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Typography in Publication Design

Making Grids Flexible

A systematic approach to understand the behavior of grid

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Abstract: The grid is a well known tool in graphic design, mainly in typography. Being a common tool in practice, it hardly got externalized in terms of knowledge representation. Grid is effective in space management and helps designer in decision making, both visual and managerial type. In spite of these advantages, many students and professionals are skeptic about its use. There is an expressed fear about getting trapped in the grid. This paper will try to understand this tool and will try to externalize the cognitive process of designing layout using grids. With the FBS framework, the behavior variables of grids are defined. These variables are used to propose a method to make layouts flexible. This method is called as Grid Variable Method. The variables of grid and its application in GV method is discussed with various examples in graphic design.

Key words: Grids in graphic design, FBS framework, Grid Variable method, design tool.

1. Introduction

The research in design is a recent phenomenon and currently going through pre-paradigmatic phase (Cantamessa, 2001). The cognitive processes involved in graphic design activity are not yet understood properly. The field of graphic design has a good amount of experiential research foundation based on the expertise of senior designers. But in the theoretical and experimental domain of research it is still in the primary phase.

1.1 Grids in graphic design

The grid is a well known tool in graphic design mainly in typography. It generally consists of a fixed set of guidelines. Although it plays an important role in industrial design process it always remained underneath the visual discourse of communication. Applying grids means submitting oneself to the particular geometry. In abstraction, it is nothing but the natural urge to seek for the order or regularity. Figure 1 shows the common forms of grids

in publication design. Undoubtedly many interesting experiments are done with grids but there are hardly any efforts to theorize it.

The use of grid for visual layouts is not at all new. In visual art we can find the inscriptions and the evidences of grid from the medieval period or even before (Little, 1966) (Lawlor, 2002) (Vatsyayan, 1983) (Alice Boner, 2000). Past few centuries the meaning of grid has shifted from interface between physical and super-physical worlds to interface between physical world and its perception by the rational cognition (Williamson, 1986). The modern grid which is in contemporary use was fully developed in its current form and use by second decade of twentieth century (Gottschall, [1989] 1991). This grid is based on new design philosophy emerged out of constructivism which was inclined towards rationalism and minimalism.

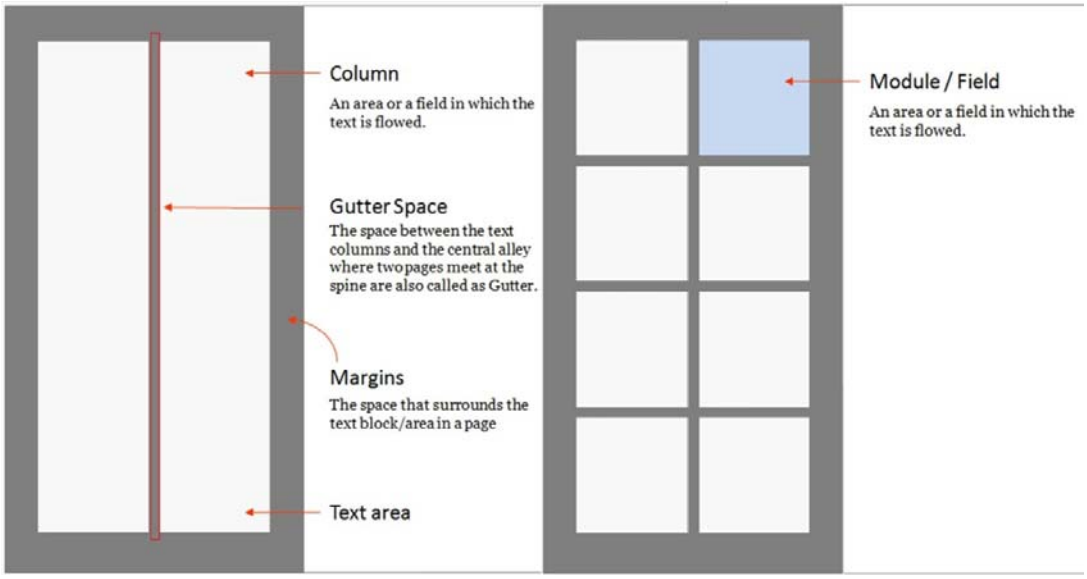

Figure.1 Common grids in Publication design

1.2 Use of grid

Grids are used in graphic design as a syntactic tool. Most of the design applications use or may use grid for effective planning of visual information. But some design applications use grids more prominently than others. There are various qualitative and quantitative situational factors which demand the use of grid in design. Our study has consolidated these factors from various applications of grids in art, architecture and design. Refer table 7 for the list of qualitative and quantitative factors defining the need of grid.

Quantitative factors	Qualitative factors
Mass production	Homogeneity
Large quantity of information	Visual identity
Variety of information	Information hierarchy
Less production time	Visual ergonomics
Multiple production sites	Visual aesthetics
Repetitive work	Cultural identity
Quantitative precision	Philosophical identity

Table 1. Factors defining the need for grid in design

There are various reasons for which grids are used in visual design. The main requirement is always for the space management. Most of the design applications use or may use grid for effective planning of visual information. Grid is an important device useful in decision making (Bokil & Ranade, 2009) while creating visual layouts. The advantages of grid can be seen from different perspectives. The various advantages are as listed below-

- Space organization
- Content management
- Work distribution- Great collaborative device
- Homogeneity, Cohesive style and character
- Resource management- time and money
- Usability enhancement
- Aesthetic enhancement
- Cultural identity
- Philosophical statement

In spite of these advantages, many of students and even professionals consider it as a monotonous mechanical device which constraints their creative freedom. While practicing the design with grids the challenge is to use it creatively with more flexibility.

