Exploring a colored linkography for identifying the members of design team

XU Jiang\textsuperscript{a}\textsuperscript{*}; CHUAI Ying\textsuperscript{a} and GAN Xiang\textsuperscript{b}

\textsuperscript{a}Tongji University, China
\textsuperscript{b}Southeast University, China and Monash University, Australia

* Corresponding author: xujzju@163.com

This paper introduces the colored linkography as a modified method for identifying members’ character in the interaction of design teams. Some indicators are raised and applied with a sample of postgraduate team. Result shows that the colored linkography and its following indicators contribute to evaluating and comparing the endeavor and interdependence of members. Consequently, the colored linkography is a feasible tool that has much more value for deeper researches.

keywords: colored linkography; design team; modified method; members’ character

Introduction

Researches on evaluating design teams usually focus broadly on four aspects: the person, the environment, the product and the process (Oman, Tumer, Wood & Seepersad, 2012). Just as other groups, each designer is the constituent part of a whole design team, so the attribute of one designer associates with the performance of the whole team (Foo, 2011). The members network is reported as one of the most reliable potentiality related to identifying the character of members in a design team (Guan, Luo, Peng, Wang, Sun & Qiu, 2013).

Different researching styles have already performed to reveal the individual impact on design teams. Applying the metaphorical thinking, Casakin and Miller (2008) explored the individual acquiring character in design reasoning and analyzed the design performance, which enables leaders to refer the special field that needs to put effort in. Goellner, Wakes and Shaw (2009) create a method on organizing, presenting and applying the interplay between consumers and product to determine whether designers’ achievement is of
success. Bouchard, Omhover, Mougenot, Aoussat and Westerman (2008) compiled an interactive software that retrieves the design information of designers in the team. Although these studies employed advanced methodology to identify designers, there is a lack of quantization that statistically measures and compares attributes of designers. In another study of design teams, Goldschmidt (1990) originally established the technique of linkography to study designers’ cognition and performance. During decades of employing and evolution, however, researchers have changed the linkography into a tool to present the content and process of design reasoning. The linkography now is still a potential technique, which analyses the endeavor and capacity of members in design teams.

For the purpose of reusing the linkography to identify the members of design team, this paper concentrates on introducing a colored linkography as a revised method on analyzing the interactive network of design teams. The generation and operation of this modified linkography is reported in this paper. A case study originated from a design of lock for bicycles is also performed to verify the feasibility of colored linkography.

**Background**

**Design Cognition**

As an important domain of design behavioristic, design cognition was synthesized by concrete thought and abstract thought. Theoretically speaking, design cognition is a part of the human cognitive process of gathering, recognizing, collecting, memorizing, recalling, and processing design information by designers (Chan, 1990; Chan, 2008); Asimow (1962) proposed that the structure of the design process consists of the vertical structure of the continuous behavior and the horizontal structure of the decision making cycle. Based on the logical analysis and artificial intelligence, Mitchell presented the Design Computing and Cognition in 1977, which models and computes the process and knowledge of design cognition (Hayes, Goel, Tumer, Agogino & Regli, 2011). Zeisel (1995) considered that the design process is the helical structure composed of concept, performance, and testing. This burgeoning multidisciplinary field has attracted increasingly more scholars to engage in this study from their own professions. Cross existing study, there were two typical theories of design cognition, one was the Symbolic Information Processing (SIP) raised by Simon, the other was the Situativity Theory (SIT) derived from Schon. Based on these theories, scholars established a series of models focusing on the course of design especially the use of algorithm simulation to generate the innovative design (Visser, 2006).

To sum up, the existing study in the Design Computing and Cognition has obtained huge achievement including cognition modeling, creation generation and individual cognition. However, studies have analyzed the role of personal knowledge in the design team using the linkography-design cognitive model is relatively lacking. From this perspective, interaction relating individual attributes to team achievement in the group network is regarded as the vital point to model the relationship and dependence between team and members.
**Linkography**

The linkography was first proposed by Goldschmidt (1990), which is an effective means to evaluate the level of thinking of designers and their team design. Based on the oral analysis experiment, it is based on spoken data to describe and analyze the temporal structure of design cognitive reasoning. Semantic link is the basis of multidimensional model realization. According to the degree of correlation between the evolution of design cognitive concept and the indexing of module indexing, the concept and intention of dynamic evolution are called "design node" in the design process. Designation of the correlation between nodes or not re-calibration can be based on semantic link to judge, any link can be linked to the design of the connection, so as to establish the link shown in Figure 1.

