

# **An Analysis of IFIP TC 8 WG 8.6**

## *In Search for a Common Theoretical Denominator*

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**Abstract.** The IFIP TC 8 WG 8.6 focuses on the transfer and diffusion of information technology. Since the working group was established in 1993 there have been a number of events where members of the group have produced contributions analyzing transfer and diffusion of IT in different settings and from different perspectives. In this paper we report the result of an analysis of the theoretical perspectives the contributors have applied in the studies. Our analysis suggests that even though there is an even distribution of factor and process oriented studies reported in proceedings the theoretical denominator for the long standing members of WG 8.6 is the process oriented approach to the study of transfer and diffusion of IT.

## **1 Introduction**

In 2003 the IFIP TC 8 WG 8.6 celebrated its 10<sup>th</sup> anniversary. On that occasion a review of the proceedings from the events during the period 1993-2003 was presented. This presentation was compiled to a contribution appearing in the proceedings of the WG 8.6 conference in 2005 [1]. The comprehensive review of the 113 papers appearing in the seven volumes of proceedings from the first ten years provided insights in the multiplicity of the study of “Transfer and Diffusion of Information Technology”, which is the thematic label of IFIP TC 8 WG 8.6. Among other issues the review demonstrated which terms from the transfer and diffusion vocabulary had been used, which types of technologies were studied over the ten-year period, what the unit of analysis had been, what types of methods researchers applied in the studies, the nature of exploration in the studies, and the type of theoretical framework used in the analysis of diffusion and transfer of information technology.

The latter theme related to the use of theoretical frameworks in the studies gave food for thought with respect to the issue of whether or not the researchers involved

in the WG 8.6 have developed a common theoretical foundation. The overall mission statement of IFIP and also the specific statement for WG 8.6 explicitly state as an objective to foster and develop suitable and robust frameworks, models or theories and it is our understanding that one of the purposes of bringing academics and practitioners together at the IFIP events is to support this type of activity for example through the presentation of papers included in the proceedings.

The objective of this paper is to outline which academic frameworks for transfer and diffusion of information technologies have been applied in the studies presented in the proceedings of the past events in WG 8.6. Without doubt Rogers [2] has been of the most influential researchers in the general field of diffusion of innovations, a claim which has also been supported and extended for IT diffusion research by members of WG 8.6 [3]. Thus, before becoming familiar with the results of the review of the proceedings it was our assumption that Rogers' prominent framework on diffusion of innovations would be one of the core theoretical frameworks and also the most cited source in the work of WG 8.6. However, it turned out that few of the reported studies had actually directly applied Rogers' framework in their work, but many studies referred to Rogers. The limited frequency of using Rogers' framework could therefore not be explained with the fact that the contributors were not familiar with the framework. This insight has inspired us to pursue this issue further in the present paper and to provide an overview of which other frameworks have then been used to conceptualize and analyze diffusion and transfer of information technologies.

It has been argued that the works of Rogers represent a positivistic approach to the study of the diffusion and transfer of technological innovations[4]. One assumption is therefore that the reason for not applying Rogers is that contributors to WG 8.6 prefer more interpretive approaches to the study of the transfer and diffusion of technological innovations. One consequence of this assumption is that apart from identifying which theories and frameworks are applied in the working group the analysis also aims at looking for possible patterns with respect to the methodological approaches of the studies presented in the proceedings. It is not our ambition to determine if one framework has better explanatory power than another. Nor is it to judge its relevance. Instead our goal is to provide an overview mapping of those frameworks, models, theories which contributors of the WG 8.6 events have found useful for explaining transfer and diffusion of information technologies.

The remainder of the paper is structured as follows: Section 2 outlines the conclusions on the usage of Rogers' work as explanatory framework from the WG 8.6 anniversary review as a motivation for the present study. Section 3 provides some reflections on differences between models, frameworks, theories and theory building. The section also presents our classification scheme and our method of deriving data from the contributions in the proceedings. Section 4 is dedicated to a discussion of benefits of making the type of exercise the study provides and some concluding remarks and directions for future work.

