Perceptual Congruence In The Deployment Of Systems Development Methodologies

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Abstract

This paper studies the perceptual congruence between IS managers and developers, regarding the deployment of systems development methodologies. The results indicate that IS managers are generally more positive about systems development methodologies than developers. Some congruent and incongruent perceptions were identified. Stakeholders give a rating to a factor depending on its relevance and importance to the job they have to perform.

Keywords

System development, methodologies, methodology deployment, managers, developers, perceptual congruence

INTRODUCTION

Systems development methodologies (SDM) have formed one of the most intensive research topics in Information Systems (IS) and Software Engineering. Jayaratna (1994) estimates the current number of methodologies to be of order 1000. Despite the high investment in the development of SDMs, their usefulness is still a controversial issue (Baskerville et al. 1992, Wynekoop and Russo 1993, Glass 1995, Fitzgerald 1996, Wastell 1996, Introna and Whitley 1997, Nandhakumar and Avison 1999). Recent surveys on their use also indicate quite consistently that many organizations claim that they do not use any methodologies (Hardy et al. 1995, Chatzoglou and Macaulay 1996, Russo et al. 1996, Fitzgerald 1998).

Systems development is an activity involving many different stakeholder groups, e.g. systems developers, IS managers, end-users, etc., participating in the systems development process or influenced by it. It is possible that SDMs reflect the viewpoints and interests of these groups differently. Therefore these groups may perceive the benefits and problems of SDMs differently. Unfortunately, there is not much comparative analysis of the perceptions of these groups regarding SDMs. Markus and Bjørn-Andersen (1987) discuss the types of control (power) exercised by an IS department over users. They identify the technical, structural, conceptual and symbolic exercise of power, each of which may be related to SDMs. Kraft (1977), in his classic book, applied the labor process theory to argue that IS managers use methods such as structured programming, modularization and chief programmer teams as a way to control programmers and to routinize their work. Also Bansler and Havn (1991) contend that systems development should be studied from a labor process perspective, largely echoing the views of Kraft (1977).

In this paper we will focus on the differences in perceptions between IS managers and systems developers. In more theoretical terms, this paper investigates perceptual congruence among supervisors and subordinates in systems development. Perceptual congruence can be defined as the degree to which individuals view matters similarly (Turban and Jones 1988). We will analyze the perceptions of IS managers and developers at individual and organizational level, regarding the deployment of SDMs.

PERCEPTUAL CONGRUENCE AND SDM DEPLOYMENT

Perceptual congruence

Orlikowski and Gash (1994) introduce the concept of 'technological frame' originating from the tradition of Social Construction of Technology (Bijker, 1989) to identify different assumptions, expectations and knowledge that members of an organization use to understand technology in the organization. This term includes not only the nature and role of the technology itself, but the specific conditions, applications, and consequences of those technology in particular contexts. They argue that technological frames have a powerful effect on technology, as people's assumptions, expectations and knowledge about the purpose, context, importance and role of technology will strongly influence their choices made regarding the design and use of those technologies. They also define congruence in technological frames by referring to the alignment of frames on key elements or categories. Congruent does not mean identical, but rather related in structure (i.e. common categories of frames) and content (i.e. similar values on the common categories). They state that congruent technological frames will imply similar expectations about the role of the technology in the business, the nature of technological use, or the type and frequency of support and maintenance. On the other hand, incongruent technological frames imply important differences in expectations, assumptions or knowledge about some key aspects of the technology. The existence of incongruent technological frames in an organization will cause difficulties and conflicts regarding the development, implementation and use of technologies in that organization.

Research on technological frames has been qualitative by nature (Bijker, 1989; Orlikowksi and Gash, 1994). This paper applies the closely related concept of 'perceptual congruence' that has a more quantitative research tradition. Perceptual congruence can be defined as the degree to which individuals view matters similarly (Turban and Jones 1988). It can be attributed to a considerable degree to the division of labor. Different job characteristics may lead to a greater range of perceptions, because of the different responsibilities, roles and objectives associated with each job (Turban and Jones 1988, O'Reilly et al. 1980).