2. What is creative use of grids?

The grids are mostly understood by the common consensus developed by design books and practicing designers. Let's understand the idea of 'creative use of grid' available through consensus.

2.1 Design literature

The literature on grids in modern design is very much focused on the field of typography. Most of the design books do touch upon this topic and there are few books dedicated to

this tool. But when it comes to research, there is very sparse material available for the reference.

Books which demonstrate the grid and its use mention the fear of designs becoming dull and lifeless unless used imaginatively. Alan Swann, in his book 'How to understand and use GRIDS' (1989), while accepting the importance of grid talk about the need for freedom from the rigid grid to achieve dynamic and creative effects. People who don't know how to use the grid 'creatively' or where to break the grid to achieve the dynamism may get trapped into the monotonous repetition. All the design books demonstrate the basic steps in formation of grids. To understand the grids every book uses lots of examples and layouts designed by renowned designers. But there is hardly any articulation and systematic method provided to use grids in creative way. Creativity and imagination are always treated as subjective skills and very recently become a subject of research. Knowledge of variables to formulate the grid will help the designer to create variety of grids with lot of flexibility.

2.2. Design consensus

The available design literature is not sufficient to reflect the concept of grid in the design field. It might not reflect the actual situation and might not represent every designer and design style. A survey through online questionnaire was conducted to collect consensus and differences of opinions about the grid and its application in layout design. 140 designers participated in the survey out of which 125 were from Indian design community. The general conclusions from the analysis of data are-

1. 14% respondents were quite dogmatic about the grids and feel uncomfortable without grids, but there were 12% of respondents who don't use grids in their work.
2. There is a lack of knowledge representation and articulation about the use of grids in design process.
3. There are different notions of grid based on the field of design.
4. People have different philosophies and beliefs about the application of grids.
5. The use and requirement of grid depends on the habit and nature of the designer.
6. Design education should give more importance to grids.

With an articulated remark of advantages being much greater than disadvantages, maximum respondents voted for visual consistency, order and discipline. Although, 26% respondents were quite dogmatic with a position of 'no disadvantages at all', many others (41%) expressed the fear of getting caught in the grids if not used properly. There is also

complaint about design becoming static, monotonous and boxy because of grids. A respondent expressed his doubt saying using grids sometimes leads to confusion while designing. The feedback about disadvantages of grids is listed in table 2.

Disadvantages of grids	**% response**
If not used properly there is fear of getting caught in it	41
It makes the design static and boxy	26
There are no disadvantages	26
Everything looks similar because of grids	16
It is boring to work with grids	9
It needs lot of time to create grids. It is not time effective.	9
The visual looks dead	3
None of the above	13

Table 2. Disadvantages of using grids

Although the fear of getting trapped in the grid is expressed by many designers, the suggested solution is always in the form of subjective and vague description. The creative use of grid is treated like an art which can be observed and need to be mastered through the practice.

2.3. For flexibility of grids

To avoid the entrapment of grid and to create interesting layouts, the grids should be used with more flexibility. Here, we are not trying to invent new method to bring flexibility but to articulate few systematic methods to achieve the flexibility. In general practice, a grid like modular grid, which gives multiple options, is used to bring flexibility in grid (Vignelli, 1976) (Brockman, 1981) Expert designers sometimes use multiple grids overlapping each other for further variety in layouts (Hurlburt, 1978) (Bosshard, 2000). If it is still not sufficient to break away from the disciplined structure it is suggested to break the grid occasionally to get interesting results (Samara, 2005). We are suggesting a systematic way to understand this making and breaking of grid. The method proposed here uses the variables of grid and hence called as Grid Variable method.

The approach followed for articulation is based on the design research from the perspective of cognitive science and artificial intelligence (Sembugamoorthy & Chandrasekaran, 1986) (Gero, 1990) (Goel, 1997). The classification of design into routine, innovative and creative is well accepted in design research (Brown & Chandrasekaran, 1985) (Coyne, Rosenman, Radford, & Gero, 1987) (Gero, 1990). If the design variables and

the ranges of values they can take remain fixed during design processing, the design is routine; if the design variables remain fixed but the ranges of values change, the design is innovative; and if the design variables and the range of values both change, the design is creative. With this model of design prototype, the creative and innovative use of grids are analysed here for better understanding.

First, it is essential to represent the design process in the form of theoretical framework. Then we will discuss the variables of grid. The use of these variables is then validated by design examples.

3. Knowledge representation of grid

The field of graphic design is highly practice based and application oriented. It can be observed from the practice and pedagogy of graphic design at large doesn't give much stress on articulation and theorization. There is enough literature available to share the practicalities but proper knowledge representation and articulation is almost missing. First extensive writing on grids was by Joseph Muller Brockman in the form of a book- Grid Systems. (Brockman, 1981) It explains the role of grid in design, its advantages and demonstrates formulation of grid through design steps. It is followed by lots of examples of design layouts and the grids used. It is expected from the reader to understand the process of design from the examples and design descriptions. Almost all literature published on grids (Vignelli, 1976) (Hurlburt, 1978) (Swann, 1989) (Bosshard, 2000) (Elam, Grid Systems, 2004) (Samara, 2005) (Vinh & Boulton, 2007) and about typography (Ruder, 1984) (Baines & Haslam, 2005) (Elam, Typographic Systems, 2007) followed the same model for knowledge transfer.

