# SHOULD WE WORRY ABOUT THE TIME ORIENTATION OF CULTURES WHEN DESIGNING SYSTEMS?

Yan Zhang[1], Ravindra S. Goonetilleke[2*], Thomas Plocher[3], and Sheau-Farn Max Liang[4]
[1,2] Department of Industrial Engineering and Engineering Management,
Hong Kong University of Science and Technology, Clear Water Bay, Hong Kong.
[3] Honeywell Laboratories, Minneapolis, MN.
[4] Department of Industrial Engineering & Management, National Taipei University of Technology, Taiwan, ROC.
* ravindra@ust.hk

With the globalization of companies, knowledge of cultural differences and cognitive behavior are becoming very crucial for the design of systems. Time orientation, which categorizes behaviors as monochronic or polychronic, is potentially an important consideration as it can influence the manner in which an operator interacts with complex systems. Thus, systems and their design may have to accommodate these different behaviors. In this paper, the Modified Polychronic Attitude Index 3 (MPAI3) and the Inventory of Polychronic Values (IPV) were used to evaluate the time orientation of Americans, Mainland Chinese and Hong Kong Chinese. The MPAI3 as well as the IPV scales showed significant differences between Americans and Chinese, but no significant difference between Mainland Chinese and Hong Kong Chinese. The results also showed that a majority of Americans are polychronic while Hong Kong Chinese tend to show monochronic abilities. These results and their implications on interface design are discussed in this paper.

## INTRODUCTION

With the proliferation of information and entertainment, people's ability to manage time (Hall, 1959; Francis-Smythe and Robertson, 1999) seems to influence their behavior. Activities are sometimes performed together (parallel) while at other times they are done one at a time (serially). These two extreme approaches of handling tasks are inherent in people's behavior and have been well documented by the work of Hall (1959), who classified them as monochronic and polychronic behaviors. Monochronic persons do one thing at a time, while polychronics tend to do many things at once (Hall, 1983).

Several different methods have been used to evaluate monochronicity and polychronicity. Some of these are the Polychronic Attitude Index (PAI) (Kaufman et al., 1991), Polychronic Attitude Index 3 (PAI3) (Kaufman-Scarborough et al., 1999), Modified Polychronic Attitude Index 3 (MPAI3) (Lindquist et al., 2001), and Inventory of Polychronic Values (IPV) (Bluedorn et al., 1999). The MPAI3 scale has been shown to have a relatively high reliability with Cronbach's alpha of 0.88 for American participants and 0.68 for Japanese participants (Lindquist et al., 2001). Similarly, the IPV scale has been shown to have a Cronbach's alpha of 0.86 with US senior business majors (Bluedorn et al., 1999). Since a Cronbach's alpha value greater than 0.80 is sufficient for internal consistency (Nunnally, 1978), these two scales together with other questions were used in the current study. The aims of this paper are to evaluate potential differences in monochronicity or polychronicity (M-P) among different cultures (America, Mainland China and Hong Kong) using the MPAI3 and IPV questionnaires and then discuss their potential implications for system design.

## METHODOLOGY

The MPAI3 and IPV scales are shown in Table 1. A web-based questionnaire was developed, and completed by 272 respondents including Americans, Chinese and other nationalities. The first section of the questionnaire included questions related to demographics, education, employment, birth nationality and current nationality. The second section contained 44 questions related to monochronic or polychronic behavior. These questions were answered on a 7-point Likert scale (1= strongly disagree and 7=strongly agree). The 44 questions included 11 questions related to

beliefs, 15 questions related to preferences, 14 questions related to actions and 4 questions related to interruptions. The M-P index was calculated for both MPAI3 (Lindquist et al., 2001) and IPV (Bluedorn et al., 1999).

