Cultural differences explaining the differences in results in GSS: implications for the next decade

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Abstract

For the next decade, the “support” that comes from Group Support Systems (GSS) will be increasingly directed towards culturally diversified groups. While there have been many GSS studies concerning culture and cultural differences, no dedicated review of GSS research exists for the identification of current gaps and opportunities of doing cross-cultural GSS research. For this purpose, this paper provides a comprehensive review utilizing a taxonomy of six categories: research type, GSS technology used, independent variables, dependent variables, use of culture, and findings. Additionally, this study also aims to illustrate how differences in experimental results arising from comparable studies, but from a different cultural setting, can be explained consistently using Hofstede’s dimensions. To do so, we presented a comparative study on the use of GSS in Australia and Singapore and explain the differences in results using Hofstede’s [G. Hofstede, Culture’s Consequences—International Differences in Work-related Values, Sage, Beverly Hills, CA (1980).] cultural dimensions. Last, but not least, we present the implications of the impact of culture on GSS research for the next decade from the viewpoint of the three GSS stakeholders: the facilitators, GSS software designers, and the GSS researchers. With the above, this paper seeks (i) to prepare a comprehensive map of GSS research involving culture, and (ii) to prepare a picture of what all these mean and where we should be heading in the next decade.

Keywords: Cultural differences; GSS; Implications

1. Introduction

If you have a joint venture with a Japanese company, they will send 24 people here to learn everything you know, and you will send one person there to tell them everything you know... (Kupfer [40], p. 58)

The above quote reminds us of the cultural differences that exist between a western and eastern nation. Culture has been defined in a number of related ways [5,39,68]. Ferraro [27] provides a succinct definition of culture as follows: “Culture is everything that people have, think, and do as members of their society”. Ferraro highlights that the three verbs, have, think, and do, differentiate nations and people within nations. Culture becomes a dominant force when a group of people interacts—be it international business, group decision making, or international negotiation [5,27]. For example, Adler [5] mentions that in North American Businesses individuals usually make decisions, while in...
Japan, groups make decision. Also, in North America, a decision is made very quickly, while in some slow-paced cultures, the amount of time spent on decision making increases the value of the decision made [5].

In this paper, we look at culture and its impact on group decision making using Group Support Systems (GSS). A number of studies have been conducted on the use of GSS involving culture, for example see Watson et al. [76], Mejias et al. [45], Tan et al. [63], among many others. We take a closer look in almost all the GSS studies involving culture. We also present a comparative study on the use of a GSS in Australia and Singapore and explain the differences in results using Hofstede’s [39] cultural dimensions. We then discuss the implications of GSS research for the next decade. The primary objectives of our paper are, therefore, (i) to prepare a comprehensive map of GSS research involving culture, and (ii) to prepare a picture of what all these mean and where we should be heading in the next decade.

The paper is organized as follows. Section 2 provides a comprehensive review of GSS research involving culture. We present only the GSS studies where culture has been used extensively in an objective way. Section 3 presents a comparative inquiry into two similar laboratory experiments conducted in Australia and Singapore and explains the differences in results using Hofstede’s [39] cultural dimensions. Implications for the next decade of the impact of culture on GSS research are presented in Section 4. Three stakeholders of GSS, namely the facilitators, the GSS software designers, and the GSS researchers are highlighted here. Finally, conclusions are presented in Section 5.

2. Culture and GSS research: a review

In this section, we perform a comprehensive review of GSS research involving culture. A number of reviews of GSS research are available in the literature, for example, see Pervan [51], Pervan and Atkinson [50], Fjermestad and Hiltz [28], Nunamaker et al. [49], among many others. All these studies also reviewed some GSS research involving culture. However, dedicated reviews of GSS research involving culture are not available in the literature. De Vreede et al. [25], while reporting the applications of GSS in Africa, did a review of past GSS applications research in non-Euro-American cultures and presented 12 such applications. While the authors report that GSS research involving Culture is scarce in the literature, their overview ([25], p. 203) is not comprehensive. We make an attempt here to give a comprehensive and dedicated overview of GSS research that involves culture.

2.1. Methodology

Our research starts from previous review research on GSS (Refs. [28,49–51], amongst many others) and identifying publications involving GSS and culture. We covered major conferences on Information Systems, for example ICIS, AIS conference, HICSS, UCIS, and the like. We also made use of the electronic databases (for example, ABI/Inform, ScienceDirect, etc.) using relevant keywords. Finally, we also used the conventional method of browsing through the journals and conference proceedings in the library for relevant materials. Unlike other reviews (dealing only with experimental research, etc.), we took interest in all types of research on GSS and culture. Our only requirement being that involvement of culture must be substantial in the research. Mere mention of culture in passing would not fulfill our criterion.

2.1.1. Group support systems (GSS)

A broader view of GSS is adopted here in our paper. Two versions of GSS have been covered in our review [53]. One is the networked GSS, where all participants have individual PCs that are all networked. This type of GSS is also popularly known as Electronic Meeting System (EMS) [22]. EMS might use a variety of software, such as GroupSystem [72], and SAMM [76]. The second is the non-networked GSS, where an analyst operates a single workstation and the participants take part in an open discussion in order to develop an appropriate decision model on-line to tackle the task at hand. This type of GSS is also popularly known as Decision Conferencing (DC) [53]. DC might use a variety of software, for example HIVIEW, and EQUITY, amongst others. The main difference between these two types of GSS lies in the type of group work for which computer support is
needed. The former (EMS) primarily involves supporting and improving group communication, while the later (DC) involves developing on-line decision models to solve a group problem of strategic nature [53].

Besides GSS, we also reviewed past research on GroupWare to identify whether culture plays a role in GroupWare and if so, in what manner [41,61].

2.1.2. Research categories

A number of authors have categorized general IS research [11,29,74]. Very recently, Pervan [51] adapted Alavi and Carlson’s [11] taxonomy to suit GSS research. In turn, we have adopted Pervan’s classifications to describe the research type which comprise of 19 categories: GSS frameworks, Conceptual models, Conceptual overview, Theory, Opinion and example, Opinion and personal experience, Tools—techniques—methods—model applications, Conceptual framework and their applications, Description of type or class of product—technology—systems, etc., Description of specific application—system, etc., Laboratory experiment, Field study, Positivist case study, Interpretivist case study, Action research, Survey, Development of GSS instrument, and Secondary data.

2.2. Results and analysis

Our comprehensive search resulted in 30 studies on GSS involving culture. In all these studies, culture constitutes a substantial portion of the GSS research. In other words, culture has been used either as an independent or dependent variable, or analyzed in detail to develop the hypotheses or propositions. Alternatively, in more exploratory studies, culture has been used substantially to explain the differences in results found in non-western countries.

Table 1 presents the 30 studies in an easy to understand format. These studies are categorized by Research type, GSS technology used, Independent variables, Dependent variables, Use of culture, and Findings. Following sections describe each category in detail and highlight the gaps for possible future research on GSS involving culture.

2.2.1. Research type

We first categorize the 30 studies into empirical and non-empirical studies [51]. Eighteen fall in the category of empirical, and the remaining 12 fall in the category of non-empirical. Among the 19 research categories, the GSS and culture researchers have adopted ten categories. Distribution of these research categories by frequencies are as follows: Laboratory experiments (13), Conceptual overview (7), Field study (2), Description of type or class of product-technology, etc. (2), Survey (1), Opinion and personal experience (1), Tools—techniques—methods—model applications (1), Description of specific application—system, etc. (1), Action research (1), Conceptual framework and their applications (1). In line with other GSS research reviews laboratory experiments were found to dominate the culture research, followed by conceptual overviews. We noted only two field-study type researches, but no field experiment and case study research, thus highlighting the opportunities for further future research in these areas. Most of the conceptual overview type studies presented a number of propositions [63], research questions [14], and possible projects [49] on GSS and culture. A rich area of future research will be to take these concepts and perform other types of research such as field studies, field experiments, and case studies (both positivist and interpretivist).