This model of knowledge transfer is based on direct internalization of knowledge through observations. The same methodology to the large extent is implemented in pedagogy of graphic design. The procedural knowledge is not externalized. The lack of articulation of cognitive steps in designing a visual using grid is never got enough attention since the routine design is satisfied with current model of knowledge transfer. But this model with direct internalization through empirical methods demands lots of practice and time. Current status of design literature shows the incomplete knowledge externalization, lack of knowledge representation and inefficient model of knowledge transfer.

Without profound representation it is difficult to provide the means for 'creative use' of grid. Design research has separated creative and innovative design from routine design in

design research (Goel, 1997). Applying same principles for grid, if it is defined with appropriate variables, the change in the value of such variables will result in the creative use of grid. And change in the variables will give innovative use of grid.

3.1 Two layered model for application of grid in design

The grid is always treated in design community as a tool. The grid is considered as something which assists designers while designing. It is a part of design process. For better analysis, grid is given status of design. It is considered as a designed object rather than a tool or method. It may look a trivial step but it opens the door of applying design theories to understand and articulate grids in design.

Making the conceptual model of grid (Bokil & Ranade, 2012) more explicit gives us two levels as shown in figure 2. The grid is considered here as a designed object at first level and designer is the user. Designer then at second level uses grid to design visual for expected viewer. Treating grid as a design gives more focus on grid itself and use of grid is separated from the effect of designed visual. The main advantage of this two level model is the applicability of design research methodology like FBS model in the study of grids.

3.2 FBS representation of grid

As represented by figure 3, designer works on the two levels. First the design brief is studied and the requirements are articulated. It gives the function of the visual to be designed (F). From the function the expected behavior (Be) of visual is imagined by designer and a rough structure (S) is conceptualized. The conceptualization of rough structure doesn't require the grid but designer follows the notion of tacit grid which is based on the provisional behavior of grid. The tentative structure, such formed, gives the idea about actual behavior (Bs) of visual. This actual behavior is compared to expected behavior and if the designer is not satisfied with the potential design output the variables are reformulated. These iterations continue till the rough layout shows the potential to satisfy the design requirements.