Research indicates that greater perceptual congruence has positive effects in an organization (Schnake et al. 1990, Wexley and Palukos 1983). This can be contributed to the fact that perceptual congruence reduces uncertainty and ambiguity between individuals (Wexley and Palukos 1983). Conversely, there is also evidence that perceptual incongruence may be problematic. Lederer and Prasad (1992) found that different perceptions among cost estimators and non-estimators make it more difficult to produce accurate cost estimates. Deming (1986) argues that barriers between workers with different responsibilities can obstruct teamwork and reduce productivity. More closely related to systems development, Tripp (1991) reports that differences between users and systems professionals regarding development goals resulted in the delay of systems development, causing cost and schedule overruns. In their discussion of CASE implementation, Corbitt and Norman (1991) list a "common view among managers and workers" as critical for successful technology implementation. Even though

research indicates that greater perceptual congruence has positive consequences in an organization, very little is known about perceptual congruence in systems development.

Study	Stakeholders	Perceptions studied	Conclusions
Roberts et al. (1998)	Functional managers IS managers Systems personnel External consultants	Factors critical to systems development methodology implementation.	No significant differences were found between the perceptions of the different stakeholders.
Jiang, J.J. et al. (1998)	Systems developers Systems users	Frequency of systems development problems.	Stakeholders have different perceptions regarding failures associated with IS development.
Von Hellens (1997)	Managerial viewpoint Organizational viewpoint Engineering viewpoint	Information systems quality versus software quality.	Perceptions of stakeholders are not mutually exclusive, but each group emphasizes different activities.
Verner and Cerpa (1997)	Managers Analysts Software engineers	Advantages/disadvantages of the waterfall and prototyping approach.	Perceptions of the stakeholders differ significantly. The rating of an attribute depends on its relevance and importance to the job of the stakeholder.
Lederer and Prasad (1995)	Cost estimators Non- estimators	Systems development cost estimation.	Identified congruent and incongruent perceptions among the stakeholders.
Finlay and Mitchell (1994)	Developers Customers	Tangible/intangible systems outcomes associated with the introduction of IE	Stakeholders had different perceptions regarding the achieved benefits associated with the introduction of IE.
Nelson (1991)	IS personnel End-user personnel	Educational needs	Identified congruent and incongruent perceptions among stakeholders.

Table 1: Summary of empirical research on perceptual congruence in systems development

A number of researchers have applied the concept of perceptual congruence in the context of Computer Science and IS (Nuseibeh et al. 1996, Gillies 1991). The concept of technological frame (Bijker, 1989) as applied by Orlikowski and Gash (1994) also has a close similarity with the idea of perceptual congruence. Some empirical studies, where it has been applied in the context of systems development, are summarized in Table 1. Verner and Cerpa (1997), Jiang et al. (1998) and Finlay and Mitchell (1994) found significant differences between the perceptions of the stakeholder groups. Verner and Cerpa (1997) state that each occupation group gives a rating to an attribute depending on its relevance and importance to the job they have to perform. Von Hellens (1997) remarked that although each group emphasizes different activities, their perceptions are not mutually exclusive. This is also reflected by the results of Nelson (1991) and Lederer and Prasad (1995) who identified congruent and incongruent perceptions among the groups. On the other hand, Roberts et al. (1998) found no significant differences between the perceptions of the stakeholder groups when they studied the critical factors of SDM implementation.

Systems development methodology deployment

There exist a lot of uncertainty regarding the definitions of the term “method” and “methodology” (Wynekoop and Russo 1993). We do not wish to contribute to this debate. Instead this paper uses the term “methodology” to cover the totality of systems development approaches (i.e. structured approach, OO approach, etc.), process models (i.e. linear life-cycle, spiral models, etc.), specific methods (e.g. IE, OMT, etc.) and specific techniques. The deployment of methodologies can be analyzed from several perspectives. We selected the following five:

- Perceived methodology support as production technology
- Perceived methodology support as control technology
- Perceived methodology support as cognitive and cooperative technology
- Perceived methodology impact on the quality of the developed systems

- Perceived methodology impact on the productivity & quality of the development process.