![Figure 1 Linkography]

Design the cognitive language data by preprocessing, transforming the construction of structured semantic association link matrix. The matrix basically stores the link data at the bottom of the node to realize the mutual conversion of unstructured language data and structural data and is coded according to the degree of relevance of the design cognitive concept. If the correlation degree is high, it is related, Low, can be ignored, that is not relevant. On the basis of dividing the design node, the semantic relevance of the nodes is judged and coded, and the link matrix is established. For any design node i, denoted as Ni, its corresponding link vector can be encoded by 0 or 1 by associating with other nodes semantics, expressed as:

$$L_i = [l_{i1}, l_{i2}, ..., l_{in}]$$

(1)

Where L_i is the link vector of N_i, l_{in} is the semantically associated encoded values of N_i and N_n nodes. After the coding is completed, each node will form a link vector with the number of nodes as the number of nodes. Combine all the node link vectors to get the full link vector, where the node has no practical meaning from the link and will be zeroed. Researchers have changed the linkography into a tool to present the content and process of design reasoning. However, the linkography now is still a potential technique, which is used to analyze the endeavor and capacity of members in design teams. Therefore, the research of the linked table in the research team needs to be further enhanced. Based on the classic design cognitive model and linkography, this paper reuses the linkography to identify the members of design team, and concentrates on introducing a colored
linkography as a revised method on analyzing the interactive network of design teams, and explore the concept evolution law of the team design process.

**FBS Ontology**
As is proposed by Goldschmidt, the relationship of design moves was subjectively judged by elementary knowledge, so the generation of linkography was vague (Cai et al., 2009). For the purpose of improving the agreement and reliability for generating a linkography, Gero and Kan (2009) founded the function-behavior-structure (FBS) ontology modeling the framework of design process to segment and code the design moves in term of the purposeful nature of designing. The FBS framework encodes the design and design creativity through parsing the protocol within three categories:

1. Function represents the purposed requirement during the activity of ideation.
2. Structure that embodies the concept of an outcome.
3. Behavior that achieves from functions or structure (Gero, 2000).

After segmenting and coding, each category is linked semantically which builds a linkography embedded the FBS framework (Pourmohamadi, Gero & Saunders, 2011). Additionally, the Delphi method is employed to arbitrate reliability of FBS segmenting and the linkography (Gero, Pourmohamadi, & Williams, 2012). This study uses FBS ontology to ensure the reliability of segmentation and coding.

Furthermore, this study builds a new form for the linkography and extends the links index and critical moves for measuring the diversity of team members.

**Design Team Communication**
Teamwork is regarded as a more efficient form confronting tasks and challenges if the task requires a team. Meanwhile, design process often includes team behavior, in some cases, a synergistic team design inspires designers more ideation. One of the factors that make team operate effectively is communication. It is also an important aspect for identifying team network. Findings have been received by many studies that members’ shared mental models may reveal the interaction framework of effective design team (Chou, Wang, Wang, Huang & Cheng, 2008). To ensure the quality and productivity of design team, each member should preserve their sufficient interplay and communication (Guan et al., 2013). Andy Dong (2006) counted the amount of communication that represents the impact of concept between designers. This was an indicator to deduce the crucial member in a design team. However, there is a lack of comprehension of design course in this measurement. Therefore, this study concentrates on utilizing the FBS ontology and linkography to capture design issues deriving from members’ interaction, identify the individual character and evaluate the individual impact on design teams.

**Interaction Model of the Members in Design Team**
The fundamental of this interaction model is the FBS coding scheme which segments the design process strictly into three basic classes of variables: function, behavior and structure (Gero, 2000). In the model of teamwork interaction, the function represents the anticipant purposes of synectics and the structure contains the concept of the final outcome and their combination. The individuals construct their ideation from grasping
several emphases of the function. During communication, they may formulate different elements from others, which will cause comparisons and perfection involving citations and acquiring among team members. From the perspective of individual, the interplay involves two directionally converse behaviors, the acquiring behavior links the previous teammates and the cited behavior links the latter teammates. The citations and acquiring of interplay transform the individual issues and form the atmosphere of deliberation in teamwork. The structure is then integrated by parts of individual concept. Figure 2 show the model of interaction involving the relationships among team members and basic design variables.