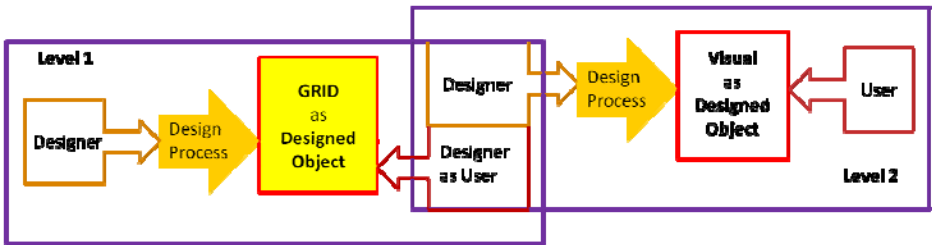

Figure.2 Two level Model for graphic design process with grids

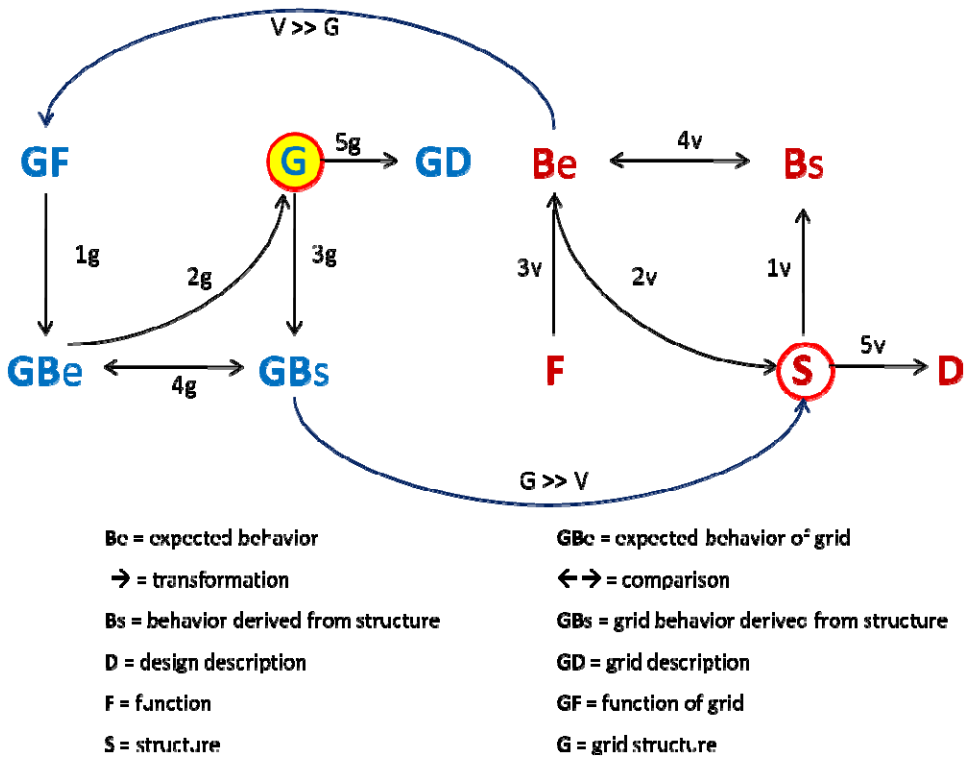

Figure.3 The FBS framework on two levels of visual designed with grids

Once the rough layout is finalized designer starts with final design. Expected visual behavior leads the designer to FBS path of grid design. The expected behavior of grid imaged by the designer while creating rough design helps him to design final grid. The actual grid behavior provides the set of values for designer to choose while creating the final visual structure. The layout such created is tested by comparing actual behavior and behavior expected by designer. If required, the reformulation of variables is carried out at all three stages of both levels.

4. Grid variable method for publication design

The FBS path gives a framework to articulate the graphic design process involving grids. To get more control on the process and to understand the influential factors in visual design it is necessary to define the variables of grid. The variables in FBS framework are defined and generalized by Qian and Gero (Qian & Gero, 1996). By extending the same approach, the variables of grid are defined here. As shown in figure 3, the behavior of grid is responsible for the structure of visual. Hence, the behavior variables are most influential and considered here for GV method.

4.1 Behavior variables of grid

Behavior is the way by which the meaning of structure is inferred. It is useful in design process for problem formulation, synthesis, analysis, evaluation and reformulation. (Gero, 1990) The behavior of grid is spatial behavior. It is responsible for the final layout of visual. There is no temporal factor involved in grids created for static visuals. Since behavior connects structure and function (Tham, Lee, & Gero, 1990) the behavior variables of grid plays very important role in the creation of visual. Behavior variables of grid on the basic level are structural type. It means they are derived from the structure itself without any external effect.

Our previous study (Bokil, 2009) has demonstrated five variables of grid which have been called as syntactic variables. After applying FBS structure it is realized that these are nothing but five **structural type behavior variables**. These variables are as follows- position, orientation, area, proportion and sequence. Given a structure of a grid, some of these behavior variables, or all, attain a finite set of values, which help designer to take appropriate design decisions. It puts some restrictions on design but it helps to work faster and bring the discipline in the process. Please note that in design many of these variables are fixed simultaneously by designer while creating a layout. Let's understand the structural type behavior variables.

Position: The grid gives the point reference to put the visual elements in the two dimensional field. This is in the form of points or intersecting lines which mark the positions either in rows or in scattered form. It nails the elements in the graphic layout to the surface. Figure 4 shows a grid for a booklet designed by Massimo Vignelli. In this grid, the first intersection at top is fixed for the heading of the topic under discussion and first intersection at bottom is fixed for page numbers. These position variables are fixed throughout the pages. All other position variables are used whenever required for other type of content.

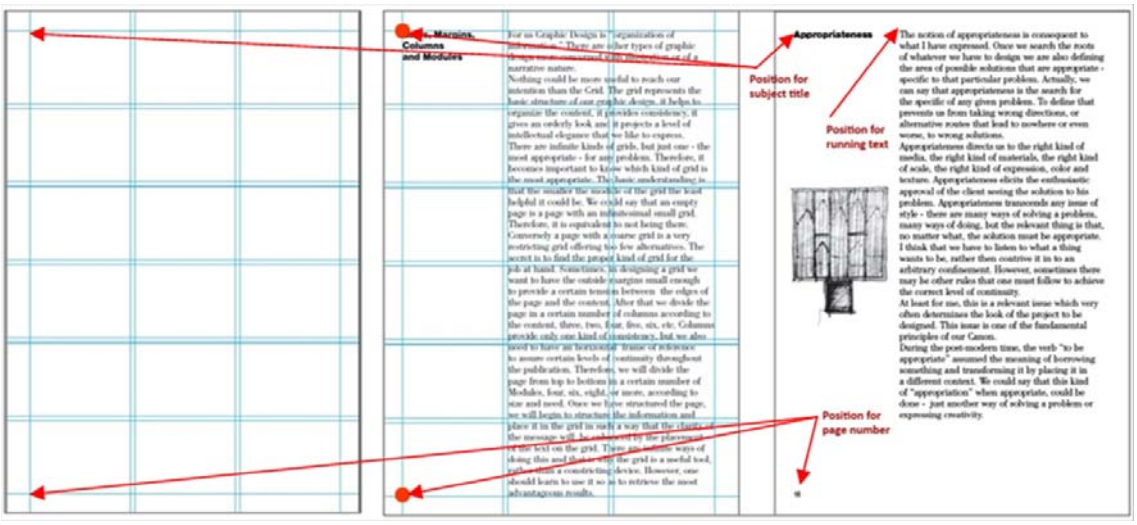

Figure.4 Behavior variable of grid- Position

Orientation: It is a line based function and aligns the visual objects or part of the object along a particular line. Orientations at different angles can create different expressions. In publication design, there is a strong influence of vertical and horizontal alignment because of traditional flow of text. The text generally flows in a line and through columns. Figure 5 shows a magazine spread with five column grid. The text is oriented horizontally, except the word 'Madeira'. The running text flows through vertical columns.

Figure.5 Behavior variable of grid- Orientation

Position and orientation variables generally combine together in the form of alignment of visual elements to each other and to the grid.