2.2.2. GSS technology

This category identifies the types of GSS technologies that have been used in cultural research. GroupSystems [72] has been used in eight studies, followed by prototype GSS in six studies, SAMM [76] in three studies, while DC has been used in only one study [55]. To date, there is a general lack of published literature on DC. For example, Pervan [51] reported only four cases (out of 234 cases) where DC has been employed, utilizing some decision making type software. This lack of reported studies on DC might be due to the proprietary nature of the many DC studies. For example, hundreds of Decision Conferences have been conducted at Curtin University of Technology but only one study has been published in the journal [53] due to the confidential nature of the projects. Studies on DC and culture are, therefore, potential future areas of fruitful research.

It is interesting to note that GroupWare has been used in only one cultural study [61], despite its widespread applications in organizations [41]. Smith and Dodds [61], however, make some interesting observations regarding the impact of culture on GroupWare
<table>
<thead>
<tr>
<th>Source</th>
<th>Research type</th>
<th>GSS technology</th>
<th>Independent variables</th>
<th>Dependent variables</th>
<th>Use of culture</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aiken et al. [8]</td>
<td>Description of type or class of product, technology, etc.</td>
<td>Prototype GSS</td>
<td>–</td>
<td>–</td>
<td>Description of the impact of culture on group communication</td>
<td>Communication barriers with respect to different culture are identified.</td>
</tr>
<tr>
<td>Tan, BCY et al. [63]</td>
<td>Conceptual overview No GSS technology</td>
<td>–</td>
<td>Anonymity, Group size, Task type</td>
<td>Power distance (PD) effects</td>
<td>Culture (PD) as dependent variable</td>
<td>Four main propositions (with corollaries in some) are presented relating PD with anonymity, group size and task type</td>
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<tr>
<td>Mejias et al. [44]</td>
<td>Laboratory experiments GroupSystem Technology support (GSS and non-GSS), Identification feature (anonymity and identified), Culture (USA and Mexico)</td>
<td>Technology support (GSS and non-GSS), Anonymity, Group size, Task type</td>
<td>No. of comments, No. of unique ideas, Participation equity</td>
<td>Culture as independent variable, Hofstede’s [39] cultural dimension were used to develop the hypotheses</td>
<td>Mexican GSS groups perceived higher participation equity than the USA groups.</td>
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<tr>
<td>Mejias et al. [45]</td>
<td>Laboratory experiments GroupSystem Technology support (GSS and non-GSS), Identification feature (anonymity and identified), Culture (USA and Mexico)</td>
<td>Technology support (GSS and non-GSS), Anonymity, Group size, Task type</td>
<td>Consensus level, Satisfaction with decision, Participation equity</td>
<td>Culture as independent variable, Hofstede’s [39] cultural dimension were used to develop the hypotheses</td>
<td>Mexican groups generated higher levels of consensus than USA groups. Mexican participants perceived higher levels of satisfaction and participation equity than USA participants did.</td>
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<tr>
<td>Watson et al. [76]</td>
<td>Laboratory experiments SAMM Culture (USA and Singapore), Technology support (baseline, manual, and GSS support)</td>
<td>Culture (USA and Singapore), Technology support (baseline, manual, and GSS support)</td>
<td>Change in consensus</td>
<td>Culture as independent variable, Hofstede’s [39] cultural dimension were used to develop the hypotheses</td>
<td>Singaporean groups had higher pre-meeting consensus than the US groups. Change in consensus was less for Singaporean groups than corresponding US groups. Equality of influence was more equal in Singaporean baseline groups than US baseline groups.</td>
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<tr>
<td>Authors</td>
<td>Study Type</td>
<td>GSS Used</td>
<td>Technology Support</td>
<td>Amount of Conflict</td>
<td>Conflict Resolution Strategies</td>
<td>Hofstede’s Cultural Dimensions</td>
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<tr>
<td>Quaddus et al. [55]</td>
<td>Laboratory experiments</td>
<td>Decision conferencing (DC) using HIVIEW</td>
<td>Technology support (DC vs. manual), Task type (resource allocation vs. planning)</td>
<td>Amount of conflict, Conflict resolution strategies, Productivity of conflict</td>
<td>Hofstede’s [39] cultural dimensions were used to develop hypotheses in the context of Singapore</td>
<td>Culture is used as independent variable, and also to develop the hypotheses</td>
</tr>
<tr>
<td>Griffith [34]</td>
<td>Laboratory experiments</td>
<td>GroupSystem</td>
<td>Culture, Hofstede’s [39] power distance (PD)</td>
<td>Satisfaction</td>
<td>Hofstede’s [39] cultural dimensions were used to explain the differences between Mexican and USA/Canadian studies.</td>
<td>Culture is used to explain the similarities/differences between US and Korean firms.</td>
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<tr>
<td>Morales et al. [47]</td>
<td>Field study (exploratory)</td>
<td>GroupSystem</td>
<td>Technology support (face-to-face vs. GSS support), Facilitation, Culture</td>
<td>Communication, Comfortability with GSS, Quality of results, Group participation</td>
<td>Hofstede’s [39] cultural dimensions were used to explain the differences between Mexican and USA/Canadian studies.</td>
<td>Culture is used to explain the similarities/differences between US and Korean firms.</td>
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<tr>
<td>Chung and Adams [15]</td>
<td>Survey</td>
<td>No GSS used</td>
<td>Task, Environment, Cohesiveness, Size, Communication, Leadership</td>
<td>Satisfaction level, Goal attainment, Consensus, Equity, Confidence, Conflict, etc.</td>
<td>Hofstede’s [39] cultural dimensions were used to explain the differences between Mexican and USA/Canadian studies.</td>
<td>Culture is used to explain the similarities/differences between US and Korean firms.</td>
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<tr>
<td>Smith and Dodds [61]</td>
<td>Opinion and personal experience</td>
<td>GroupWare</td>
<td>Age, Appraisal system, Attitude, Culture</td>
<td>Information flow, Up-to-date information, Information integrity, automatic processing, Efficiency, Organisational responsiveness.</td>
<td>Culture is used to analyse the impact of GroupWare on management and work practices.</td>
<td>Hofstede’s [39] cultural dimensions are analysed and suggestions made on how best GroupWare can be used in different countries (e.g. high PD countries would not like information sharing feature of GroupWare). The need and impact of selective broadcast (SB) is identified in the context of Indonesian culture. Implementation of SB in RAPAT is described.</td>
</tr>
<tr>
<td>Abdat et al. [1]</td>
<td>Tools, techniques, methods, model applications</td>
<td>RAPAT-prototype asynchronous GSS</td>
<td>Selective broadcast, Anonymity, Memory</td>
<td>–</td>
<td>Culture is used in describing the requirements of the independent variables.</td>
<td>Hofstede’s [39] cultural dimensions are analysed and suggestions made on how best GroupWare can be used in different countries (e.g. high PD countries would not like information sharing feature of GroupWare). The need and impact of selective broadcast (SB) is identified in the context of Indonesian culture. Implementation of SB in RAPAT is described.</td>
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<td>Findings</td>
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<tr>
<td>Abdat and Pervan [2]</td>
<td>Description of type or class of product, technology, systems, etc.</td>
<td>RAPAT—a prototype asynchronous GSS</td>
<td>–</td>
<td>–</td>
<td>Culture is used to describe the requirements for asynchronous pre-meetings in Indonesia</td>
<td>Development of RAPAT as an asynchronous GSS at the pre-meeting stages of strategy formulation for Indonesian culture is described.</td>
</tr>
<tr>
<td>Tan et al. [65]</td>
<td>Laboratory experiments</td>
<td>SAMM</td>
<td>Culture, Communication medium (unsupported, FTF, dispersed), Task type</td>
<td>Majority influence</td>
<td>Culture is used as an independent variable and also used to develop the hypotheses</td>