Figure 2  The model of interaction in design team

To study this model, this study 1) apply the coding scheme on the basis of semantic analysis, 2) build the member set \{M_1, M_2, ..., M_n\} and the interplay set \{L_{RY}, L_{RX}, ..., L_{BY}, L_{YB}\}, \ L_{RY} represents the transform of concept from R to Y to identify the attributes of roles in the design team. From this model, this study expects to deduce some indicators for assessing the endeavor and activeness of group members and identifying the key member whose interdependence with others promote the interaction of teams.

The Colored Linkography Methodology
Concerning the members’ attributes and their communication and sharing, this study colors the distinct knowledge of members and applied quantitative methods to expose the source and inheritance of issues from the specific members. Furthermore, depending on the outcomes above, the attributes of roles and the individual impacts on synectics will be defined.

Definition and Expression
In order to distinguish different member and their issues along with the sequence of talking, this study refines the conventional linkography and colors individual design moves and the links tie them. Figure 3 is a typical example of colored linkography. The three letters R, B and Y represent three colors: red, blue, yellow, and corresponding to three...
members in one design team. The following expressions and operations will be introduced through this example.

![Diagram of colored linkography]

Figure 3  A typical example of colored linkography

In the colored linkography, one specific color of nodes corresponds to one specific member in the design team. Integrating the models of interaction, the distribution and relations among colored nodes embody the communication within members and the conveying and evolution of concept. Therefore, this colored linkography can both acquire information in the study of design protocol and re-exert the effect on assessing design productivity of an individual designer (Shah, Kulkarni, & Vargas-Hernandez, 2000).

To analyze the distributions of a wide variety of random nodes and their links, this study clusters them into data sets. First of all, the nodes (e.g. \( R_1 \)) are named with its color code (e.g. \( R \) is the code of red, \( B \) is the code of blue) and its sequence number. Each link connects two nodes, so one link is named by the nodes it ties (e.g. \( R_1B_2 \)) and this code scheme contributes to recognize the forelink or backlink of one node, e.g. the \( R_1B_2 \) link is the forelink of \( R_1 \) and the backlink of \( B_2 \). Then this study let the node set (e.g. \( N = \{ R_1, B_2, R_3, Y_4 \} \)) contains the codes of nodes and the link set (e.g. \( L = \{ R_1B_2, B_2R_3, R_3Y_4, B_2Y_4 \} \)) contains the codes of links in order to cluster the data of the structure of colored linkography. In addition, this study defines the \( x_i \) equals 1 if node \( i \) is raised by the member who is represented by the color \( x \). Otherwise, the \( x_i \) equals 0. In this manner, the colored linkography could be encoded as a two-way color-node matrix, as is depicted in figure 4.
Figure 4  Two-way color-node matrix encoded from the colored linkography

**Operation**
In order to analysis the source and inheritance of each member’s concept elaborated in the model of interaction from the colored linkography, the study separates the nodes of each individual by letting the member’s node set (e.g. $N_R = \{R1, R3\}$) contains the codes of personal nodes and the individual link set (e.g. $L_R = \{R1B2, B2R3, R3Y4\}$) contains the codes of individual links. Moreover, the interaction between two members can be expressed by the mutual link set (e.g. $L_{RB} = L_R \cap L_H = \{R1B2, B2R3\}$) which collects the links tying two specific members.

**Identification of Roles**

**Issues Occurrence**
As the premise for identifying the character of the members in design team, issues occurrence should be measured from colored linkography, which relates to the amount of members’ concepts and reflects the activeness of each member. John (2010) calculates the cumulative occurrence of design, where any differences are indications of issues interaction, through the FBS coding scheme and the additive manner. In colored linkography, the issues occurrence could be calculated according to the color-node matrix. Through the matrix, the issues occurrence of the member who is represented by color x, at node n, will be

$$I_x = \sum_{i=1}^{n} x_i$$

(2)

and the mean of it is

$$\bar{I}_x = \frac{I_x}{n} \times 100\%$$

(3)

Because of this algorithm of accumulation, the issues occurrence reveals the respectively total quantity of concept of one member that assesses the personal contribution to the course of design, but not necessarily the merit of the final consensus. What’s more, the standard deviation of the issues occurrence is also an indicator for the activeness that
individual member has put into the course of design. Some indexes that reflect
the interaction among team members are proposed as follow.

**Citation Index**

Team members are facilitated to integrate thoughts and determine schemes through
interactive flow that involves interlaced citations and acquiring (J.F Interaction). The
link index and critical moves in linkography are positive indicators to measure the productivity
of design moves (Kan & Gero, 2008). Consequently, if these indicators of individual moves
are integrated, then some derived indicators could be generated to identify the roles in
design teams.