Area: Grid divides the space in small pockets. Each part is defined by its position and area. It is this variable which acts as a container. In publication design, the text takes the form of the text box according to the area provided by grid. Figure 6 shows the area

defined by golden proportion for a book design. This area and its position are maintained throughout the pages of book.

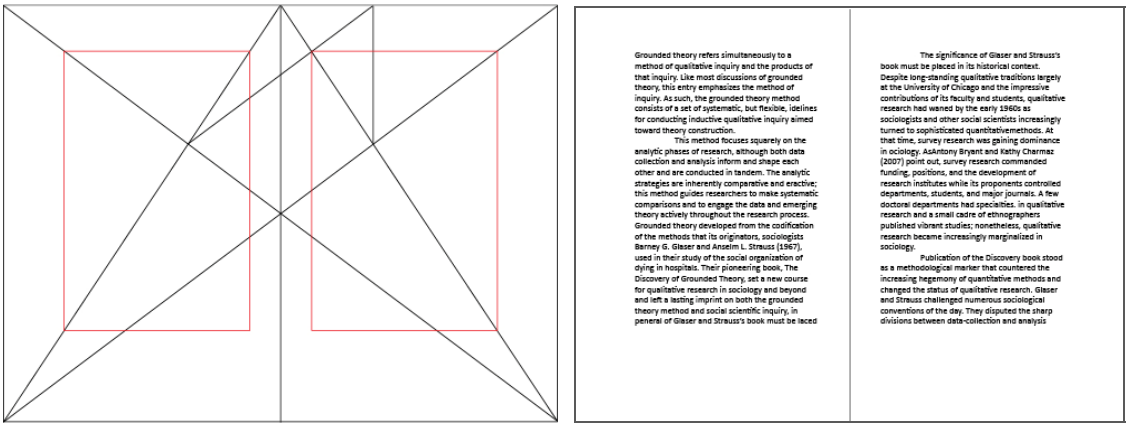

Figure.6 Behavior variable of grid- area

Proportion: Figure 7 demonstrates different proportions and sizes in a spread from a book. The images are in the form of three different proportions derived from the grid. In the typographic column grid it takes the form of enclosure for the text to fit in. The variable of proportion is more important for pictorial content. Text being free flowing can run through the area of any proportion. But pictorial elements may have constraint on the proportion.

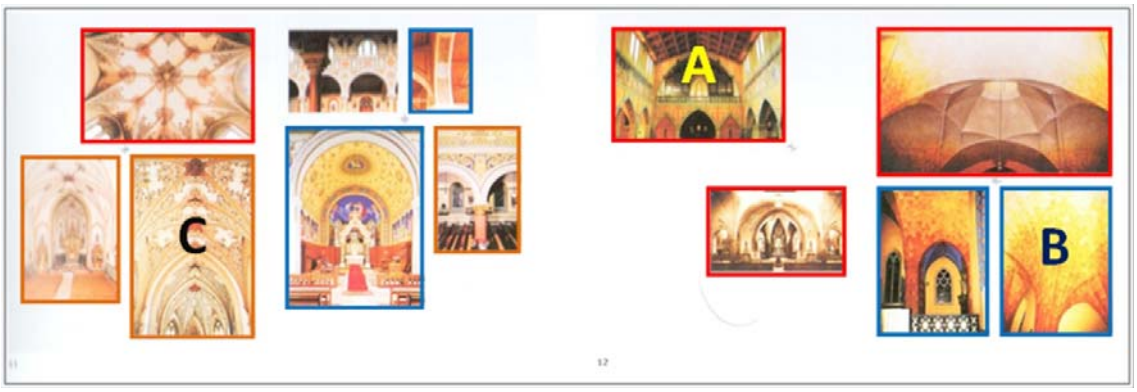

Figure.7 Behavior variable of grid- Proportion

Sequence: It helps to arrange the content in a linear order. When space is divided in small pockets it naturally generates the logical sequence in linear or radial direction. If the sizes are uneven, the sequence that is formed can be explained using the Gestalt principles. Sometimes the semantics of the content influence the order of sequence within

demarcated space. Figure 8 shows a layout from a comic book with a sequence created by the division of space. In case of text, the sequence is decided by the direction of reading.