The first, second and third perspectives are loosely based on the work by Henderson and Cooprider (1990). They developed and empirically tested a functional model for IS planning and design aids. This model consists of two major categories, namely production technology and coordination technology. They define production technology as "functionality that directly impacts the capacity of an individual(s) to generate planning or design decisions and subsequent artifacts or products". Coordination technology is defined as "functionality that enables or supports the interactions of multiple agents in the execution of a planning or design task". Coordination technology consists of control functionality and cooperative functionality. The control functionality "enables the user to plan for and enforce rules, policies or priorities that will govern or restrict the activities of team members during the planning or design process". The cooperative functionality "enables the user to exchange information with other individual(s) for the purpose of influencing (affecting) the concept, process or product of the planning/design team.[1]

Perceptual congruence and the deployment of systems development methodologies

Bansler and Havn (1991) contend that software development has undergone a process of industrialization since the 1960's. This transformation process includes the following:

- Capitalization of the software production process by substituting human labor with software and machines.
- Division of labor, fragmentation of work and a stratification of jobs, including hierarchies of authority.
- Introduction of management-defined production and documentation standards and quality control measures.

SDMs are related with all three transformations. It has allowed increased capitalization of the systems development process as exemplified by CASE tools (Urwiler et al. 1995, Vessey et al. 1992). It may also serve as a means of imposing the desired division of labor in systems development (Fitzgerald 1996) and definitely it may include desired production and documentation standards and quality control measures.

Reflecting the labor process perspective, Kraft (1977), Greenbaum (1979) and Bansler and Havn (1991) claim that systems development techniques are primarily introduced as a means of improving management control. The labor process perspective, when applied to systems development, argues that this transformation of software development has not been the result of technological imperative inherent to the software development process. Rather, it occurred because managers want to restructure the process in order to increase profits. For example, IS managers see structured programming as a way to routinize work. By doing this they can control the manner in which systems are developed and standardize the production process. Roberts et al. (1998) and Fitzgerald (1996) also stress the standardization of the development process by SDMs.

Even though Friedman and Cornford (1989) point out that all the above transformations, especially the division of labor into more fragmented jobs, have not been realized, overall we

[1] Henderson and Cooprider (1991) also identify *organisational technology* consisting of two additional functionalities: support functionality "to help an individual user understand and use a planning and design aid effectively" and infrastructure defined as "standards that enable portability of skills, knowledge, procedures, or methods across planning or design processes". The support functionality can be interpreted as a 'meta-functionality' in the sense that it supports the utilisation of all the basic functionalities. One of the findings of Henderson and Coorpider' study was that the support functionality was difficult for respondents to clearly differentiate. The infrastructure component resulted from the feedback during the study and its differentiation was not tested empirically. We see infrastructure functionalities such as standards to support cooperation.

consider it as management's agenda to introduce SDMs as a means of achieving desired changes in the systems development process. The assumption that the introduction of SDMs represents management's agenda is partly supported by the empirical findings which show that the management's role is vital for the acceptance of various IT process innovations (Swanson 1994). Examples of this are software process improvements (Humphrey 1991, Daskalantonakis 1994, Haley 1996) and CASE tools (Urwiler et al. 1995, Iivari 1996). This leads to our first general hypothesis:

- H1: The perceptions of IS managers regarding SDMs are more positive than the perceptions of developers.

IS managers are concerned with the effectiveness of the organization, the production process and how IS contribute to the profitability of the organization. On the other hand, systems developers are mainly concerned with the production of the final product (von Hellens, 1997). Since both managers and developers are involved with the production of an information system, one would expect that their perceptions would not be mutually exclusive, and that some congruent perceptions will exist. However, the responsibilities of IS managers and developers regarding the production of an information system are different. Besides being responsible for delivering the final system, IS managers are also responsible for an effective production process (Roberts et al. 1998). This leads to our first sub-hypothesis:

- H1.1: Perceived methodology support as production technology is higher among managers than developers.