Table 1. Monochronicity or Polychronicity (M/P) Scales

| |
|---|
| **Modified Polychronic Attitude Index 3 (MPAI3)** |
| 1. I like to juggle several activities at the same time. |
| 2. I am comfortable doing several activities at the same time. |
| 3. People should try to do many things at once. |
| **Inventory of Polychronic Values (IPV)** - modified for individuals |
| 1. I like to juggle several activities at the same time. |
| 2. I would rather complete an entire project every day than complete parts of several projects. |
| 3. I believe people should try to do many things at once. |
| 4. When I work by myself, I usually work on one project at a time. |
| 5. I prefer to do one thing at a time. |
| 6. I believe people do their best work when they have many tasks to complete. |
| 7. I believe it is best to complete one task before beginning another. |
| 8. I believe it is best for people to be given several tasks and assignments to perform. |
| 9. I seldom like to work on many tasks or assignments at the same time. |
| 10. I would rather complete parts of several projects every day than complete an entire project. |

* Each item uses a 7-point scale with 1 implying high monochronicity and 7 high polychronicity. Questions 2, 4, 5, 7, and 9 in the IPV scale were reverse scaled.

## RESULTS AND ANALYSIS

The internal consistency or reliability was evaluated using Cronbach's alpha, which was 0.7239 and 0.8798 for the MPAI3 and IPV scales respectively (N=272). The IPV scale reliability is comparable with that of Bluedorn et al. (1999), even though the reliability of the MPAI3 is lower than the US respondents, but higher than the Japanese respondents as reported in Lindquist et al. (2001).

The demographics of the participants are given in Table 2, while the simple statistics of the two scales, for the three populations, are shown in Table 3.

Table 2. Demographics of the current nationality of respondents. The values corresponding to their birth nationalities are in parenthesis.

| | American | Mainland Chinese | Hong Kong Chinese |
|---|---|---|---|
| ***Gender*** | | | |
| Male | 64 (57) | 35 (34) | 19 (20) |
| Female | 66 (61) | 15 (15) | 15 (15) |
| ***Age (years)*** | | | |
| Between 20 and 29 | 31 (27) | 43 (43) | 34 (34) |
| Between 30 and 39 | 37 (34) | 6 (5) | 0 (1) |
| Between 40 and 49 | 30 (29) | 0 (0) | 0 (0) |
| 50 or more | 32 (28) | 1 (1) | 0 (0) |
| ***Education*** | | | |
| High School | 6 (6) | 0 (0) | 0 (0) |
| Undergraduate degree | 33 (33) | 23 (23) | 34 (34) |
| Graduate degree | 79 (69) | 24 (23) | 0 (1) |
| Other | 12 (10) | 3 (3) | 0 (0) |
| ***Total*** | 130 (118) | 50 (49) | 34 (35) |

The mean of the scale item scores was used in order to be able to compare across the two scales. Figures 1 and 2 show the mean scale values of the respondents' current nationality and birth nationality. The figures show that Americans tend to be more polychronic than Mainland Chinese and Hong Kong Chinese.

Table 3. Scale statistics for the current nationality of respondents. The values for birth nationalities are within parenthesis. Note that the Scale value = mean of scale items

| | | American | Mainland Chinese | Hong Kong Chinese |
|---|---|---|---|---|
| MPAI3 | Minimum | 1.00 (1.00) | 2.00 (2.00) | 1.00 (1.00) |
| | Maximum | 7.00 (7.00) | 6.33 (6.33) | 5.33 (5.33) |
| | Mean | 4.68 (4.62) | 3.91 (3.90) | 3.56 (3.61) |
| | Std Dev | 1.27 (1.26) | 0.96 (0.97) | 1.04 (1.05) |
| IPV | Minimum | 1.60 (1.60) | 1.90 (1.90) | 1.22 (1.22) |
| | Maximum | 6.50 (6.50) | 6.10 (6.10) | 4.90 (4.90) |
| | Mean | 4.36 (4.31) | 3.55 (3.57) | 3.32 (3.28) |
| | Std Dev | 1.13 (1.15) | 0.98 (0.98) | 0.79 (0.80) |
| No. of respondents | | 130 (118) | 50 (49) | 34 (35) |