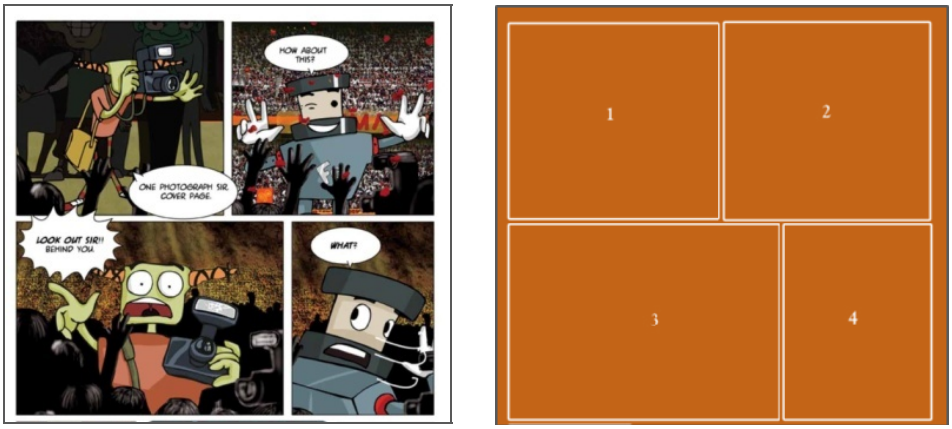

Figure.8 Behavior variable of grid- Sequence

When applied with the content of design, each of these direct behavior variables, alone or in combination, gives exogenous (indirect) variable. Exogenous type of behavior variable is a variable which is shown when external object (in this case 'the content') is applied to the structure. The exogenous type variables such derived are- **semantic unit, direction, plan, perspective and hierarchy**. Figure 9 shows the use of perspective variable in layout. The orientation variable is used to mould and arrange the content such a way that it gives the sense of third dimension. Body text here is in a two dimension plane while other visual elements are in perspective. Due to the limitation of space, these exogenous variables are not discussed in this paper.

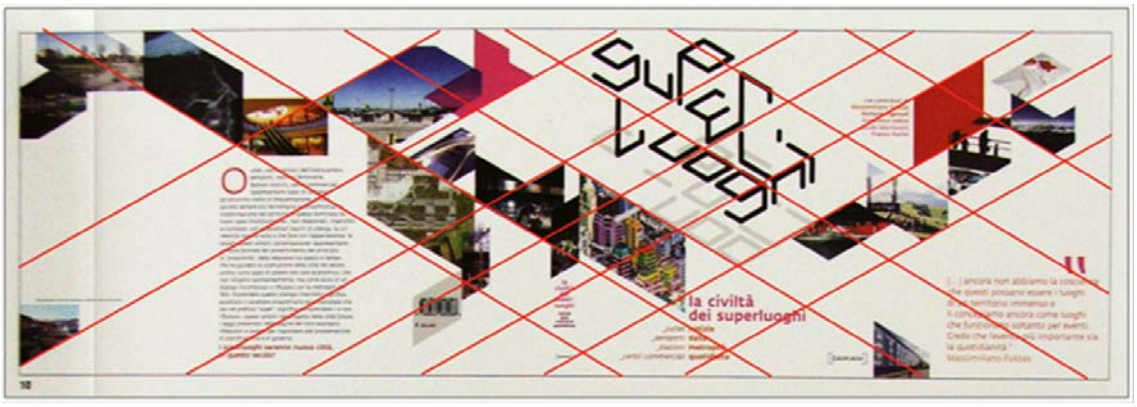

Figure.9 Exogenous Behavior variable of grid- Perspective

4.2 Demonstration of GV method

In Grid Variable method, the behavior variables are activated and altered during the process of design. When these variables change their values during the design process it results in interesting layouts. For design application like book design as shown in figure 6, sometimes no flexibility is required and a routine design with fixed values of area and position variables is commonly used. But in application like magazine cover or poster, it is necessary to use grids creatively for creating attractive design. Figure 10 shows interesting layouts created with skillful use of grids.

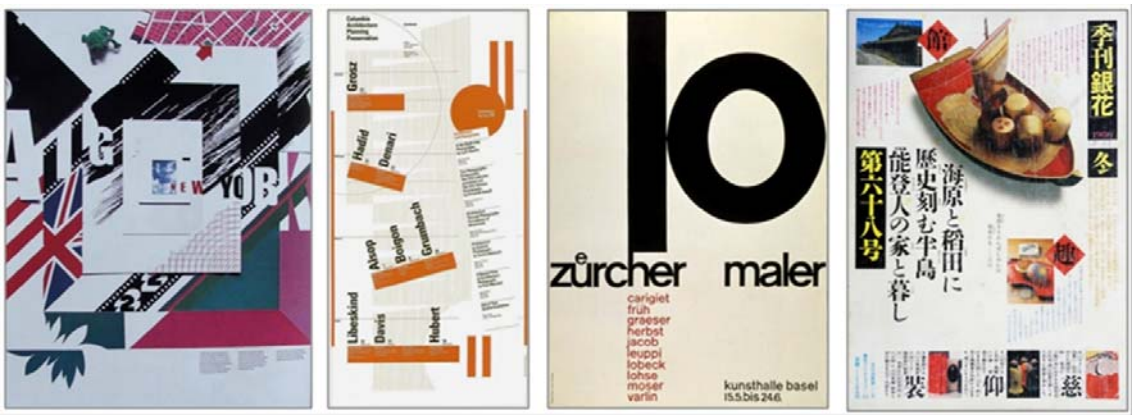

Figure.10 Few layouts with creative use of grids

The cover pages and the posters are needed to be created with uneven or surprising values of behavior variables. Many visual elements either break the grid or have contrast of values with respect to remaining layout. The real challenge for using grid is in the layout with lots of information like news papers or magazine spreads. The need for grid is severe in such applications (refer figure 11). Newspapers have lots of content and very little time to spent hence the most common variables which are varied are proportion and area. The sports pages and cultural pages show lots of other variables in play. They even sometimes break the grid.

Figure.11 Variations in grid by changing values of behavior variables

The schematics in figure 12 give the glimpse of the idea of changing the values of behavior variables of grid. There are four ways in which these variables can be used to create flexible layouts. They are discussed below.