The individuals concentrate on anticipant purposes of design and construct their own
reasoning. Members demonstrate their concept and this self-concept influence the
atmosphere of deliberation and the external memory of the team. Through
communication, the working memory of individuals will be referred and reconstruct, and,
in turn, exchange with the external memory continuously. In the colored linkography, the
forelinks of a node indicate that the concept embedded in the node has been cited by
subsequence. In the links set $L$, specifically, if the node $i$ and $j$ tied by one link meet the
requirement that $i<j$, node $i$ is proved to be cited by node $j$, which can be noted as $C_{ij}$

$$ C_i = \sum C_{ij} $$

and means node $i$ has been cited for $C_i$ times in $L$. What’s more, the citations
span of node $i$ measuring the interval of these interplays will be $CS_{ij} = j - i$

and

$$ CS_i = \sum CS_{ij} $$

shows its citations span in $L$. As a consequence, the number of citations of
the member represented by color $x$ is defined by Eq. 3:

$$ C_x = \sum C_i $$

(4)

where the $N_x$ is the member’s node set and the Eq. 4:

$$ CS_x = \sum CS_i $$

(5)
calculates the total citations span. Furthermore, to evenly asses the impact of one
member on the team, the citation index is expressed as:

$$ CI_x = C_x / length(N_x) $$

(6)
and the citation span index will be:

\[ CSI_x = \frac{CS_x}{\text{length}(N_x)} \]

(7)

where the \( \text{length}(N_x) \) indicates the amount of elements in the set \( N \). Although LI and critical moves have been integrated into individual, the relation to design performance is retained. In other words, a higher value of citation index and citation span index denotes that this member poses stronger impact on the design team than others.

**Acquiring Index**

Referring to the citation index, the backlinks of a node in the colored linkography indicate that the concept involved in the node has acquired from previous issues. In the links set \( L \), specifically, if the node \( i \) and \( j \) tied by one link meet the condition that \( i > j \), then the node \( i \) is proved to acquire from the node \( j \), which can be noted as \( A_{ij} \) and

\[ A_i = \sum_{j<i} A_{ij} \]

means node \( i \) has acquired for \( C_i \) times in \( L \). What’s more, the acquiring span of node \( i \) measuring the interval of these interplays will be

\[ AS_{ij} = j - i \]

and

\[ AS_i = \sum_{j<i} AS_{ij} \]

mediates its acquiring span in \( L \). As a consequence, the number of acquiring of the member represented by color \( x \) is defined by Eq. 7:

\[ A_x = \sum_{N_x} A_i \]

(8)

where the \( N_x \) is the member’s node set and the Eq. 8:

\[ AS_x = \sum_{N_x} AS_i \]

(9)

shows the total acquiring span. Furthermore, to assess the balanced capability of invoking the external memory of the teamwork, the acquiring index is expressed as:

\[ AI_x = \frac{A_x}{\text{length}(N_x)} \]

(10)

and the acquiring span index will be:

\[ ASI_x = \frac{AS_x}{\text{length}(N_x)} \]

(11)
where the $\text{length}(N_x)$ indicates the amount of elements in the set $N$. Because the relation to design performance is still retained from the model of LI and critical moves, the value of acquiring index and acquiring span index reveal the improvement of object-related abilities and satisfaction of the teamwork. In other word, the higher these two indexes denote the stronger dependence on the team.

**Experiments**

**Sample Design**

Textual data for the present studies were obtained from one design team contains 5 postgraduate students majoring in industrial design. However, they received distinct undergraduate course, so the preferences on design were different which contain structure design, appearance design and design valuation. Consequently, all the participants may raise issues based on their background of profession. The purpose of building this situation of team was that each member might construct special creation from the function and contribute different impacts on individuals and the outcome in this study. What’s more, there was no obvious supervisor in this team. Without known leadership in the team, this study can assess the capabilities of individuals and identify their attributes regardless the weight of anyone’s talking. The object of this design work was a bicycle lock design.