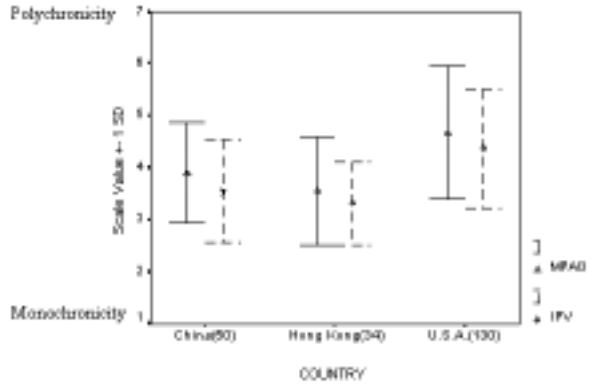


Figure 1. Mean scale values (mean ± 1 standard deviation) for current nationality

The mean values of Mainland Chinese and Hong Kong Chinese were below the neutral value of 4 (that is, neither monochronic nor polychronic), but, higher than 4 for Americans. A one-way (nationality) ANOVA with the scale value as the dependent variable was performed for each scale. Unlike the values shown in Table 3 and Figures 1 and 2, the published method for calculating the MPAI3 score was used. That is, the MPAI3 scale score for the ANOVA was the summation of the three items (Lindquist et al., 2001), rather than the mean of the items. The ANOVA for current nationality showed a significant difference ($F(2,211)= 16.55$; $p < 0.0001$) for MPAI3 as well as for IPV ($F(2,211)= 19.36$; $p < 0.0001$). Similarly, the ANOVA for birth nationality also showed a significant difference for MPAI3 ($F(2,199)= 13.49$; $p < 0.0001$) and for IPV ($F(2,199)= 17.02$; $p < 0.0001$).

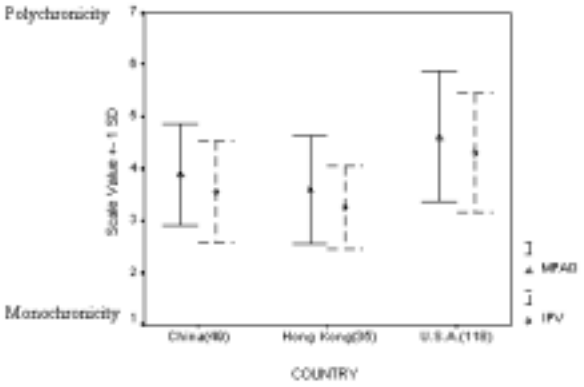


Figure 2. Mean scale values (mean ± 1 standard deviation) for birth nationality

The *Post hoc* Duncan test for the three populations are shown in Tables 4 and 5. The neutral value (that is, neither monochronic nor polychronic) was 12 for MPAI3 and 4 for IPV. Hence, Americans appear to be polychronic; Hong Kong Chinese and Mainland Chinese however, seem to be inclined towards monochronic behavior, even though some respondents show polychronic tendencies.

Table 4. Duncan grouping of MPAI3 and IPV score for current nationalities. The underline indicates that the means are not statistically different at the p = 0.05 level

| MPAI3 | | |
|---|---|---|
| U.S.A. | China | Hong Kong |
| 14.05 | 11.72 | 10.68 |
| **IPV** | | |
| U.S.A. | China | Hong Kong |
| 4.36 | 3.55 | 3.32 |

Table 5. Duncan grouping of MPAI3 and IPV score for birth nationalities. The underline indicates that the means are not statistically different at the p = 0.05 level

| MPAI3 | | |
|---|---|---|
| U.S.A. | China | Hong Kong |
| 13.85 | 11.69 | 10.83 |
| **IPV** | | |
| U.S.A. | China | Hong Kong |
| 4.31 | 3.57 | 3.28 |

## DISCUSSION AND CONCLUSION

The analysis of variance showed a significant difference among the three populations, for both MPAI3 and IPV scales. A *post-hoc* Duncan test showed a significant difference ($p < 0.05$) between Americans and Chinese, but no significant difference between Mainland Chinese and Hong Kong Chinese. Generally, the mean scores of Americans are indicative of polychronic tendencies while those of Hong Kong Chinese indicate monochronic tendencies. This finding is similar to those of Lee and Harada (1999) and Lindquist et al. (2001) where Japanese were shown to be more monochronic compared to Americans.

