support system and survey report reveal that many young physicians are also comfortable with use.

There exist many possible models for classification, which can be expressed as rules, decision trees. Once the model is built, unknown data can be classified. In order to test the quality of the model its accuracy can be tested by using a test set. If a certain set of data is available for building a classifier, normally one splits this set into a larger set, which is the training set, and a smaller set which is the test set. Given below is diagrammatic representation of usage of classifier to predict the category of a person with the symptoms obtained from the dataset (Figure3).

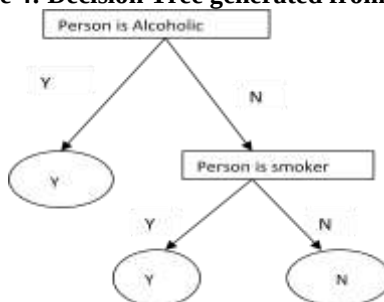
Figure 3: Usage of Classifier to predict the category of a person using the symptoms from the dataset



Classification by Decision Tree Induction

Decision tree can be used to classify an unknown class data instance. The idea is to push the instance down the tree, following the branches whose attributes values match the instances attribute values, until the instance reaches a leaf node, whose class label is then assigned to the instance. For example, the data instance to be classified is described by the tuple (Age=67, Gender=female, Alcoholic = "n", Smoker="y", Goal=?), where "?" denotes the unknown value of the goal instance. In this example, Gender and Age attributes are irrelevant to a particular classification task. The tree tests whether the person is alcoholic / smoker (depicted in figure 4).

Figure 4: Decision Tree generated from table3



The decision tree shown above is generated from a very small training set (table3). In this table each row corresponds to a patient record. We will refer to a row as a data instance. The data set contains three predictor attributes, age, gender, person is alcoholic, person is smoker and one goal attribute, namely hypertensive whose values (to be predicted from symptoms) indicate whether the corresponding patient is hypertensive or not.

Extracting rules from decision tree:-

Rules of the form of IF-THEN can be extracted from the decision tree which is easier to understand.

IF conditions THEN conclusion

This kind of rule consists of two parts. The rule antecedent (the IF part) contains one or more conditions about value of predictor attributes where as the rule consequent (THEN part) contains a prediction about the value of a goal attribute. An accurate prediction of the value of a goal attribute will improve decision-making process. IF-THEN prediction rules are very popular in data mining; they represent discovered knowledge at a high level of abstraction (Kaur H. and Wasan S.K. 2006). In the health care system it can be applied as follows:-

IF Alcoholic="Y" THEN Hypertensive="Y"

IF Smoker="Y" THEN Hypertensive="Y"

IF Alcoholic="Y" and Smoker="Y" THEN Hypertensive ="Y"

Outlier Analysis

The data stored in a database may reflect outliers-noise, exceptional cases, or incomplete data objects. These objects may confuse the analysis process, causing over fitting of the data to the knowledge model constructed. As a result, the accuracy of the discovered patterns can be poor. One of the applications of outlier analysis in healthcare can be to predict the abnormal values in the medical diagnosis of the patient (as presented in table 4).

Table 4. The dataset used for Outlier Analysis

Age	Sex	Alcoholic	Smoker	Hypertensive
60	M	Y	Y	Y
75	M	Y	Y	Y
40	M	N	Y	Y
40	F	Y	Y	Y
56	F	N	N	N
34	M	Y	Y	Y
75	M	N	N	N

The Outlier Analysis in this case will detect the highlighted value as an exceptional case as a person who is 75 years, alcoholic and a smoker is not hypertensive. Thus by using data mining technique large set of patient that these physicians prescribe can be modulated /computed using association rule of data mining technique. The role of medical informatics results in data reduction and provides insight how patient demographic variables influences drug adoption by physicians. Our study involved 2000 patient data from private hospitals from NCR region. Data mining analysis with patient records / prescriptions transacted is carried out using TANAGRA software. The significant pattern for new branded drug prescription could not be inferred using patient characteristics.

Method for obtaining elements

Stephens and Gammack (1994, p.176) argued in connection with this: 'When elements are provided by an experimenter, this can compromise subjects' freedom to choose elements meaningful to themselves and requires the experimenter to assume that a subject's construal of the elements is in some way compatible with the rationale for the choice of elements themselves.' Consequently, our first desideratum was that physician should be allowed to be actively involved in the process of selecting elements.