**Table 1  Partial segmentation and code encoded from textual data in this sample**

<table>
<thead>
<tr>
<th>No.</th>
<th>Utterance</th>
<th>Code</th>
<th>Links</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>Chen: diversify the lock, consider the extension of them</td>
<td>Bs</td>
<td>10</td>
</tr>
<tr>
<td>27</td>
<td>Zhou: one lock can protect more than one bike</td>
<td>Bs</td>
<td>26</td>
</tr>
<tr>
<td>28</td>
<td>Zhou: on the handle, achieve the locking action more fluently</td>
<td>S</td>
<td>5</td>
</tr>
<tr>
<td>29</td>
<td>Li: solve the problem of space between two bikes</td>
<td>Bs</td>
<td>19</td>
</tr>
<tr>
<td>30</td>
<td>Chen: design a lock combining the plate on the back wheel</td>
<td>S</td>
<td>29</td>
</tr>
<tr>
<td>31</td>
<td>Zhou: used on public bikes</td>
<td>S</td>
<td>9</td>
</tr>
</tbody>
</table>

**Coding within FBS and Building The Colored Linkography**

This study used the FBS coding scheme to segment and code the textual record by two separate coders. The agreement of these two coders’ result was 92.8, which could regard as be reliable. An example of the segmentation and code of the design protocol is posted in table 1. Here during the coding process, the study notes the backlinks of each node after of the Code row in this table, which is following the operation principle of the linkographer, an open-source design protocol analysis tool (Pourmohamadi & Gero, 2011).
In order to avoid ambiguities and perform further studies, part of the forelinks and backlinks are presented in figure 5 and 6 separately. In the whole colored linkography, there are 245 links tying 122 segments, so on average each segment has 2.01 links and each member has 22.6 segments and 49 links. However, some members in the teamwork have more segments and link the others.

![Figure 5](image1.png)  
*Figure 5  Part of the forelinks in the resultant colored linkography are assembled*

![Figure 6](image2.png)  
*Figure 6  Part of the backlinks in the resultant colored linkography are assembled*

**Calculation of Indicators**

Figure 7 plots the results of equation 1, where the X-axis is node numbers and the Y-axis is the issues occurrence. This index reveals the respectively total quantity of concept of one member that assesses the personal effort to the course of design. The result in the figure qualitatively infers the contribution of each member in the sample to the process of design. In addition, the mean and standard deviation of issues occurrences figured in table 2 enable the comparison of the originality of each member. Li has the most issues occurrences with the mean of 32.73%, and is more active in the middle and later periods. In other word, Li has put into the most effort for the design team in the sample. On the other hand, the distribution of issues raised by Jia is 0.090, so he is much more active during the whole reasoning process. As a consequence, the devotion of Li and Jia in this
interaction is much higher than others’, especially Wang whose graph line climbs a small scale and the SD is only 0.019.

![Issues occurrence for the design team](image)

**Figure 7** Issues occurrence for the design team

**Table 2** The means and standard deviations of issues of the design team

<table>
<thead>
<tr>
<th></th>
<th>Chen</th>
<th>Jia</th>
<th>Li</th>
<th>Wang</th>
<th>Zou</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\bar{I}$</td>
<td>18.85</td>
<td>23.77</td>
<td>32.73</td>
<td>7.38</td>
<td>17.21</td>
</tr>
<tr>
<td>SD</td>
<td>0.055</td>
<td>0.090</td>
<td>0.074</td>
<td>0.019</td>
<td>0.045</td>
</tr>
</tbody>
</table>

Table 3 and 4 figure out the outcomes of equations 3, 4, 7 and 8 and figure 8 and 9 is the result of equations 5, 6, 9 and 10. These data evaluate the attributes of roles in the interaction. The citations index (CI) and acquiring index (AI) contribute to relatively assess the frequency of interplay of roles during the process of design. In order to compare the individual CI and AI distinctly, these two indexes are enlarged in figures. In addition, the CSI and ASI indicate the popularity of individual moves in the colored linkography. Figure 8 shows that Wang’s CI and Chen’s CSI is the highest, that is, their standpoints are more widely accepted among this design team. Combining the issues occurrence above, the acts of reasoning of Wang is less than others’, but they are referred most. This implies Wang has proposed the critical creation that guides the ideation of other members. Figure 10 presents Wang’s colored linkography annotated with Wang’s ideas and identification. Figure 9 depicts that Jia’ AI and Chen’ ASI are higher than other members. They are proved to prefer to record the external memory as well as others’ working memory and invoke to their reasoning. Combining the indicators above, Chen has not proposed the most issues during the design reasoning, but Chen invokes the external memory more deeply and activates it more dynamic. In turn, Chen’s originality poses stronger impact on external
memory and individual work memory. Figure 11 presents Chen’s colored linkography annotated with Chen’s ideas and identification. Comprehensively, the model of this sampled design team could be summarized as figure 12, where, during this teamwork of design, the interdependence between Chen and other members is the key factor that develops this team’s interaction.