The time orientation differences can have a significant effect on interface design. Lee and Harada (1999) found that

Japanese preferred ‘deep’ interface structures and ‘verbal’ labels while Koreans and Americans preferred ‘shallow’ and ‘graphic’ interfaces. This result may be attributed to information-overload as suggested by Haase et al. (1979) who defined polychronicity as “the ability to cope with stimulus-intense, information-overload environments”. Hall and Hall (1990) made reference to polychronic people as "live(ing) in a sea of information” while monochronics are said to be those who deal with things one at a time, and those who don’t like to be interrupted. Similarly, Kaufman-Scarborough and Lindquist (1999) have also mentioned that polychronic persons are able to manage interruptions, activity switches, and job uncertainty and time pressure better than monochronic persons. Thus, it appears that monochronic persons may not be able to handle polychronically driven work (Schein, 1992). Monochronic persons tend to do one task at a time. They may feel “lost” or “disorganized” when the system involves many concurrent tasks with excessive information. At the same time, monochronic persons may not know where to start and how to handle interruptions.

Based on the above, it is clear that the amount of information presented to an operator at any one time can have a significant effect on performance depending on whether a person is monochronic or polychronic. Polychronic persons may want to process more information, as opposed to monochronic persons who may want only a limited amount of information at any one time. In terms of human work such as web use, this may mean giving the ability for the user to access one or many things at a time so that the user can process many things at a less complex level or letting the user dig "deeper" in relation to one aspect as shown by Lee and Harada (1999). In more complex situations such as process control, the operator has to have the ability to access important information in a predetermined way that is coherent with the cognitive processing of information whether it is one idea/item at a time or many at once. Hence, time orientation differences among individuals appear to be a factor that cannot be neglected, beyond colors and icons, when designing and developing systems if interfaces are to be individual or culture compatible.

## ACKNOWLEDGMENTS

The authors would like to thank Honeywell Laboratories for funding this study.

## REFERENCES

Bluedorn, A.C., Kalliath, T.J., Strube, M.J. and Martin, G.D., 1999. Polychronicity and the Inventory of Polychronic Values (IPV): The development of an instrument to measure a fundamental dimension of organizational culture. Journal of Managerial Psychology, 14(3-4), 205-230.

Francis-Smythe, J. and Robertson, I., 1999. Time-related individual differences. Time and Society, 8(2), 273-292.

Haase, R.F., Lee, D.Y., and Banks, D.L., 1979. Cognitive correlates of polychronicity. Perceptual and Motor Skills, 49, 271-282.

Hall, E.T., 1959. The silent language. New York: Fawcett Publications.

Hall, E.T., 1983. The dance of life: the other dimension of time. New York: Anchor Press.

Hall, E.T., 1990. The hidden dimension. New York: Anchor Press.

Hall, E.T. and Hall, M.R., 1990. Understanding cultural differences. Yarmouth, Me: Intercultural Press.

Kaufman, C.F., Lane, P. M. and Lindquist, J. D., 1991. Exploring more than 24 hours a day: A preliminary investigation of polychronic time use. Journal of Consumer Research, 18(3), 392-401.

Kaufman-Scarborough, C. and Lindquist, J.D., 1999. Time management and polychronicity: Comparisons, contrasts, and insights for the workplace. Journal of Managerial Psychology, 14(3-4), 288-312.

Lee, K.P. and Harada, A., 1999. A study on the cultural effects on user-interface design: with the emphasis on the cross-cultural usability testing through world wide web. In Proceedings of the 4th Asian Design Conference, Nagaoka, Japan.

Lindquist, J.D., Knieling, J. and Kaufman-Scarborough, C., 2001. Polychronicity and consumer behavior outcomes among Japanese and U.S. students: A study of response to culture in a U.S. university setting. In Proceedings of the Tenth Biennial World Marketing Congress. City Hall Cardiff, UK.

Nunnally, J. C., 1978. Psychometric Theory, McGraw Hill, New York, NY.

Schein, E.H., 1992. Organizational culture and leadership (2nd ed.). San Francisco: Jossey-Bass Publishers.