Representation of elements

In the standard repertory grid application, elements are mostly represented by visual abstractions or general descriptions created solely by the researcher. Traditional elements are often generalizations of a specific aspect of the problem that is under investigation. An example of such general elements could be pictograms

representing a variety of phrases which in turn represent different kinds of firms. A point of concern is that these sorts of generic elements might compromise the elicitation of personal meanings that are connected to physicians' own practices. Our goal was to obtain elements that could be considered authentic slices from physicians' life worlds. Accordingly, our second desideratum was that the elements were created in a spirit of cooperation and were authentic representations of physicians' day-to-day practicing practices in parallel to teaching perspective (Carlos A. van Kan et al 2010).

Standard method of eliciting constructs

The standard process of eliciting constructs from elements is known as the triadic method. The normal elicitation phrase would have the following structure: In what ways are the two elements (for example pupils) same and different from a third in terms of the particular topic under investigation (for example in terms of their potential). This triadic method is administered in order to capture the bipolarity of the construct. Because we wanted to work with embodied and contextualized elements (i.e. interactions in classroom situations), we considered this triadic method to be too complex. The issue of complexity overload, although mostly ascribed to the capabilities of the subject rather than the elements themselves, has been encountered in earlier research (Barton, Walton and Rowe, 1976). Our third desideratum, therefore, was that constructs were elicited using a simple method that has discriminating qualities.

Bipolarity of constructs

In the standard repertory grid procedure, the bipolarity of constructs has often been equated with constructs having to have a strictly dichotomous character (Millis, Neimeyer and Riemann, 1990), presenting clear-cut contrasting or opposite poles. In addition, most constructs in these studies have been evaluative, having a preferable and less preferable pole. Strictly dichotomous constructs, however, run the risk of reducing the complexity of the topic under investigation into unrefined black and white categories (Bonarius et al., 1984). More commonly, however, a structured interview is used involving client-therapist interaction. For this reason, it is important to encourage a relaxed atmosphere (for example cafeteria) where clients can express themselves without feeling judged. This interaction reveals interviewers' attitudes and indicates whether a genuine respect for the interviewee's own constructs exists. When carrying out the interview, the investigator must consider the phenomenological slant of the repertory grid method, whose goal is to obtain a clear representation of the interviewee's construction processes.

Physicians were selected from NCR hospital for repertory grid scaled interview. Reason being the physicians attached with private hospitals, do practice singly or in clinic with multi-disciplinary physicians visiting and hence are in touch with pharmaceutical companies through medical representatives. Fifteen MD doctors were chosen of which one is a lady gynecologist with 40 years of experience. Rest four participants were male with 5 to 20 years of practicing experience. These physicians were briefed initially that purpose of the interview – to understand the motive / impetus of selection of pharmaceutical companies while prescribing their medicines.

V. Results and discussion

Data Analysis

Coding of doctor's constructs for medicine preferences from different pharmaceutical firms

For data analysis, constructs were listed for each physician's interview. The reasons identified were unipolar, often simply descriptive of perceived quality characteristics /confidence achieved, and described using similar terms across subjects wherever possible. That is, although constructs were usually identified using the specific language of subjects, it was found that physician respondents frequently identified similar constructs even though slightly different wording was used. For example, they invariably described the 'new company/product' option as 'risky', 'not an option', 'least confidence', a 'no brainer (i.e. not keeping in memory)', and when asked to elaborate they would invariably attempt to get across the idea that 'F or G (small scale industry/new entrant)' was simply not a viable alternative because it had no previous track record in market. It was therefore decided to use the term 'risky / null' to describe this construct, and this label was then used in the subsequent questionnaires of all physicians who attempted to express this view. The identified bipolar opposites are continuum to figure out the construct space (as computed in table5).

Table 5: Bipolar Construct Relationship and identified elements

Bipolar Constructs- Relationship											Elements									
											Y		1	2	3	4	5	N		
Construct											Positive		Myself	GP	Specialist	Jr	Person Disliked	Negative		
Values	1	Product Characteristics	V1	A	Brand established product					N	N	Y	N	N	Brand	not established in market				
			V2	B	No complain with product					N	N	Y	N	N	Complain-	as brand not equally effective				
Attributes	2	Disposition to firms	A1	C	Big company / reputation					Y	Y	N	Y	N	Medium scaled company/reputation (1/2 brand)					
			A2	D	Prefer to prescribe new drug					Y	Y	N	Y	N	Don't prefer to prescribe new drug					
	3	Communication Intelligence	A3	E	Brand name stuck in mind					Y	Y	Y	Y	N	Failure to remember brand name					
			A4	F	Frequent calls = brand remembrance					Y	Y	N	Y	N	Failure to remember brand / less calls					
Personal Value	4	Relationship	C1	G	Personal interest with co. medicine					N	N	Y	N	Y	No Personal interest to prescribe					
	5	Personal confidence	C2	H	Risky to prescribe – product-new firm					N	N	N	N	N	Not risky; trv it out.					