## 2 Background

As mentioned earlier Rogers [2] is considered a most influential researcher in the field of diffusion of innovations. In the WG 8.6 proceedings from 2001, McMaster [5] opened the discussion whether or not Rogers' work on diffusion of innovations was actually the most quoted theoretical contribution by researchers in the WG 8.6. Based on his analysis of the proceedings from three previous conferences McMaster concluded that it was not the case. Furthermore, based on proceedings from seven conferences [1] observed that Rogers' seminal book which by that time has been published in five editions was not as widely used by the researchers contributing to the seven volumes of the proceedings of IFIP WG 8.6 as one would expect. Rogers was identified as the single most cited author, but a closer look at the references to Rogers indicated that a citation is not identical with application of the theory. The review by [1] identified that roughly a third of all articles (31 out of 108, 29%) showed a neutral attitude towards Rogers in the sense that reference is made to Rogers without specifically making any value judgment about whether or not the framework is helpful for the particular study. Twelve articles are critical to Rogers (11%), typically drawing attention to the limitations of his factor oriented approach when studying diffusion of innovations. Ten articles (9%) are directly based on his work. This counting punctuates the myth that Rogers' framework is often used in the studies of diffusion of innovations.

Even though Rogers is often cited this is not synonymous with direct use of his theory in the analysis of adoption and diffusion of innovations. It could as well be a matter of simply citing Rogers as a proponent of the study of diffusion of innovations or quoting him as an example of a positivistic or factor oriented approach to the study of the diffusion of innovations.

Another conclusion Kautz et al. [1] reached with respect to the limited use of Rogers as explanatory framework was that contributions to the WG 8.6 in their majority focus on adoption on the organizational level whereas Rogers predominantly deals with adoption by individuals: hence Rogers' framework is not suitable for the analysis. This insight triggered our interest in investigating which other frameworks or models were used by the contributing researchers. The next section presents alternatives to Rogers' framework which have been applied in the WG 8.6 contributions. However, before getting that far a few comments on the terms framework, model and theory are provided.

## 3 Frameworks, Models and Theories

In the work of WG 8.6 we do not distinguish strictly between the terms frameworks, models or theories. What the difference between them is and what defines the three terms would justify an in-depth discussion in itself (see e.g. [6]). The group of researchers in WG 8.6 represent multidisciplinary traditions – especially with researchers from the IS field being strongly represented – and the distinctions between frameworks, models and theories are not always used rigorously by

academic contributors. In addition, contributing practitioners do not always greatly appreciate the “academic terminological pedantry”.

A number of researchers have produced comprehensive reviews of the study of diffusion of innovations [7-9]. The reviews have provided different classification schemes with respect to characteristics of the innovation [10] and impact of innovation [4,11]. Common for these reviews is that they have not focused specifically on the methodological approach of the studies. In his review of the study of innovations Wolfe [4] suggested that depending on the nature of the study researchers should choose their methodological approach. Wolfe distinguished between factor and variance theory.

Members of WG 8.6 have also contributed to reviews on diffusion of innovations. McMaster and Kautz [3] provided a review on the history of the concept of diffusion. Tracing the term back about five hundred years they noted that imbedded in the concept is a master-slave connotation. Larsen [12] has also contributed to the collection of reviews of diffusion of innovations and its content and scope. Larsen suggested that in order to align the further study with the technological development the WG 8.6 should “focus on societal implications, business potential, stakeholder awareness, marketing and solution development requirements of new IS/IT products.” Common for the above-mentioned studies is a recommendation of considering both positivistic and interpretivistic school(s) of thought in the study of diffusion of innovations. However, without favoring any approach or strictly defining the characteristics of the two.

Markus and Robey [13] have provided an account on that particular issue. They suggested that researchers should distinguish between variance and process theory, the latter representing interpretative approaches to the study of diffusion of innovations and variance theory representing a more positivistic approach to studying the subject.

One of the strengths of the interpretive approach is the critical approach to the myth of objectivity of scientific research. It is accepted that there are no objective causal relations which can be observed and communicated and it is accepted there is no truth which is just waiting to be explained by the researcher(s) [14]. The positivistic reductionism is in other words dismissed and phenomenology and hermeneutics are among other interpretivistic approaches used to make sense of the world as it is viewed in the lenses of the researcher.