<td>In the individualistic culture (Singapore), majority influence was stronger in the unsupported setting than FTF and dispersed setting. In the collective culture (USA), there were no corresponding differences.</td>
</tr>
<tr>
<td>Briggs et al. [14]</td>
<td>Conceptual overview</td>
<td>No specific GSS technology</td>
<td>Implicitly and explicitly many</td>
<td>Implicitly and explicitly many</td>
<td>Culture is identified and used as one of the major issues in GSS</td>
<td>A number of research questions concerning culture and GSS are presented.</td>
</tr>
<tr>
<td>Nunamaker et al. [49]</td>
<td>Conceptual overview</td>
<td>No specific GSS technology</td>
<td>Implicitly and explicitly many</td>
<td>Implicitly and explicitly many</td>
<td>Culture is identified and used as one of the major issues in GSS</td>
<td>Laboratory and field studies concerning culture and GSS are reviewed. A number of possible projects concerning culture and GSS are then presented.</td>
</tr>
<tr>
<td>De Vreede et al. [25]</td>
<td>Field study (then grounded theory)</td>
<td>Group System</td>
<td>Endorsement by top management, Computer literacy, Referent power, Oral communication, Satisfaction with use</td>
<td>Use and acceptance of GSS technology</td>
<td>Culture is used to identify and justify the independent variables.</td>
<td>An extended Technology Acceptance Model (TAM) is developed to use and accept GSS in East and South Africa.</td>
</tr>
<tr>
<td>Atkinson and Pervan [12]</td>
<td>Laboratory experiments</td>
<td>Group System</td>
<td>Culture (power distance), Anonymity</td>
<td>Productivity</td>
<td>Culture is used as an independent variable and also used to derive the hypothesis.</td>
<td>High Power distance (PD) cultures derive greater productivity from anonymity. All cultures derive productivity from anonymity, and all cultures perceive anonymity as advantageous. Anonymity allowed Singapore groups express openly, which resulted in dissatisfaction and lower post-meeting consensus. This was not obvious in US groups. GDSS led to more even member influence in US groups, but resulted in less even member influence in Singaporean groups.</td>
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<tr>
<td>Ho et al. [36]</td>
<td>Laboratory experiments</td>
<td>SAMM system</td>
<td>Technology (GDSS, manual, baseline), Anonymity</td>
<td>Post-meeting consensus, Equality of influence</td>
<td>Culture is used to analyse the differences between Singapore and US groups.</td>
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<tr>
<td>Reference</td>
<td>Type</td>
<td>System</td>
<td>Language</td>
<td>Culture</td>
<td>Dependent Variables</td>
<td>Notes</td>
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<tr>
<td>Tan et al. [64]</td>
<td>Conceptual overview</td>
<td>No GSS technology</td>
<td>Communication mode, Task type, Group size</td>
<td>Culture (PD) effects</td>
<td>Culture (PD) effects are used as dependent variables</td>
<td>Several propositions are developed relating PD with communication mode, task type, and group size. Cultural and organisational implications are identified for the implementation of GSS Impacts of culture on the adoption and use of GSS are identified and discussed. Cultural differences among Japan, Singapore and Taiwan are identified and implications for GSS design are explored. Organizational culture inhibited the motivation of the team members to participate, resulting in a general apathy towards the meeting process, lack of team spirit and diminished discussion quality. HK students reported more learning than the Netherlands students. Significant differences were observed between the HK and Netherlands students in “joint team feeling” and “development of trust”. Subjects gave high ratings for both the Korean and the English GSS. No statistical significant differences between the ratings of the Korean and the English GSS were observed in the three dependent variables. Preference for Korean language was observed in oral communication by the Korean subjects.</td>
</tr>
<tr>
<td>Davison [19]</td>
<td>Conceptual overview</td>
<td>No GSS technology</td>
<td>Culture, Organisational variables</td>
<td>GSS implementation</td>
<td>Used as an independent variable</td>
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</tr>
<tr>
<td>Davison and Jordan [20]</td>
<td>Conceptual overview</td>
<td>No GSS technology</td>
<td>Culture</td>
<td>Adoption and use of GSS</td>
<td>Used as independent variable</td>
<td></td>
</tr>
<tr>
<td>Raman and Wei [56]</td>
<td>Description of specific application, system, etc.</td>
<td>Not stated</td>
<td>Implicitly/explicitly many including culture</td>
<td>GSS design</td>
<td>Culture is used as independent variable.</td>
<td></td>
</tr>
<tr>
<td>Davison and Vogel [18]</td>
<td>Action research</td>
<td>Group System</td>
<td>–</td>
<td>–</td>
<td>Observations of the impact of organizational culture on GSS application</td>
<td></td>
</tr>
<tr>
<td>Vogel et al. [73]</td>
<td>Laboratory experiments</td>
<td>Group System, NetMeeting, E-mail</td>
<td>Culture (Hong Kong vs. Netherlands), Tool Support</td>
<td>Educational value, Team dynamics</td>
<td>As independent variable</td>
<td></td>
</tr>
<tr>
<td>Aiken et al. [7]</td>
<td>Laboratory experiments</td>
<td>Prototype multilingual GSS</td>
<td>Language used in the meeting (Korean vs. English)</td>
<td>Ease of communication, Shyness and Satisfaction with the meeting process</td>
<td>Culture is used to identify and justify the independent variables</td>
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<table>
<thead>
<tr>
<th>Source</th>
<th>Research type</th>
<th>GSS technology</th>
<th>Independent variables</th>
<th>Dependent variables</th>
<th>Use of culture</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aiken et al. [9]</td>
<td>Laboratory experiments</td>
<td>Prototype</td>
<td>Language used in the meeting (Spanish and English)</td>
<td>Effectiveness of the GSS (making less errors)</td>
<td>Need for reducing/eliminating lingual barriers to communication is justified</td>
<td>Hypothesis that “a multilingual group can use a multilingual GSS effectively” is supported.</td>
</tr>
<tr>
<td>Tan et al. [66]</td>
<td>Laboratory experiments</td>
<td>Not explicitly mentioned</td>
<td>National culture (Singapore vs. USA), task type, communication medium</td>
<td>Status influence, Sustained influence, and Perceived influence</td>
<td>Culture is used as independent variable, PD and I-C (Hofstede 1980) are used to develop the hypotheses</td>
<td>Singapore groups reported higher sustained influence than the USA groups. Singapore groups that completed the preference task in un-supported setting reported higher perceived influence than groups under other treatments. In general, computer-mediated communication reduces status effects during communication in both Singapore and USA groups.</td>
</tr>
<tr>
<td>Davison and Jordan [17]</td>
<td>Conceptual framework and their applications</td>
<td>No GSS technology</td>
<td>Culture (PD and UA; Hofstede [39]), Attributes of information</td>
<td>Barriers to and benefits arising from the adoption of GSS</td>
<td>Culture is used to develop the framework, as independent variable</td>
<td>Barriers to and benefits arising from the adoption of GSS are perceived differently by IS professionals in 20 countries. Hence, the conceptual framework is supported. Five propositions are put forward for GSS appropriation in organizations based on organizational cultural dimensions.</td>
</tr>
<tr>
<td>Serida-Nishimura [59]</td>
<td>Conceptual overview</td>
<td>No specific GSS technology</td>
<td>Organizational culture</td>
<td>GSS appropriation in organizations</td>
<td>Organizational culture is used to develop and explain a conceptual model of GSS appropriation</td>
<td>Five propositions are put forward for GSS appropriation in organizations based on organizational cultural dimensions.</td>
</tr>
<tr>
<td>Aiken et al. [6]</td>
<td>Laboratory experiments</td>
<td>Prototype</td>
<td>Language used in the meeting (English vs. Malay)</td>
<td>Ease of communication, fear of peer criticism, meeting satisfaction</td>
<td>Culture is used to identify and justify the independent variables</td>
<td>No significant differences were observed between the American and the Malay groups in terms of the dependent variables. Multilingual GSS is therefore effective regardless of a group’s nationality or language.</td>
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</table>