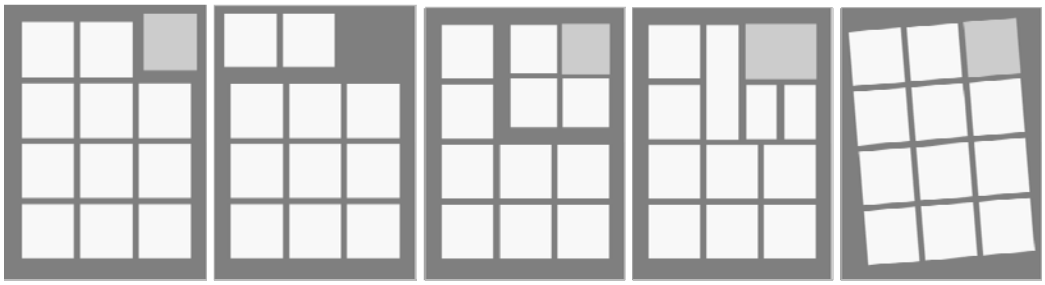

Figure.12 Variations in grid by changing values of behavior variables

GV method A] The grid itself gives the scope to attain a range of values for behavior variables without changing the structure of grid. Within this scope the flexibility of layout can be increased by having uneven values for variables of grid to start with.

In the grid shown in figure 13, there are 16 positions created by the grid to place the text box. There are two orientations and 13 different proportions possible. And there are more than 65 combinations of areas which can be created. The figure has shown few variations in proportion. Similarly, any one variable or many variables in combination can change their values to give variety of layouts from the same grid. Bosshard has demonstrated

(Bosshard, 2000) around 300 variations of grid on a square background by just changing variable values. Dubberly Design Office recently published a poster demonstrating 892 ways to partition a 3x4 grid which is also based on the same principle (ddo, 2011).

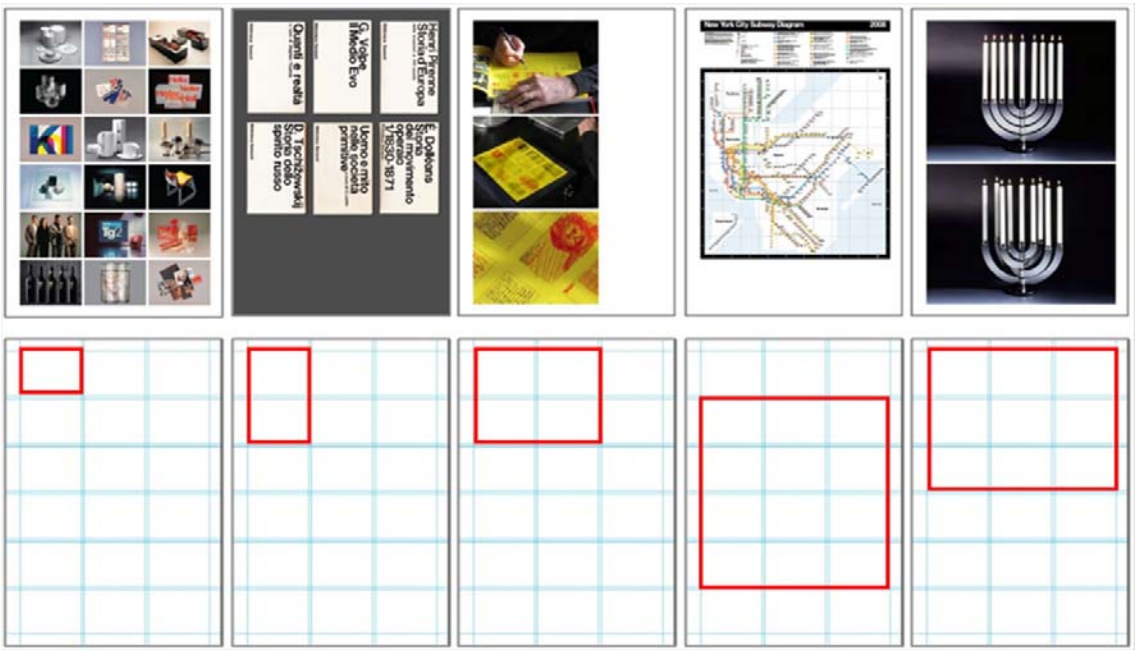

Figure.13 Proportion variable attaining various values (1x1, 1x2, 2x2, 3x4, 3x3)

GV method B] The grid is designed first. Then the values of variables are changed by changing the grid either before or after creating the layout. For example, two posters and a magazine cover page in figure 14 are designed as per the grid and then the orientation variable of complete grid with the layout is changed to a new value. The value of orientation is changed from its routine vertical-horizontal position. This change has created a little imbalance in the layout and makes it interesting.

Figure.14 Poster designed as per the grid and then the orientation is changed to new value

GV method C] The layout is designed as per the grid and then a part of the layout is released from the constraint of one or more behavior variables. This change in values generates more interests in some part of the layout which break away the monotonous look of the grid. First image in the figure below (fig. 15) shows a magazine cover page where only two visual elements are given a new orientation values. A magazine spread shows a detailed infographics. To increase the interest level, only few elements are given a perspective and all other elements are kept in two dimensional grid.

Figure.15 Part of layout has reset to new values of variables

GV method D] The layout is designed as per the grid and to increase the information content of visual new background elements are introduced either in harmony or in contradiction to the grid variables. Figure 16 has a magazine spread and two broachers. The text follows the discipline of grid whereas the background images and other visual elements are used to create more interest by loosening the geometric boundaries.