Table 3  The amount of citations and citation span of individual design issues

<table>
<thead>
<tr>
<th></th>
<th>Chen</th>
<th>Jia</th>
<th>Li</th>
<th>Wang</th>
<th>Zou</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>56</td>
<td>47</td>
<td>78</td>
<td>23</td>
<td>28</td>
</tr>
<tr>
<td>CS</td>
<td>1076</td>
<td>835</td>
<td>1449</td>
<td>412</td>
<td>576</td>
</tr>
</tbody>
</table>

Figure 8  The citation index (CI) and citation span index (CSI) of individual design issues

Table 4  The amount of acquiring and acquiring span of design issues

<table>
<thead>
<tr>
<th></th>
<th>Chen</th>
<th>Jia</th>
<th>Li</th>
<th>Wang</th>
<th>Zou</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>38</td>
<td>65</td>
<td>53</td>
<td>14</td>
<td>38</td>
</tr>
<tr>
<td>AS</td>
<td>926</td>
<td>992</td>
<td>1008</td>
<td>189</td>
<td>679</td>
</tr>
</tbody>
</table>
Figure 9  The acquiring index (AI) and acquiring span index (ASI) of individual design issues
Figure 10  Wang’s colored linkography annotated with Wang’s ideas and identification
Figure 11  Chen’s colored linkography annotated with Chen’s ideas and identification
6. Discussion
Successful teamwork relies upon synergism existing between all team members creating an environment where they are all willing to contribute and participate in order to promote and nurture a positive, effective team environment. Team members must be flexible enough to adapt to cooperative working environments where goals are achieved through collaboration and social interdependence rather than individualized, competitive goals (Luca & Tarricone, 2001). So the analysis of the designers in the design team’s personal attributes and contribution, is to help the team to conduct a thorough analysis, a good division of labor, improve the design team management and cooperation.

In this study, we use a color linkography model and encode the color node matrix according to the distribution of the members’ design actions, so as to analyze the individual indexes of the members. Through the color link and the matrix algorithm, we can show the evolution of the individual concept and evaluate the individual attributes, the breadth of the personal concept in the design phase. Dong (2006) identified the existence of central designer who has the ability to connect with and integrate concept from others by accounting the amount utterances in textual record in terms of assessing the relationship in the interaction. This study interprets this attribute in assembling concepts as “the interdependence between key member and other members”. In this study, through the color linkgraphy model and matrix calculation, reveals the total number of each member of the concept, and get the citations index (CI) and acquiring index (AI), which contribute to relatively assess the frequency of interplay of roles during the process of design. The higher the CI and CSI, indicating that the designers’ positions are more widely accepted in this design team. Therefore, this model can be used to show the most important designers in the interaction. Then this study also evaluates how profound the individual concepts are in design synectics.

The FBS ontology and Delphi method employed in this study enhance the reliability of parsing and segmenting, as is proposed in previous research by Gero et al. (2012), which is a pre-configuration step of structuring the colored linkography. Then, comparing with Dong (2006), this study additionally assesses how profoundly the individual concepts develop in design reasoning. In other word, the content of communication is also an
essential index for identify the character of roles in the model of interaction. Colored linkography contains the distribution of individual nodes and the span of links implying the generation and evolution of concepts, so it is a more thorough methodology for identifying the members of design team.

7. Conclusion
This study proposes the generation of the colored linkography on the foundation of previous researches on linkography. This modified linkography differentiates individual design moves and interaction with others distinctly. What’s more, to analyze the character of members from the colored linkography, a color-node matrix is encoded according to the distribution of design moves. Then, the algorithm of five indicators following with the colored linkography and matrix is presented to embody the evolution of individual concept and evaluate different aspects of individual attribute. Therefore, this linkography is considered as a method to compute the interaction model and identify the members in design team. After that, a case originated from a design of lock for bicycles is performed to verify the feasibility of colored linkography. In the case, this study reveals the respectively total quantity of concept of each member and shows the most important designer in the interaction, which achieves the purpose on identifying the members in design team. Consequently, the colored linkography is feasible and reliable. In the future work, the researches expect to develop a measurable approach to represent the links in colored linkography so that the analysis of interaction in design teams can be refined.

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About the Authors

**XU Jiang** researches for the national design strategy and design management. Host and participate in a number of major consulting projects of Chinese Academy of Engineering Innovative Design - development strategy research and the National Natural Science Foundation.

**CHUAI Ying** researches for design management and design cognition computing. Participated in the National Natural Science Foundation of China and a number of design management research projects.

**GAN Xiang** researches for industrial design and design cognition computing.