Table 1 (continued)
applications (see Findings column in Table 1). In addition, six studies reported the use of prototype GSS technologies, two of which support asynchronous group meetings [1,2] while the others support multiple languages [8]. In nine studies, however, no specific GSS technology has been used. All these studies are of the conceptual overview/framework or survey type.

2.2.3. Independent variables

The impacts of independent variables provide rich information regarding the future design issues of GSS software. Ideally, culture (e.g. its dimensions) should be used as one of the independent variables with the outcomes of group sessions (e.g. satisfaction, productivity, etc.) as the dependent variables. Eighteen studies employing several different research methods have used culture or language as independent variables. In the remaining studies, culture has been used indirectly but substantially. A number of other independent variables have been used in the reported studies as can be seen from Table 1. Following culture, the next most popular independent variable used is technology support (eight cases) in the form of baseline, manual, and GSS supported (or some variations of these). The third most popular independent variable is anonymity (six cases) followed by task type (five cases) and group size (three cases).

2.2.4. Dependent variables

Dependent variables are chosen from the expected outcomes of the group sessions. The choice of both dependent and independent variables, of course, depends on research objectives. The most popular dependent variable specified in the studies is adoption—use—acceptance of GSS (five cases) followed by consensus (four cases), and satisfaction (four cases). Literature on culture [5,39,68] provides information and evidence on how culture impacts some of the dependent variables presented in Table 1. For example, Adler [5] points out that in the context of problem recognition (an important aspect of decision making using GSS), Western cultures perceive situations as problems to be solved, while Eastern cultures accept situations as they are. In this regard, decision quality and satisfaction with the decision, which comprise two of the dependent variables detailed in Table 1, will be different in different cultures when using GSS to solve a task.

2.2.5. Use of culture

This column of Table 1 provides useful information on how culture had been used in GSS research. There were three ways that culture had been used substantially in all the identified studies reflected in Table 1: as an independent variable, as a dependent variable, and as a context variable. In the first and second modes, culture was used directly in the GSS research conducted. In the third mode, culture, as a context variable, was used substantially to explain the differences in results of similar experiments in two or more countries. While culture and language have been used as independent variables in 18 studies as mentioned earlier, one specific dimension of culture (power distance effects) has been used as a dependent variable in two studies. These two studies showed how GSS was able to reduce the effects of power distance across different cultures.

In addition, culture is used directly to develop hypotheses in eight studies. In all the studies, culture is used substantially to explain the outcomes of the research.

2.2.6. Findings

Table 1 presents the findings in greater detail. In experimental research, where culture has been used as an independent variable, the expected results were confirmed. For example, Mejias et al. [45] hypothesized and reported that Mexican participants perceived higher levels of participation equity than their US counterparts. This was expected since Mexico is a high power distance country compared to USA [39] and GSS is expected to reduce the power distance effect [63]. Other findings of Table 1 are self-explanatory.

3. Role of culture: a cross-cultural comparative inquiry

In this section, we present a comparative study on the impact of DC on group conflict and conflict management. The use of GSS has been found to foster increased levels of participation and facilitates a more systematic, structured group process, resulting in more effective management of conflict in groups. As a result, group consensus was also found to be higher in GSS-supported groups as compared to groups using other methods.
This research first replicates an Australian study [54] in Singapore to investigate the effects of DC on group conflict and conflict management. This study takes a comparative inquiry approach to examine the role of cultural differences between the two countries in explaining the discrepancies in results. This research is of utmost significance for three primary reasons. First, previous studies on conflict in GSS domain have primarily dealt with networked GSS and neglected non-networked GSS like DC (see, for example, Refs. [46,52,58]). This study, on the other hand, takes a systematic approach to study the impact of DC on group conflict. Second, all previous studies concentrated on only one task, and hence, results are limited to the extent of the task. This study considers two tasks thus increasing the possibility of generalizing the result. Third, previous studies on conflict concentrated on Western culture alone. As mentioned earlier, this study makes a comparative analysis of two cultures, Western and Asian, as represented by Australia and Singapore, respectively, in the context of group conflict generation and management using Hofstede’s [39] cultural dimensions. The primary objectives of this study are, therefore, as follows:

(i) to compare and contrast the differences in findings of the Singapore study with the corresponding Australian study;

(ii) to investigate the role of culture in explaining these differences, if any.

To fulfill the above objectives, a “comparative inquiry” approach (a method of interpretivist paradigm) was chosen and used.

3.1. The research model

The research model for this study, adapted from the input–process–output framework of McGrath [42], is shown in Fig. 1. “Technology support” and “task” are taken as the input factors. Note that “culture” is taken as the given group context [62], not as an input factor. There are two types of conflict and three types of conflict resolution strategies used in the conflict interaction process. Finally, we look at the outcome in terms of the “productivity” of the conflict. Fig. 1 also reflects the results of the Singapore study compared with that of the Australian study in order to explore the role of culture in these two similar experiments.

3.1.1. Group context: culture

Hofstede [39] has extensively researched differences in culture among people of different nationalities. He conducted an international attitude survey on the employees of HERMES, a multinational corporation. The study, which was done between 1967 and 1973,
involved HERMES employees in 66 countries. It was later limited to 40 countries for reasons of stability of data. The findings of Hofstede’s study have been used in other empirical studies prior to this, for example see Ho et al. [36], Tan et al. [64], Watson et al. [76].

From the HERMES study, four dimensions of national culture were identified. They are: Power Distance, Uncertainty Avoidance, Individualism and Masculinity. The definitions of the four dimensions are as follows [39].

- **Power Distance** is the extent to which society accepts the fact that power in institutions and organizations is unevenly distributed.

- **Uncertainty Avoidance** is the degree to which a society feels threatened by uncertain and ambiguous situations, which leads them to support beliefs promising certainty and to maintain institutions protecting conformity.

- **Individualism** refers to a preference for a loose knit social framework in society in which individuals are only supposed to take care of themselves and their immediate families. This is opposed to **Collectivism**, which implies a preference for a tightly knit social framework in which individuals can expect their relatives and clan to protect them in exchange for loyalty.

- **Masculinity** refers to a preference for achievement, heroism, assertiveness and material success; as opposed to **Femininity**, which implies a preference for relationships, modesty, caring for the weak and the quality of life.

The data in the study was collated to yield index scores for various countries. The country index scores of Singapore and Australia are presented in Table 2 below.

The country index scores of the four dimensions are a projection of the general societal norm. The societal norm is meant to be a value system shared by the majority of the middle classes in a society. Reference to Table 2 will be made in the comparative inquiry part of the study.

It must be noted that Hofstede’s cultural dimensions have primarily been developed from the study of individuals in a specific organization across different nations and its dataset is also old. However, Usunier ([71], pp. 30–31) points out that numerous replications of Hofstede’s study have been conducted and the cultural dimensions have been found to be stable over time and samples. Despite some limitations Hofstede’s dimensions have been widely used over the years. In the context of GSS, almost all the studies used Hofstede’s dimensions (see Table 1). In line with all the previous studies of GSS involving culture, we have also adopted Hofstede’s dimension in our research.

### 3.2. Research design

A $2 \times 2$ factorial repeated measures design was used in both studies. The two factors were (1) computer support and (2) task. The computer support variable had two levels — DC (with computer support) and Manual (without computer support). As for the task variable, two different tasks were used. Task 1 was a resource allocation case [75], while Task 2 was a strategic planning case [78].

For the Singapore study, a total of 20 groups, consisting of three to four members per group, participated in the laboratory experiment. For the Australian study, a total of six groups, consisting of the three to five members per group participated in that experiment.

Two treatment variations were applied; which meant that each group had to work on both tasks, using DC (with computer support) on one task and performing the other task manually. Whether a group was performing each task manually or with computer support was determined on random basis. None of the groups knew how the arrangement would be until the day of the experiment itself. The order of technology was counterbalanced to minimize the order effects [13].

#### 3.2.1. Subjects

The subjects for the Singapore study comprised of first year undergraduate students from the Nanyang Business School, Nanyang Technological University, Singapore, satisfying a course requirement. A total of

<table>
<thead>
<tr>
<th>Country index scores of the cultural dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power distance (PDI)</td>
</tr>
<tr>
<td>Singapore 74</td>
</tr>
<tr>
<td>Australia 36</td>
</tr>
</tbody>
</table>
77 students participated in this study. They formed 20 ad hoc groups of size 3 or 4. The subjects were drawn from a large class of over 1000 students.

For the Australian study, subjects were undergraduate business students enrolled in a Decision Support Unit at Curtin University. The students were given five credit points for participation.

### 3.2.2. Instruments

Three self-report instruments were used to measure the amount and type of conflict experienced, the conflict resolution strategies used and the productivity of the conflict. These instruments were used to assess the groups’ perception towards the three aspects mentioned above. Factor analysis performed on the instruments revealed their reliability to be around 0.70 [46].

### 3.3. Comparison of Singapore and Australian results

We now compare the results of Singapore and Australian studies to explore the role of culture. Table 3 is a summary of the results of both studies. The figures in each cell represent the respective mean scores. Table 4 presents the comparative results of the ANOVA tests.