In order to establish an effective development process, IS managers have to manage the resources used during development and maintenance. To do so, they have to control the different resources, i.e. people, budget and time. Therefor we can expect them to emphasize this aspect more than in the case of developers. Fitzgerald (1996) argues that one of the conceptual underpinnings of SDMs is the facilitation of project management and control. This view is also reflected by Westrup (1993). We formulate the second sub-hypothesis as follows:

- H1.2: Perceived methodology support as control technology is higher among managers than developers.

Systems development is a collective work process involving systems professionals and customer representatives with different educational backgrounds and different experience. IS managers are responsible to organize the different team members in such a way that cooperation and communication problems between team members are kept to a minimum. This leads to our third sub-hypothesis:

- H1.3: Perceived methodology support as cognitive and cooperation technology is higher among managers than developers.

As described above, both managers and developers are involved in the production of an information system. The developed system is of main concern to both parties, but in addition, managers are also responsible for an effective development process. Niederman et al. (1991) list the development of an information architecture and the improvement of the software development process among the top ten concerns facing senior IS managers. We formulate the fourth and fifth sub-hypothesis as follow:

- H1.4: The perceived impact of SDMs on the quality of developed systems is higher among managers than developers.
- H1.5: The perceived impact of SDMs on the productivity and quality of the development process is higher among managers than developers.

RESEARCH DESIGN

Survey

This study is part of a larger survey on SDM use in South Africa, which was conducted between July and October 1999. The 1999 IT Users Handbook (the most comprehensive reference guide to the IT industry in South Africa) was used and the 443 listed organizations were contacted via telephone to determine if they were willing to participate in the study. 213 organizations agreed to take part. A package of questionnaires was sent to a contact person in each organization who distributed it. This package consisted of one questionnaire to be answered by the IT manager, and a number of questionnaires to be answered by individual systems developers in the organization. The number of developer questionnaires was determined for each organization during the telephone contacts. The response rate of the survey was as follows: 83 organizations (39%), 234 developers (26%) and 73 managers (34%) responded. The profiles of the responding organizations are reported in Huisman and Iivari (2000).

Measurement

The questionnaire is available from the first author on request. All the questions were addressed to both developers and managers. *Perceived methodology support as production technology* was measured using 11 items. Factor analysis using the developer data gave only one factor, while factor analysis using the manager data gave three factors: "Support for organizational alignment", "Support for technical design" and "Support for verification and validation". The following analysis uses both factor structures. The reliability of the first factor was 0.90/0.91[2], of the second factor 0.85/0.82, of the third factor 0.83/0.86 and of the total factor (including all items) 0.94/0.91. *Perceived methodology support as control technology* was measured using nine items. Factor analysis using the developer data and the manager data separately, resulted in only one factor. The reliability of this factor was 0.94/0.92. *Perceived methodology support as cognitive and cooperation technology* was measured using 11 items based on the work by Iivari and Maansaari (1998). Factor analysis using the developer and manager data separately, resulted in both instances in two similar factors: "Support for the common conception of systems development practice" and "Support for the evaluation of systems development practice". The reliability of the first factor was 0.92/0.92 and 0.79/0.92 for the second factor. *Perceived methodology impact on the quality of developed systems* was measured using eight items adopted from ISO 9126 standard (ISO 1990). Factor analysis using the developer data and the manager data separately, resulted in only one factor. The reliability of this factor was 0.95/0.93. *Perceived methodology impact on the quality and productivity of the development process* was measured using 10 items. Factor analysis using the developer data resulted in only one factor, while the factor analysis on the manager data resulted in two factors: "Productivity effects and morale" and "Quality effects, goal achievement and reputation". The following analysis uses both factor structures. The reliability of the first factor was 0.89/0.90, of the second factor 0.88/0.86 and of the total factor (including all items) 0.94/0.92.

Two background variables, "Perceived performance of the IS department" and "Maximum intensity of method use" were also measured. *Perceived performance of the IS department*, was measured using the 10-item instrument used by Iivari (1996). Factor analysis of the merged developer and manager data (n=307) gave three factors:[3] "Productivity and quality", "Cost of development and maintenance" and "Organizational health". The reliability of the first factor was 0.80/0.76, of the second factor 0.72/0.73, and 0.79/0.77 for the third factor after deleting one item. *Maximum intensity of method use* was measured as the maximum of

[2] The figure before the slash refers to the developer data and the figure after the slash to the manager data.