Figure.16 Visual elements introduced at background in contrast with grid variables

5. Conclusion

This paper has attempted to externalize the knowledge about grids. The FBS framework provides a good understanding about the design process involving grids. The knowledge about the variables of grid is proved to be useful to analyze the process of making and breaking grids. These variables can be further used to flexibility index of the layouts. Once this process is externalized it can be useful for many computer generated design programs and applications.

The grid variable method provides a theoretical foundation to analyze the use of grids in existing designs. As well as based on the analysis of existing layouts, this method can be used to produce innovative and creative layouts with the help of grids without getting trapped in the boxy looks of grids.

References

Alice Boner, S. R. (2000). *Vastusutra Upanisad- The essence of form in sacred art.* Delhi: Motilal Banarasidas Publication.

Baines, P., & Haslam, A. (2005). *Type and typography.* New York, United States: Watson Guptill Publications.

Bokil, P. (2009, July). Functions of Grid, a key for flexibility in framework. (P. R. Poovaiah, Ed.) *Design thoughts* (2), pp. 42-48.

Bokil, P., & Ranade, S. (2012). Across the time and space: Application of Systems Thinking to bridge the past and the future of design practices. *Design principles and practices* .

Bokil, P., & Ranade, S. (2009, October). Diagonal grid in graphic design. *IASDR 2009 conference proceedings* . Seoul, S Korea: IASDR.

Boner, A. (1962). *Principles of composition in Hindu sculpture.* Leiden, Netherlands: E. J. Brill.

Bosshard, H. R. (2000). *The Typographic Grid.* (A. Bluhm, Trans.) Zurich: Verlag Niggli.

Brockman, J. M. (1981). *Grid systems in Graphic design.* Niederteufen, Switzerland: Arthur Niggli Ltd. Publishers.

Brown, D. C., & Chandrasekaran, B. (1985). Expert systems for a class of mechanical design activity. In J. S. Gero (Ed.), *Knowledge Engineering in Computer-Aided Design* (pp. 259-282). Amsterdam: North-Holland.

Cantamessa, M. (2001). Design research in perspective - a meta research on ICED'97 and ICED'99. In S. Culley, & e. al (Ed.), *International Conference on Engineering Design (ICED'01)* (pp. 29-36). Glasgow: IMechE.

Coyne, R. D., Rosenman, M. A., Radford, A. D., & Gero, J. S. (1987). Innovation and creativity in knowledge-based CAD. In J. S. Gero (Ed.), *Expert Systems in Computer-Aided Design* (pp. 435-465). Amsterdam: North-Holland.

ddo. (2011, March 4). *The 892 unique ways to partition a 3 x 4 grid*. Retrieved June 12, 2011, from Dubberly Design Office: http://www.dubberly.com/concept-maps/3x4grid.html

Elam, K. (2004). *Grid Systems.* New York: Princeton Architectural Press.

Elam, K. (2007). *Typographic Systems.* New York, United States: Princeton Architectural Press.

Gero, J. S. (1990). Design prototypes: Aknowledge representation sceme for design. *AI Magazine , 11* (4), 26-36.

Goel, A. K. (1997). Design, Analogy, and Creativity. *IEEE Expert, Intelligent Systems &their Applications , 12* (3), 62-70.

Gottschall, E. ([1989] 1991). *Typographic Communication Today.* London: The MIT Press.

Hurlburt, A. (1978). *The Grid- A modular system for the design and production of newspapers, magazines, and books.* New York: Van Nostrand Reinhold Company.

Kramrisch, S. (1976). *The Hindu Temples.* Delhi: Motilal Banarasidass Publication.

Lawlor, R. (2002). *Sacred Geometry- Philosophy and Practice.* London: Thames & Hudson Ltd.

Little, A. M. (1966). A Series of Notes in Three Parts on Greek Pictorial Composition. *American Journal of Archaeology , 70* (2), pp. 165-169.

Qian, L., & Gero, J. (1996). Function-behavior-structure paths and their role in analogy-based design. *Artificial Intelligence for Engineering Design, Analysis and Manufacturing , 10* (04), 289-312.

Ruder, E. (1984). *Typography, A manual of Design.* New York: Hastings House, Publishers, Inc.

Samara, T. (2005). *Making and breaking the grid- A graphic design layout workshop.* Beverly: Rockport Publishers, Inc.

Sembugamoorthy, V., & Chandrasekaran, B. (1986). Functional representation of devices and compilation of diagnostic problem solving systems. In J. Kolodner, & C. Riesbeck (Eds.), *Experience, Memory and Reasoning* (pp. 47-73). NJ: Erlbaum.

Swann, A. (1989). *How to understand and use GRIDS.* London: Quarto Publishing plc.

Tham, K., Lee, H., & Gero, J. (1990). Building envelope design using design prototypes. *ASHRAE Transactions , 96* (2), 508-520.

Vatsyayan, K. (1983). *The Square and the Circle of the Indian Arts.* New Delhi: Roli Books International.

Vignelli, M. (1976). *Grids: Their Meaning and Use for federal Designers* (Vols. No. 036-000-00038-4). Washington: National Endowment for the arts- USA.

Vinh, K., & Boulton, M. (2007, March 10). *Grids are Good.* Retrieved September 23, 2010

Williamson, J. H. (1986). The Grid: History, Use and Meaning. *Design Issues , 3* (2), 15-30.