<table>
<thead>
<tr>
<th>Conflict type</th>
<th>Country</th>
<th>DC Resource allocation</th>
<th>Strategic planning</th>
<th>Manual Resource allocation</th>
<th>Strategic planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Issue-based</td>
<td>SIN</td>
<td>28.67</td>
<td>29.08</td>
<td>31.21</td>
<td>33.69</td>
</tr>
<tr>
<td></td>
<td>AUS</td>
<td>38.42</td>
<td>39.44</td>
<td>35.20</td>
<td>40.00</td>
</tr>
<tr>
<td>Interpersonal</td>
<td>SIN</td>
<td>09.00</td>
<td>10.87</td>
<td>11.05</td>
<td>09.05</td>
</tr>
<tr>
<td></td>
<td>AUS</td>
<td>12.25</td>
<td>15.56</td>
<td>17.40</td>
<td>09.92</td>
</tr>
<tr>
<td>Avoidance resolution</td>
<td>SIN</td>
<td>13.72</td>
<td>16.24</td>
<td>16.16</td>
<td>14.72</td>
</tr>
<tr>
<td></td>
<td>AUS</td>
<td>12.50</td>
<td>12.22</td>
<td>13.50</td>
<td>12.31</td>
</tr>
<tr>
<td>Distributive resolution</td>
<td>SIN</td>
<td>12.15</td>
<td>13.55</td>
<td>14.05</td>
<td>13.44</td>
</tr>
<tr>
<td></td>
<td>AUS</td>
<td>13.75</td>
<td>13.22</td>
<td>13.60</td>
<td>15.08</td>
</tr>
<tr>
<td>Integrative resolution</td>
<td>SIN</td>
<td>18.97</td>
<td>18.11</td>
<td>18.24</td>
<td>17.95</td>
</tr>
<tr>
<td></td>
<td>AUS</td>
<td>17.50</td>
<td>19.56</td>
<td>19.70</td>
<td>18.31</td>
</tr>
<tr>
<td>Productivity of conflict</td>
<td>SIN</td>
<td>43.15</td>
<td>40.53</td>
<td>39.11</td>
<td>39.38</td>
</tr>
<tr>
<td></td>
<td>AUS</td>
<td>44.25</td>
<td>47.56</td>
<td>43.40</td>
<td>45.15</td>
</tr>
</tbody>
</table>

The figures in each cell represent the mean scores for each of the two countries.

### Table 4

Summary of Anova—Singapore and Australia

<table>
<thead>
<tr>
<th>Conflict type</th>
<th>Country</th>
<th>Support</th>
<th>Task</th>
<th>Support–task interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>p</td>
<td></td>
</tr>
<tr>
<td>Issue-Based</td>
<td>SIN</td>
<td>10.216</td>
<td><strong>0.002</strong></td>
<td>1.670</td>
</tr>
<tr>
<td></td>
<td>AUS</td>
<td>0.916</td>
<td>0.344</td>
<td>4.513</td>
</tr>
<tr>
<td>Interpersonal</td>
<td>SIN</td>
<td>0.026</td>
<td>0.873</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>AUS</td>
<td>0.013</td>
<td>0.909</td>
<td>2.413</td>
</tr>
<tr>
<td>Avoidance Resolution</td>
<td>SIN</td>
<td>0.351</td>
<td>0.554</td>
<td>0.482</td>
</tr>
<tr>
<td></td>
<td>AUS</td>
<td>0.266</td>
<td>0.609</td>
<td>0.507</td>
</tr>
<tr>
<td>Distributive Resolution</td>
<td>SIN</td>
<td>1.555</td>
<td>0.214</td>
<td>0.299</td>
</tr>
<tr>
<td></td>
<td>AUS</td>
<td>0.676</td>
<td>0.416</td>
<td>0.262</td>
</tr>
<tr>
<td>Integrative Resolution</td>
<td>SIN</td>
<td>0.656</td>
<td>0.419</td>
<td>1.099</td>
</tr>
<tr>
<td></td>
<td>AUS</td>
<td>0.239</td>
<td>0.627</td>
<td>0.061</td>
</tr>
<tr>
<td>Productivity of conflict</td>
<td>SIN</td>
<td>4.807</td>
<td><strong>0.030</strong></td>
<td>0.984</td>
</tr>
<tr>
<td></td>
<td>AUS</td>
<td>1.299</td>
<td>0.261</td>
<td>3.097</td>
</tr>
</tbody>
</table>

*F* represents the computed *F* value and *p* represents the significance of *F*.

* *p* < 0.05 (significance of *F*).
It is noted from Table 4 that the type of “Support” is significant for the Singaporean study with respect to issue-based conflict and productivity of conflict. This is, however, not significant for the Australian study. On the other hand, “Task” was significant for the Australian study for issue-based conflict, but not for the Singaporean study. Nevertheless, it is observed that Support–Task interaction in Interpersonal conflict is significant for both the Singaporean and Australian study. The ANOVA tests do not show any conclusive pattern, but comparisons of the cultural dimensions do shed some light on these observations. A more detailed discussion of the four dimensions with respect to Singaporean and Australian culture are now presented below with reference to Tables 3 and 4.

### 3.3.1. Power distance

Hofstede’s [39] study has shown that the Singapore society is characterized by high power distance (PDI). High PDI implies that Singaporeans perceive a gap or distance between themselves and individuals who may be of higher status or who wield greater power. They perceive the views of the higher status individual to be superior to their own. As a result, they are more reserved in contributing their opinions and tend not to express their views openly for fear of being viewed negatively. This may explain the higher avoidance behavior documented in this study as compared to the Australian one (Table 3).

On the other hand, the HERMES study reveals that Australia is depicted by low power distance. The low PDI in Australia indicates that individuals feel that they are all on equal footing. Each person’s ideas are just as good as anyone else’s. Therefore, they are more comfortable with airing their views without any fear of being judged. Hence, the avoidance scores found in the Australian study are lower than those reported in Singapore study.

### 3.3.2. Uncertainty avoidance

The HERMES study reveals that Singapore is represented by a low UAI. In low UAI countries, there is greater acceptance of dissent and greater tolerance for deviance [39]. As such, emotions tend to be suppressed by social pressures and conflict rarely leads to aggression. This is actually beneficial as conflict and competition between people can be maintained on a constructive level and used to an advantage. In managing conflict, group members would tend to work towards compromising. This is done in order to accommodate the ideas of all group members, even dissenting ones. It is for this reason that the integrative conflict resolution strategy is the most often used among the three strategies. The need for consensus is evident from the mean score for integrative conflict resolution (compared to avoidance and distributive conflict resolution strategies) reported in this study.

Australia is characterized by a moderate UAI and the study reveals that people in moderate UAI countries are somewhat threatened by the uncertainties in life. In a moderate UAI country such as Australia, there is greater show of emotions than in Singapore. Aggressive behavior is also more accepted [39]. Although aggressive behavior is tolerated, it may still prove detrimental when unleashed as a result of conflict in ideas during group meetings. Therefore, deviant ideas may be dangerous and a stronger need for consensus also exists. The fact that aggressive behavior may be inordinately unleashed is a possible explanation for the higher level of interpersonal conflict detected in the Australian study as compared to the Singaporean one. However, both studies show that the level of interpersonal conflict is generally low.

Despite the fact that dissenting views exist, conclusions must eventually be reached in order to decide on solutions to problems. In the face of strong opposing viewpoints, it might be difficult to get individuals to concede. The only means of concluding would then be to come to a consensus. For this reason, the mean score for integrative conflict resolution in the Australian study is just as high as the Singapore study.

### 3.3.3. Individualism

Singapore is depicted as a collectivistic society with a relatively low IDV score. Singaporeans have greater confidence in making group decisions. Members feel a strong need to maintain harmony within the group because of the collectivist nature of Singaporean society. Thus, relationship may at times prevail over the task at hand.

The need to maintain harmony within a group may be a contributing factor to the lower levels of conflicts reported in this study as compared to the Australian one. The evidence for such a presumption lies in the lower mean scores for both issue-based and interpersonal conflict (Table 3). The differences in mean
scores for interpersonal conflict may not be very large. However, there is a rather large disparity between the Australian and Singapore mean scores for issue-based conflict. Such a situation may be representative of the relationship prevailing over the task.