[3] Factor analysis was also performed separately for the developer data and the manager data. Both resulted in three very similar factor structures, with the exception of two items, which loaded on different factors. The factor loadings were very similar, and therefor the merged data was used.

the organizational usage of 29 listed methods, possible other standard (commercial) methods and possible in-house developed methods.

Data analysis

Data analysis was performed using Statistica (version 5) software. Two analyses were conducted. In the first analysis, the group of developers and the group of managers were considered as independent samples. The multivariate Hotteling t-test for independent samples was used to analyze the differences between the perceptions of the developers and managers at the individual level. This test gives an indication of the difference between a vector of elements, but also gives an indication of the difference for each vector element individually. Differences that were tested for are the performance of the IS department, the maximum intensity of method use, the perceptions of methodology support, and the impact of SDMs on the developed systems and the development process. However, responses from managers and developers from the same organizations were also available. A second analysis was conducted to analyze the difference between the perceptions of developers and managers at the organizational level. Using the t-test for dependent samples, the perception of each developer was compared to the perception of his/her manager.

RESULTS

Table 2 gives a summary of the perceived performance of the IS department. At the *individual level*, IS managers are slightly more positive about the perceived performance of the IS department, as they report the highest values for "Productivity and quality" and "Organizational health" and the lowest value for "Cost of development and maintenance". However, these differences are not statistically significant. When the vector consisting of the above three factors was analyzed, Hotteling $T^2 = 2.89$ at the level of $F(3,270) = 0.96$ and $p = 0.41$. This indicates that no significant differences exist between the perceptions of managers and developers regarding the vector. At the *organizational level*, only "Organizational health" differ significantly at the level of $p = 0.04$.

	Individual level				Organizational level			
	Manager	Developer	t-value	p-value	Manager	Developer	t-value	p-value
Productivity & quality	3.63	3.57	0.57	0.57	3.61	3.54	1.18	0.24
Cost of development and maintenance	3.35	3.53	-1.48	0.14	3.49	3.56	-1.06	0.29
Organizational health	3.65	3.52	1.30	0.19	3.60	3.48	2.10	0.04*

Table 2: Perceived performance of the IS department

The perceptions regarding the maximum intensity of method use is described in Table 3. Both at individual and organizational level managers report higher values for method use, but these differences were not statistically significant.

	Individual level				Organizational level			
	Manager	Developer	t-value	p-value	Manager	Developer	t-value	p-value
Max method use	2.85	2.74	0.40	0.69	3.06	2.79	1.57	0.12

Table 3: Maximum intensity of method use

Table 4 shows the perceived methodology support as production technology. At the *individual level* the perceptions of managers and developers differ significantly for the vector consisting of "Support for organizational alignment", "Support for technical design" and "Support for verification and validation", with Hotteling $T^2 = 21.56$ at the level of $F(3,229) = 7.12$ and $p = 0.00$. Managers report the highest values for "Support for organizational alignment", generally the same values are reported for "Support for technical design" and developers report the highest values for "Support for verification and validation". When each one of the individual factors and the factor consisting of all items are considered separately, only "Support for organizational alignment" differs statistically significantly. The above results are reflected in the results of the analysis at the *organizational level*. The differences for "Support for organizational alignment" and "Support for verification and validation" are statistically significant, but not for "Support for technical design". The factor consisting of all the items doesn't differ at the organizational level.

	Individual level				Organizational level			
	Manager	Developer	t-value	p-value	Manager	Developer	t-value	p-value
Organizational alignment	3.64	3.33	2.31	0.02*	3.64	3.40	2.71	0.01*
Technical design	3.38	3.28	0.74	0.46	3.39	3.33	0.75	0.45
Verification & validation	2.93	3.13	-1.24	0.21	2.84	3.16	-3.12	0.00*
All items	3.43	3.26	1.28	0.20	3.40	3.35	0.77	0.44

Table 4: Support as production technology

In table 5 a summary is given of the perceived methodology as control technology. In contrast to our hypothesis, no significant differences are present between the perceptions of the managers and developers, both at individual and organizational level.