The rating scale method is the most widely used. Each element is assigned a value in a Likert-type scale delimited by both poles of the constructs. For example, the applications of a construct within a seven-point scale would be:

GPA consensus plot:

The repertory grid method, describing a like word perspective on own terms (Jankowicz, 2004), elaborated the reasons underlying patient preferences—revealing individual differences not only in terms of treatment preferences, but also in terms of the range of reasons underlying these. The basic aspects of the repertory grid procedure entail: (a) formulating a topic of investigation; (b) defining a set of elements; (c) eliciting a set of constructs that distinguish among these elements; and (d) relating elements to constructs. Clearly we did formulate a topic of investigation i.e. the way physicians interpret the inherent moral meaning of their chamber interactions during practicing sessions. The second step in the standard repertory grid procedure is also accounted for, although the process of defining the elements was largely steered by the physicians themselves instead of the researcher. Even though we provided a structure for the selection of bumpy moments, the physicians themselves indicated the exact bumpy moments. The third step in the standard repertory grid procedure involves eliciting a set of constructs.

With this step we took the liberty to broaden the concept of bipolarity and adjust the method of elicitation to fit our research purpose. We chose to work with dilemmas, which helped the physicians to interpret their chamber interactions from competing perspectives. These perspectives are not necessarily strictly dichotomous, but do foster alternative ways of construing. Building on the dilemma structure already conveyed in every single bumpy moment, we decided that using more than one bumpy moment at a time makes the method of eliciting views unnecessarily complex. Finally the fourth step consists of relating elements to constructs. In the standard repertory grid application each element is rated on each construct to provide an exact picture of views on a particular topic, hence the word 'grid' (Jankowicz, 2004). We chose to seek the meaning behind the initial constructs of physicians, thereby focusing on qualitative rather than quantitative data. Putting the rating component aside, we drew upon several valuable aspects of the standard repertory grid application and insights from the personal construct theory. The term 'repertory' is however still accurate because it refers to a person's repertoire of meanings with regard to a certain topic. Consequently one could think of our method as a repertory interview instead of a repertory grid method.

GPA map

Laddering is a process of generating additional constructs from existing ones. It's done by asking why a particular construct poles are important, or by asking for further elaboration of an existing constructs. Using a "laddering" technique, asking for an explanation helps to remove biasness from subject to subject. The simplicity of responses is an advantage of the Repertory Test (Burton & Nerlove, 1976), with one researcher's data able to be interpreted quickly by another because "there is very little waffle" (Stewart & Stewart, 1981). For example, a common response in this study was "good beach", which is representative of a salient cognitive attribute. This response then formed the basis of the Laddering Analysis. The laddering procedure was used per triad, immediately following the elicitation of a salient attribute. The question "why is that important to you on a short break?" was repeated to move upwards from the cognitive attribute to consequence statements and ultimately the more abstract value statement. When a value statement had been reached, a new triad was used. Occasionally there was a need to ladder down from a consequence statement to elicit the cognitive attribute, and then ladder back up to the level of values. At the point when a participant could not identify any similarity or difference, one further triad was used.

When no more similarity/difference statements were elicited, a final question asked whether there were any other important destination features not already mentioned. All participants were able to reach the level of values for each completed triad. The 'no repeat' rule was applied at the level of attributes but not for consequences of values. Reynolds and Gutman (1988) were critical of many previous applications of Laddering Analysis in the marketing literature and so provided a detailed account of the procedure. The length of the interviews ranged from 21 to 56 min, with a mean of 42 min. The present paper offers a general overview on the main issues related to the decision making process in medicine. Starting from the consideration that, due to the bounded rationality and uncertainty that characterize every day choices, humans do not decide according to the normative theories, we have discussed the role of cognitive maps and biases in medicine employing repertory grid framework and their importance in promoting communication technologies driven approach between firms' representatives and physicians. The function of adoption is presented as below:

$$Y = f \sum x_1 \dots x_n$$

Y = extent of drug adoption; x = attributes of drug adoption

$$Y_1 = x_1 + x_2 + x_3$$

Figure 4a: Cognitive map for treating hypertension

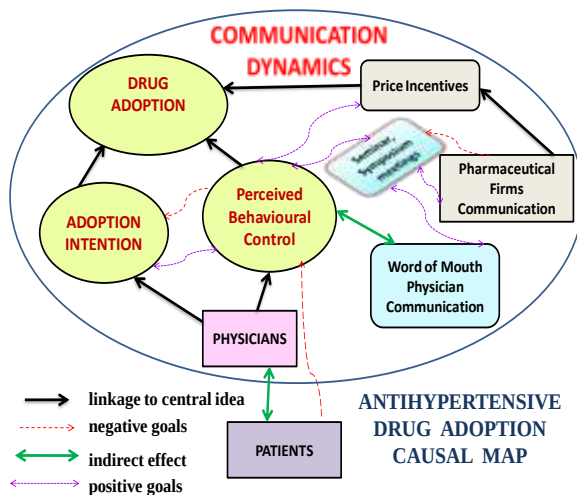
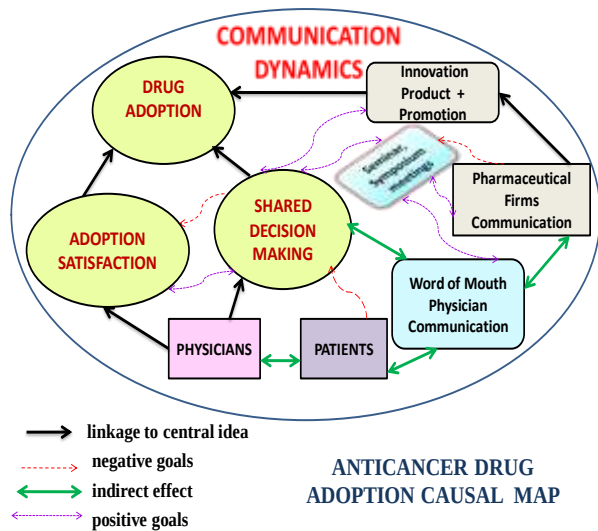


Figure 4b: Cognitive map for treating cancer



Interestingly, hypertensive patients, found outside the cognitive loop, echoed with data mining findings. Moreover, the negative goals show the adoption rate of new branded drug is going to decrease in patient-centric treatment. Finally, provider-consumer partnership is essential for cancer – treating drug adoption as shown in figure 4a. While for shared decision making model:

Y = extent of drug adoption; Z = shared decision making; X = attributes of drug adoption;

$$Y1 + Z1 = x1 + x2 + x3$$

The causal map that brings linkage between competing factors that lay the foundation for new branded drug extension is captured in figure 4b. We find marketing communication, as well as social influence in the form of word of mouth will lead to drug adoption. Shared decision making communication makes healthcare supply chain responsive for cancer treatment supporting literature findings (Olson and Bobinski et al. 2012; Frongillo and Feibelmann et al. 2013).

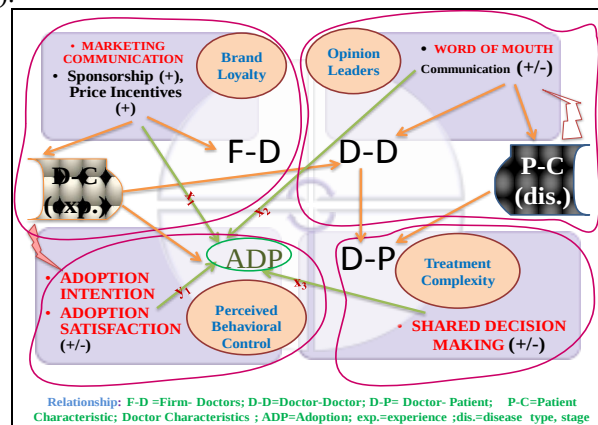


Figure 5: Innovative model proposed for drug adoption

The model presents complex strategies identified after interviewing firm's representatives, doctors (cardiologists and oncologists) and patients (hypertension and cancer patients). Intelligent communication model is depicted in figure 5 that can minimize variation of branded drug adoption. The research provides insight that both marketing communication and social influence using word of mouth communication are driving factors for drug adoption. With increase in complexity of disease, shared decision making (Thorne et al. 2013) between doctor and patient becomes a significant factor and needs to be integrated in drug adoption model. The study findings provide knowledge to firms to programme WOM and shared decision making in their marketing communication strategies. One of the limitation of the study was the number of samples in qualitative investigation needs to be increased by studying other regions for cross validation. Future direction is to test our framework conducted in other regions of India for developing a holistic view and cross validation of data using repertory grid and cognitive map technique. The authors encourage a full- fledged empirical study using the elements of adoption, identified in this paper.

VI. Declaration

The authors declare that article does not reflect opinion / policy of any organization or regulatory institution but is based on sole opinion of authors. For any errors authors are responsible and report no conflict of interest.

Acknowledgement

The authors acknowledge constructive feedback from Professor G. C. Saha at the Centre for Business Analytics and Intelligence, Arthur Lok Jack Graduate School of Business, University of West Indies. The authors thank the hospital staffs and physicians for their valuable time during various phases of investigation.

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