The importance of initiative explains the belief in individual decisions. Unlike Singaporeans who may choose to maintain group harmony at the expense of giving up their ideas, Australians will stand by their opinions if they feel they are right and therefore, task will always remain the central focus. When group members manage to keep the task in perspective, any conflict that arises would then pertain to the problem. This is another possible explanation for the higher issue-based conflict reported in the Australian study.

3.3.4. Masculinity

Australia and Singapore are both characterized by moderate levels of Masculinity. However, the cultural differences between the countries may be better distinguished by depicting Australia with a moderate level of Masculinity and Singapore with a moderate level of Femininity because Australia scores slightly higher than Singapore on the MAS.

The Femininity societal norm for Singaporeans is to be people-oriented and more concerned with societal ties. Due to the importance placed on social relations, members in society feel that they are interdependent. They would therefore work towards serving the society and improving the quality of life. As a people-oriented lot, Singaporeans are more likely to encounter less interpersonal conflict. This is evident in the reported lower interpersonal conflict as compared to the Australian one (Table 3). The opposite is found to be true for the Australian study. Singaporeans are also more likely to be advocates of integrative strategies to conflict management.

The above discussions reveal that culture plays an important role in determining the effectiveness of DC. Hofstede’s [39] cultural dimensions can be used to find the reasons for variations in results across the two countries. People with different values, preferences and beliefs tend to view and use GSS differently. While some may use it to their benefits, others may not. This observation goes to highlight the importance of understanding the implications of differences in culture on GSS facilitation, design and research going forward.

4. Implications for the next decade

In the previous sections, we have established that, depending on the culture of its participants, analogous use of GSS may produce different performance and perceptions. In addition, we have illustrated, using the results of a cross-cultural GSS comparative inquiry, how some of the cultural differences can be explained consistently using Hofstede’s [39] dimensions.

For the next decade, it becomes increasingly important for researchers and practitioners to know how diverse groups of different cultures and nationalities can be encouraged to work together more effectively and satisfactorily. Increasingly, we see the traditional office being overtaken by a virtual workplace where global collaborations are as common as face-to-face workgroups within the organization. As a result of this borderless environment, work groups and teams are expected to be more culturally diversified and less homogeneous. In addition to virtual organizations, the advent of the Internet and Electronic Commerce (EC) has brought on an acceptance, and even promotion of the borderless workplace. It is no longer acceptable for organizations to have no Internet access, as more than 96% of the large enterprise and 86% of the Small and Medium-sized Enterprises (SMEs) in Singapore have good access to the Internet as of February 1999 [79]. Similarly, at the end of June 1998, 63% of all employing businesses in Australia used personal computers (PCs) with a projection that by the end of June 1999, 43% of businesses would have had Internet access. Of the businesses without an Internet site/home page at the end of June 1998, 16% (88,000 businesses) intended to establish one by the end of June 1999 [3]. With ubiquitous Internet access and increasing prominence of Electronic Commerce in many countries, including Singapore and Australia, communications and collaboration with individuals not of the same cultural origins will be, and have been to some extent, commonplace.

The next three sections will list suggestions for increasing the efficiency and effectiveness of culturally diverse groups and propose ideas for leveraging the synergy of the diverse culture of group members. We will expound the implications of having cross-cultural groups for three stakeholders of GSS, namely the facilitators, the software designers, and the researchers.
Cross-cultural GSS group meetings mentioned in the following sections refer to both diverse participants meeting face-to-face as well as in a geographically distributed manner. However, a distinction will be made between the two when implications need to be drawn specifically for distributed meetings.

In sum, by utilizing our understanding of the state of cross-cultural research in this area, and incorporating research and views from other areas, we will outline suggestions for GSS facilitation, software design and research for the future.

4.1. Implications for facilitators

Many groupware developers have training programs to develop skilled personnel to program, run or facilitate the software ([26], p. 455). Education centers are often set up to train the required personnel. For facilitators, the emphasis is not just on technical skills, but also on facilitating skill.

Cultural differences underlying different countries are not easy to understand. The fact that facilitators come from a similar culture as the participants does not guarantee that they will be able to take into account these cultural differences ([43], p. 6). Furthermore, it has been noted that the facilitator’s fluency of the first language is no guarantee of effective communication. Members of different culture groups interpret information differently because they apply different sets of values, and you cannot force members of another culture group to accept your perceptions of reality as the only right perceptions and superior to their own ([43], p. 8).

The implication then for GSS facilitators is that in order to be effective, they must understand and be aware of the cultural priorities or the value system of the participants [43]. Even if they are of the same first language as the participants, the facilitator should not assume that his/her value system is similar to the participants. Rather, it is of paramount importance to note that while there are no language barriers, a “value” barrier may still exist. In other words, cultural dimensions may not be crouched in terms of only language differences. It is interesting to note that even a same word of a common language, or a well-known festival shared across many nations, may be understood differently by two persons holding different value systems.

For instance, in GSS sessions, additional aids (such as a topic commenter dictionary for agreed-upon definitions) are sometimes used to ensure that cross-cultural team members have a common understanding of the same word [72]. Another example is that although there are many products (e.g. Coca-cola), services (e.g. credit cards) and events (e.g. Christmas) that are common throughout the world market today as a result of modernization, they may not necessarily carry the same meaning for different parts of the world ([37], p. 2). The meaning and value of Christmas, for instance, is different for participants in different cultures.

The issue of cultural differences and how best to handle them in order to bring out the best performance and satisfaction for GSS participants remains unanswered to date. In fact, while our comparative study demonstrated that there are differences, it is unclear how the facilitator should react to these distinctions. As a result, questions such as the following are raised: should differences in value systems as a result of culture be highlighted to the participants? Assuming that the facilitator is from a different culture as the participants, should he/she therefore try to draw out and equalize some of these differences between the participants? Suppose the facilitator share the same culture as the participants, how then should he/she leverage his/her knowledge of the culture in order to be more effective? Further exploration of these questions is required to bring GSS facilitation to a more advanced level of application.

Meanwhile, research has shown that heterogeneous groups produce better quality solutions to assigned problems than homogeneous groups [38]. Others have also proposed that diverse groups have a broader and richer base of experience from which to tackle a problem [4], and essentially, groups can achieve goals more effectively than individuals by integrating individuals’ talents [15]. Literature on groupthink also bears out the need to have heterogeneous groups involved in organizational decision making. At the same time, studies goes to show that there is need to balance the need for having a core value as a norm vs. the need to have diverse critical thinking within the group [4]. Hence, while there are no straightforward answers to the aforementioned questions, we suggest that one way to leverage cultural differences is to use the diversity in the composition of the group members to the best of its advantage.
Facilitators, when armed with more information about the culture of the participants, can plan ahead, execute the GSS sessions more effectively, and will likely obtain better results from the groups involved. In the following section, using Hofstede’s [39] cultural dimensions of power distance, uncertainty avoidance and individualism, we will describe in more specific ways how GSS facilitators can better utilize their knowledge of cultural differences amongst group members to achieve greater effectiveness in cross-cultural GSS meetings.

Hoecklin [37] suggests that the two dimensions of power distance and uncertainty avoidance act together to model the way participants in the sessions think about “who has the power to decide what” and “what rules and procedures will be followed to attain the desired ends”. The former is based on power distance and the latter, uncertainty avoidance. Together, they reveal a contrast in societies’ acceptance and conception of an organization or institution, as well as the different coordination and control mechanisms employed in the different cultures, as shown in Table 5.

In the context of GSS group meetings, the contents presented in Table 5 are interpreted in the following ways. For participants from countries represented by the “family” quadrant, details of the content and the assignment of the work need to be specified for the group to achieve optimal results. On the other hand, participants from countries represented by the “pyramid of people” quadrant can be better served if the facilitator pays attention to the hierarchy of authority within the group. For the participants from the “village market” quadrant, the facilitator needs to stress desired results for the group task. Finally, for participants in the “well-oiled machine” quadrant, the facilitator should emphasize the qualifications needed in determining who to carry out which tasks.

Therefore, by understanding the likely coordination and control mechanisms prevalent in each culture as presented above allows GSS facilitators to employ that knowledge throughout the meetings to achieve group results of a better quality. We will now proceed to discuss in greater detail how facilitators can effectively employ GSS features and tools in light of different culture dimensions.