	Individual level				Organizational level			
	Manager	Developer	t-value	p-value	Manager	Developer	t-value	p-value
All items	3.35	3.23	0.95	0.34	3.33	3.30	0.48	0.63

Table 5: Support as control technology

The perceptions regarding methodology support as cognitive and cooperation technology is described in table 6. At the *individual level* managers report slightly higher values for "Support for the common conception of system development practice" and "Support for the evaluation of systems development practice". These differences are not statistically significant. The vector consisting of the two factors doesn't differ significantly, with Hotteling $T^2 = 3.03$ at the level of $F(2,228) = 1.51$ and $p = 0.22$. At *organizational level*, both "Support for the common conception of systems development practice" and "Support for the evaluation of systems development practice" differ statistically significantly, in the sense that managers report higher values than developers.

	Individual level				Organizational level			
	Manager	Developer	t-value	p-value	Manager	Developer	t-value	p-value
Common conception of SD practice	3.36	3.15	1.74	0.08	3.45	3.20	3.23	0.00*
Evaluation of SD practice	3.24	3.10	0.84	0.40	3.38	3.12	2.34	0.02*

Table 6: Support as cognitive and cooperation technology

Table 7 shows the perceived impact of systems development methodologies on the quality of the developed system. Although managers report slightly higher values than developers, no statistically significant differences are present at the individual or organizational level.

	Individual level				Organizational level			
	Manager	Developer	t-value	p-value	Manager	Developer	t-value	p-value
All items	3.53	3.32	1.64	0.10	3.40	3.33	0.86	0.39

Table 7: Impact on the quality of the developed system

Perceived methodology impact on the quality and the productivity of the development process is depicted in Table 8. At the *individual level* the vector consisting of "Productivity effects and morale" and "Quality effects, goal achievement and reputation" differs statistically significantly with Hotteling $T^2 = 8.06$ at the level of $F(2,232) = 4.01$ and $p = 0.02$. The individual factors "Productivity effects and morale" and "Quality effects, goal achievement and reputation" also differ statistically significantly, as well as the factor consisting of all the items measuring the impact of systems development methodologies on the development process. At the *organizational level* "Quality effects, goal achievement and reputation" as well as the factor consisting of all items, differ statistically significantly.

	Individual level				Organizational level			
	Manager	Developer	t-value	p-value	Manager	Developer	t-value	p-value
Productivity effects and morale	3.41	3.13	2.11	0.04*	3.20	3.12	0.83	0.41
Quality efects, goal achievement, reputation	3.58	3.21	2.84	0.00*	3.50	3.26	3.01	0.00*
All items	3.49	3.17	2.59	0.01*	3.35	3.19	2.05	0.04*

Table 8: Impact on the quality and productivity of the development process

To test our general hypothesis that IS managers are more positive about SDMs, the multivariate Hotteling t-test was performed with all the factors of the research variables (excluding total factors) as the vector elements. The results for the individual vector elements were the same as above, and for the vector Hotteling $T^2 = 37.58$ at the level of $F(9,205) = 4.02$ and $p = 0.00$. This indicates that the perceptions of IS managers and developers differ statistically significantly regarding the support provided and impact of SDMs.

DISCUSSION AND FINAL COMMENTS

Our findings indicate that some congruent and some incongruent perceptions exit among managers and developers regarding SDMs. A summary of the results are provided in Table 9. Overall, the perceptions of IS managers regarding SDMs are more positive than the perceptions of developers. This is in accordance with the findings of Yellen (1992), who reports that IS leaders and managers are more satisfied with CASE tools than non-leaders. This could be interpreted to support the view underlying the labor process perspective that systems development methodologies reflect management's agenda. The perceptions of the IS managers and developers regarding the two background variables were mostly congruent. Managers and developers view the performance of the IS department the same at the individual and organizational level, with the exception that managers report statistically significant higher values for "Organizational health" at the organizational level. The values reported for the maximum intensity of method use do not differ at individual level or at organizational level.