### 4.1.1. Power distance and uncertainty avoidance

It is suggested that the anonymity of many GSS systems is especially effective in reducing power distance during the meeting [15,57]. The idea is that with anonymity, the issue of who has the power to decide is no longer relevant since the group ideas are anonymous. This encourages more equal participation from all participants. However, people from high power distance cultures are not used to the fact that they can contribute equal ideas and they have the power to decide, and may hence be more hesitant to contribute opinions, albeit unconsciously, despite the anonymity feature. Hence, an effective facilitator is one who is able to be sensitive to the power distance dimension of cross-cultural groups and give appropriate cues to participants whenever necessary.

Another suggestion for facilitators to better utilize power distance differences is that of determining the best stage of the decision making process to engage the GSS, and at which stage to not use the mediating effects of the GSS [64]. Tan et al. [64] suggest that power distance effects are a normative influence (desire to conform to expectations of others) due to hierarchy status. They suggest that these effects can be dysfunctional during the intelligence, design, and a part of the implementation phase of a group decision making. For these decision-making phases, a GSS can add to better group decisions by reducing detrimental normative influence due to hierarchy status [64]. For the choice phase, and for part of the implementation phase, the GSS should not be used. This is because

<table>
<thead>
<tr>
<th>Uncertainty avoidance</th>
<th>Power distance index</th>
<th>Power distance index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Small</td>
<td>Large</td>
</tr>
<tr>
<td>Weak</td>
<td>Village Market</td>
<td>Family</td>
</tr>
<tr>
<td></td>
<td>• Mutual adjustment</td>
<td>• Standardization</td>
</tr>
<tr>
<td></td>
<td>of people through</td>
<td>of work processes</td>
</tr>
<tr>
<td></td>
<td>information</td>
<td>by specifying the</td>
</tr>
<tr>
<td></td>
<td>communication, and</td>
<td>contents of work</td>
</tr>
<tr>
<td></td>
<td>by specifying the</td>
<td>(who does the chores)</td>
</tr>
<tr>
<td></td>
<td>desired results</td>
<td></td>
</tr>
<tr>
<td>Strong</td>
<td>Well-oiled machine</td>
<td>Pyramid of people</td>
</tr>
<tr>
<td></td>
<td>• Standardization</td>
<td>• Emphasize who</td>
</tr>
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<td>the training required</td>
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<td>to perform the work</td>
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Adapted from Hoecklin ([37] p. 34).
stark power distance differences offer positive contributions to these latter phases especially in obtaining the necessary resources associated with the supported choice since higher status group members usually are the ones with the resources.

4.1.2. Power distance and individualism

Chung and Adams [15] recommend that facilitators can use the anonymity, parallel communication and voting features of GSS to increase cooperation and participation, while maintaining focused discussion and efficient communication [15] for high power distance and collectivistic nations. This proposition is built upon the findings of Watson et al. [76] that US groups showed greater change in consensus than Singaporean groups. In other words, even if the US groups have low pre-meeting agreement, they may come up with high post-meeting consensus. This lesser degree of change in consensus for higher power distance and more collectivistic nations (such as Korea [15] as compared to the US) is argued to command less cooperation and participation, but gives more consistent presentation, focused discussion and efficient communication.

Anonymity features of GSS have also been implied to suit individualistic cultures better [76] in the following ways. For individualistic cultures, open conflict resolution is often preferred to consensus building behind closed doors. In these instances, the anonymity feature of the GSS often allows equal participation and reduction of dominant members, thus leading to higher process gains. However, it is important to note that because the anonymity feature of the GSS dampens social-oriented information exchange, its usage may bring about unintended end results for group performance in a culture that values social-oriented communication and behavior [56,76].

A collectivist nation, on the other hand, values consensus building highly as opposed to exploiting and exploring options opened up by differences. Dissent may be discouraged in favor of consensus building [76]. Since GSS was built based on an individualistic culture, consensus and harmony building are not values that the software inherently promotes. While newer versions of GSS have allowed an option where group members can be identified, facilitators must appreciate the implications of individualistic vs. collectivistic culture in order to be able to know when to effectively use the anonymous feature. Both the anonymity and parallel entry features of GSS may have disparate impacts on the participation of group members, depending on the participants’ culture.

In essence, facilitators must be sensitive to the needs of some groups for harmony and consensus building over and above the preference for an open discussion. This point is further substantiated by Robichaux and Cooper [57] who made a series of propositions highlighting relationships between culture dimensions (power distance, individualism and masculinity–femininity) and the effects of anonymity and parallel entry on participation. While these propositions were not empirically tested and therefore not discussed in detail here, overall, they suggest that culture affects participation in the GSS environment. The net effect these two GSS features have on participation depends on both the use of the GSS (what features are used and to what extent) as well as the culture of the participants. According to Robichaux and Cooper [57], for high power distance, collectivistic and feminine cultures, facilitators may want to emphasize the anonymity feature in order to increase participation.

Finally, cognitive researchers have suggested that collectivism is related to the value placed on certain kinds of knowledge [33]. In a collectivistic group setting, feedback and knowledge pertaining to the group is more valued than is knowledge pertaining to any one individual member of the group. In other words, collectivistic groups will more tightly value group knowledge and this may lead to higher group effectiveness [31]. On the other hand, individualistic groups place a low value on knowledge pertaining to the group and therefore dismiss the belief that the group can be effective (group efficacy). Hence, for individualistic groups, group efficacy may not have a direct impact on actual group effectiveness [31]. The implication then, for GSS facilitation with regards to collectivistic groups, is that facilitators should leverage on building the group’s belief in its ability to perform effectively, as this leads to actual increased group effectiveness, and hence, better group results.

4.2. Implications for GSS designers

An ongoing trend in the design of major groupware is the increasing reliance on the web browser interface. This trend will be extended to GSS and decision
conferencing tools as well. While the web interface offers many advantages to users in terms of familiarity with the browser, consistency of the interface, and linkages to other web-based tools and web sites, they offer a new set of challenges to GSS designers when the issue of cultural differences comes into the picture.

4.2.1. Language translators for GSS

Firstly, the issue of language barriers sets in. While English is the predominant language for major groupware, there must be recognition that different cultures operate in different mother tongues. For instance, while many Chinese are proficient in English, their mother tongue and first language is, and will continue to be, Mandarin. One must question the effectiveness of using software not worded in the first language of the users.

As we can see in our comparative study between Australia and Singapore, while controlling for all other factors in the experimental study, cultural differences affects the outcomes of the study. Using Hofstede’s [39] dimensions, we were able to rationalize the differences in the results. In that study, participants from both countries use English predominantly and hence, serious language proficiency problems did not complicate the results of the study. However, one associated question arises for future studies involving other countries. The question is whether the language of the software matters and will it affect results of the study? Will the use of the software in the first language of the participants remove some of the differences between the results, or will it exacerbate them?

One solution to this dilemma would be the incorporation of language translators by the GSS designers. Aiken et al. [8] proposed a prototype of a multilingual GSS that provides simultaneous translation of multiple comments, parallel communication, anonymity and automated record keeping that will yield the same benefits to multilingual groups as traditional GSS have provided to monolingual groups. They further suggest that the translation can be ‘fuzzy’ in that it need not be a hundred percent accurate in terms of grammar or exact words, as long as the general idea can be established. There are also propositions for the development of bilingual GSS [10].

On the other hand, Gray and Olfman [32] have proposed a multilingual GSS in which bilingual or multilingual facilitators act as human translators by either manually translating each comment or editing the output from automatic translators. This approach relies heavily on human intervention and may reduce the speed at which ideas are presented to the other team members.

Yet another option, which allows individual participants to switch back and forth from one language to another during the session, will also effectively leverage the expertise of the facilitator in assessing the group at the point of use of the groupware. This option gives the facilitator an option to tailor the language requirements of the group members. In the case of a multilingual group, the facilitator must understand the group composition and gauge the reactions of the group members to decide on which language to use for different participants in the group.

Many types of software exist for web browser contents to be translated into another language (see for instance http://babelfish.altavista.com). They are usually reliable and relatively affordable [70]. With the technology available, the cost of incorporating the option of flexible language translation in GSS would be minimal and reasonably easy to implement.

On the whole, the essential concern here goes beyond the different types of language features used in GSS. Rather, the important element for GSS designers to note is that language differences comprise a very realistic challenge to the effective use of GSS. This challenge can be expected to accelerate in the coming years given that many organizations are becoming increasingly global, both internally and externally. In this regard, suitable language translation features, whether technological or manual, should be adequately considered and made available where necessary, in the design of GSS.

4.2.2. Evolving approach to GSS software development

Current GSS designs are based on North American concepts of desirable group behavior, and built upon the customs of the culture from which it was developed [76]. Watson et al. [76] suggests that both technical and social facilities need modification for successful adoption of these GSS in another culture. It would be erroneous to develop GSS assuming that there are no cultural differences in the decision making of groups [15].

It is important to note that the same software may be used very differently across different cultures. The
reason for that difference may be due to differences in expectations of the users of both the software, as well as the facilitator. While the users of one culture may expect the software to perform one set of functions, another culture’s users may have different expectations of the same software [24]. For instance, Watson et al. [76] argues that DeSanctis and Gallupe’s [23] contention that the electronic communication channel enhances communication exchange within a group are influenced by two underlying assumptions. The first is that it is important for each group member to have equal opportunity, regardless of status differentials, to express an opinion in a group decision. The second is that those group members will prefer an open communicative environment for conflict resolution. However, these assumptions may be challenged since users from different cultures may have different expectations of the same software’s capability to enforce equality in participation and conflict resolution.

The aforementioned factors suggest that different cultures have different needs and therefore, an evolving approach should be taken in GSS software development. In other words, slightly different versions of GSS software specific to different cultures may need to be developed. Researchers have suggested that GSS functionality should be carefully matched to the behavior of a group from a specific culture [24]. There have been instances of companies that have designed different browser interfaces for different customers based on their needs. Frequently, software requires modification to suit local customs, laws or conventions. Examples of such technical modifications of GSS software may conceivably include changes in spelling dictionaries, tools display on the screen, and even backup facilities. In essence, going forward, marginally different versions of GSS software based on the different needs of different cultures may need to be produced.

4.2.3. Distributed group environment

Other pertinent issues surface when designers of GSS need to consider distributed group environments. Sharma et al. [60] brought forth the importance of considering the new global dimension of groupware. Distributed groups diverge not only in terms of physical location, but also in two other ways: different time zones and the existence of multi-cultural interactions. These factors have implications as to whether or not synchronous, concurrent work processes may be feasibly initiated and engaged in [60].

One concern is the lack of nonverbal (e.g. expressions and gestures) and verbal cues in distributed group settings. Nonverbal and verbal cues play at least three important roles in group communication. They aid in regulating the flow of communication, expressing emotion, and transmitting subtle meanings [69]. These cues help group members regulate the succession of speakers and determine the timing of turn taking [42]. The lack of these cues in the distributed environment may result in an increase of turbulence in the flow of communications. This will be even more distended when distributed groups consist of members who are from different cultures, and who are not familiar with one another’s values, customs, and mannerisms. Designers of GSS for distributed multi-cultural groups should consider the issue of incorporating more regulatory features to replace the lack of cues for regulating meetings.

The lack of emotive cues (cues to express emotions) that may lead to misunderstandings amongst multi-cultural group participants, coupled with the inability to transmit subtle meanings, make communication in distributed multi-cultural group largely dependent on text-based information. Hence, there is a need to include special symbols and conventions in the GSS system to replace the expressive functions of verbal and nonverbal cues. More research is needed to identify tools that can be added to a computer conferencing environment to provide standard cues for regulating communication and supporting the emotive function [69]. Participants need seamless ways to show emphasis, commitment, disagreement and other expressive feelings.

In addition to the abovementioned factors, the need to instantaneously understand differing cultural contexts across all distributed locations in the design of distributed GSS systems is of great importance. Examples include spoken and written language translators, generally accepted expressions of accounting and engineering norms and practices, and even the more subtle human expressions such as hand shaking, waving, kissing and the like. While the use of multimedia channels may be an improvement on using only text and effective in getting around many of these differences, it is still possible that despair 😞 or happiness 😊 or jest ;-) may well be misunderstood via voice and
images. An integral challenge to global groupware designers is therefore to grapple with these differences within the group [60].

4.2.4. Others

Most GSS research had been carried out using small groups of less than 10 people. Chung and Adams [15], in a study comparing Korea and the US, have found that naturally occurring groups in both nations average 16 or 17 members and are therefore larger than those often used in GSS research to date. The implication then for GSS design is that there should be flexibility in the software to accommodate larger groups in order to make it a viable tool for group decision making in organizations.

Most of all, it is imperative that GSS be designed with as much flexibility as possible so that some features for decision-making processes can be selected at the discretion of the participants in different cultural decision making environments. It should also be designed with higher ease of use and flexibility to accommodate the large variety of tasks and needs of groups [48].

4.3. Implications for GSS researchers

Research has shown that management theories from one culture may not be directly applicable to another culture [35,37]. At the same time, there has been evidence that reflects the fact that benefits of GSS such as greater task focus or equalization of participants may be different across different cultural settings [48]. Hence, a challenge for GSS researchers in the next decade is to determine how best to carry out studies that are cross-national and cross-cultural in nature.

One important research question that arises from cross-cultural differences is whether all activities using GSS are equally affected by cross-cultural use, or merely restricted to some of the activities. It appears that certain GSS activities, such as idea generation, are remarkably similar in terms of use across different cultures ([72], p. 180). Yet, evidence has shown that multi-cultural groups achieve a significantly higher number of ideas in comparison with homogenous groups in the GSS environment [16]. On the other hand, some differences do exist on how different cultures organize data [72]. However, research in this area is limited. More research needs to be conducted to find out which activities are likely to sprout differences, and which are likely to remain similar across cultures.

The benefits that arise from having cross-cultural participants are still unclear, although many have cited that cross-cultural teams, including those using GSS, are more effective than traditional teams [72]. This is another area where research can be expanded.

One criticism that came forth strongly in the literature is the inability to balance between generalizability and context-sensitivity. In trying to generalize the context of the environment, for example, by using Hofstede [39] dimensions, many studies have lost the contextual elements and richness of the environment. In other words, the dimensions above are inadequate in capturing the environment richness. There are several reasons why these dimensions are insufficient for research purposes as explained below.

Firstly, even within the same nation, participants are not uniform with respect to these same dimensions. For instance, studies have shown that within US, Hofstede [39] values for these dimensions change depending on where you collect your data. For example, there may be as many as nine nations in North America, and four generic US corporate cultures [30].

Secondly, there are many other contextual elements outside of these dimensions that could conceivably explain the differences between the cultures. For instance, another set of bi-polar dimensions to explain other aspects of cultural differences between nations has been put forth by Trompenaars [67].

Thirdly, in doing cross-national or cultural studies, there is a context from which you collect the data. Culture may be present at the corporate or organizational level [21], regional level [77], or at the national level. These contexts add richness to the study and moderate the differences found between the studies involving different cultures.

Researchers need to adopt a multi-level or multi-perspective mindset in looking at differences between cultures, and should refrain from using a single generalizable scale to try and understand the differences. Instead, multi-level analyses, including both macro-level dimensions (such as Hofstede [39]) as well as micro-level contexts, such as company, organizational, regional as well as environmental, should be adopted. This paradigm shift requires researchers to come up with many different levels of analyses to capture the differences between nations and cultures. It also
requires them to build new kinds of research skills, with increasing emphases in the field. In a previous section (“research type”) in this paper, we have pointed out that there are only two field studies and no case study research amongst the 30 studies reviewed. More field research will help address this gap in the coming decade.

Contrary to the above, other researchers had called for more studies based on a single dimension, for instance, one out of Hofstede’s four dimensions [76], so as to be able to study the differences arising from a single dimension. This approach, together with keeping technology constant or similar across studies, will ensure that studies are controlled and can be repeated if necessary. Nonetheless, we argue that the use of multilevel analyses with multiple measures can provide the comprehensiveness and contextual richness that single dimensional studies can’t for cross-cultural studies.

5. Concluding remarks

In the increasing borderless economy of today, multi-cultural groups or teams exist in organizations of all sizes and types. The point of interest then is how one can understand and make the most of culture differences amongst group participants where the group activities, such as group decision making, are supported by Group technology. This study has gone some way towards this end by proposing numerous specific suggestions for the facilitator, GSS designer, and researcher working with groups of diverse cultures.

References


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