Research variable	Individual	Organizational
H1.1(a) Support for organizational alignment	Managers +	Managers +
H1.1(b) Support for technical design		
H1.1(c) Support for verification and validation		Developers +
H1.2 Support as control technology		
H1.3(a) Support for the common conception of SD practice		Managers +
H1.3(b) Support for the evaluation of SD practice		Managers +
H1.4 Impact on the quality of the system		
H1.5(a) Productivity effects and morale	Managers +	
H1.5(b) Quality effects, goal achievement and reputation	Managers +	Managers +

Table 9: Summary of the differences in perceptions

In Section 2 we suggested one general hypothesis with five sub-hypotheses. As Table 11 shows, one can interpret the results that two hypotheses were supported (H1.3 and H1.5), two not supported (H1.2 and H1.4), and one hypothesis (H1.1), gave mixed results. However, only in one case developers viewed SDMs more positively than managers.

In the case of hypothesis H1.1, when all the items measuring methodology support as production technology were considered as one factor, no significant differences were identified between the perceptions of managers and developers, both at individual and organizational level. However, when studying more detailed factors, managers perceived the "Support for organizational alignment" significantly higher than developers at individual and organizational level, whereas developers reported significantly higher values at organizational level for "Support for verification and validation". In the case "Support for technical design" no statistical differences were found. The above results may be interpreted to confirm previous research by Verner and Cerpa (1997) that managers and developers give a rating to a factor depending on its relevance and importance to the job they have to perform. One can conjecture organizational alignment to be a closer concern to IS managers than developers, and that it may form one of managers' rationalizations of the need for SDMs. Also, developers perceive "Support for verification and validation" significantly higher than managers. This may reflect the fact that verification and validation may be most remote for managers. Consequently, they may be very uncertain about the support. This is accentuated by the low support for verification and validation reported by both managers and developers (see Table 4).

To some extent surprisingly, managers and developers perceived methodology support as control technology the same. One explanation for this could be the duality of the role of IS managers (Bartolome and Laurent 1988). IS managers act both as supervisors and subordinates in an organization. On the hand they have to manage the developers in the IS department (acting as supervisors), and on the other hand they have to report to the top management in the organization (acting as subordinates). Our results suggest that IS managers may perceive their role in an organization more as subordinates than as supervisors, since they don't emphasize the control aspect of SDMs. Furthermore developers don't experience SDMs as being used by IS managers to control them. Further research is necessary to confirm this. Another explanation might be that project management forms one of the common spheres of experience between managers and developers. So, their degree of "homophily" (Rogers 1995) is relatively high in that area. Homophily is defined by Rogers as the degree to which two or more individuals, who interact, are similar in certain aspects. This in turn may lead to the congruent perceptions between the IS managers and developers.

The results for perceived methodology support as cognitive and cooperation technology indicate that managers reported statistically significantly higher values than developers at organizational level. This may be explained by the fact that systems development is a collective

work process involving developers with different educational backgrounds and different experience. IS managers are responsible to organize the different team members in such a way that cooperation and communication problems between team members are kept to a minimum. It may be that systems developers themselves do not perceive these problems equally relevant and therefore do not appreciate the contribution of SDMs in this respect.

There are no differences in the perceptions of IS managers and developers regarding the impact of SDMs on the quality of the developed system. These results confirm the findings of von Hellens (1997) that perceptions of the stakeholders are not mutually exclusive, but that there are certain perceptions that overlap. For example, the quality of developed systems is an equal concern for managers and developers. For managers the quality of systems partly defines the reputation of excellence of work as confirmed by the factor analysis of items measuring SDM's impact on the quality and productivity of the development process. One can also expect the quality of systems to be a concern for individual systems developers. In an extreme case, systems developers may "suffer" from the bad quality of developed systems as increased maintenance for example.

However, when we consider the impact of methodologies on the quality and productivity of the development process, IS managers report statistically significant higher values both at individual and organizational level. Once more, this is an indication that stakeholders emphasize the activities that are most important to them. Since IS managers have responsibility for the development process, they emphasize it more.

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