In the present study we apply Markus and Robey’s [13] broad methodological classification. To identify which theoretical frameworks for studying diffusion and transfer of IT contributions published in the seven volumes of WG 8.6 proceedings were read and categorized based on the broad distinction between process research oriented studies and factor research oriented studies. Our classification of the contributions with respect to use of framework, theory or model is mainly based on what the researchers argue they apply. In those cases where no indication of use of a specific framework, theory or model is given, our classification is based on an analysis of the text including an examination of references. Our presentation of contributions representing different theoretical frameworks does not include the total number of contributions appearing in the proceedings. Instead we select and provide exemplars for the identified approaches.

### 3.1 Process Research Oriented Studies

Contributions falling in the category of process research oriented studies mainly include studies applying Walsham's interpretative framework [14], Actor-Network-Theory [15,16], and Soft Systems Methodology [17]. A number of studies also combine factor oriented frameworks with process oriented frameworks. These studies often argue that the factor oriented frameworks are insufficient in explaining the processes of adoption, diffusion and implementation hence it is necessary to add elements from an interpretative school.

In his book "Interpreting Information Systems in Organisations" Walsham outlines his framework constructed around the elements content, context, and social and political processes. He derives these elements from contextualism [18] and structuralism [19]. Kautz and Henriksen [20], Muzzi and Kautz [21], and Nilsson, Grisot and Mathiassen [22] make explicit reference to Walsham's interpretative framework. Jayasuriya, Rawstorne, Caputi [23] apply Walsham in a more diverse way. They use Walsham's framework to test Rogers' stage-model. The authors explicitly mention that they apply contextualism in their study. Bøving and Bødker [24] also combine Rogers' model with an interpretative framework. They combine Rogers with a "participative approach".

Actor-Network-Theory (ANT) is another analytical approach which has been applied by a number of researchers. Contrary to Walsham's interpretative framework for IS in organizations ANT is less clear in its premises for studying the phenomenon of diffusion of innovations. Actors, actants, translation, enrolment and inscription are among the key concepts that constitute an ANT analysis. Hedström [25] applies a pure ANT perspective in her study. This is also the case with McMaster [3] in his study of how the concept of diffusion has developed over time. Lines, Andersen, and Monteiro [26] apply ANT and neo-institutional theory in their study of uptake of IT in hospitals in a Norwegian county.

A number of contributions which focus on diffusion of software development practices use Soft Systems Methodology (SSM) [17]. Through thorough case studies typically of single organizations the researchers provide interpretations of practices and reasons for the outcome of these practices. Examples of this type of contribution include Levine and Syzdek [27] and East and Metcalfe [28] who focus in particular on the use of rich pictures.

Common for all the studies in the category of process research oriented studies is that they are based on case studies. Modeling, experiments and quantitative tests are not used as research methods. In our second category, factor research oriented studies, there is a broader variety in research methods but the theoretical foundation is not as clear cut as in the process research oriented studies.

### 3.2 Factor Research Oriented Studies

As demonstrated in Section 2 Rogers' framework on diffusion of innovations does play a role in the contributions. Regardless of not being used as often as we expected Rogers is the single most cited author of a diffusion framework in the WG 8.6. When applying Rogers it is most often in connection with a factor oriented study. Among

those contributions directly applying Rogers in their analysis of adoption, diffusion and implementation of innovations are Lyytinen and Damsgaard [29]. However, Lyytinen and Damsgaard analyze the framework and conclude that it is not suitable for analyzing diffusion of complex networked information technologies. Stuart, Russo, Sypher, Simons and Hallberg [30] combine Rogers with general IS adoption literature (which generally rests on Rogers' framework). Mitsufuji [31] applies Rogers, but combines his analysis with the Bass [32] model. This contribution is among the few contributions using econometrics to analyze the phenomenon of diffusion of innovations.

The majority of factor oriented studies apply contributions from the IS literature in their studies. Often cited contributions from the IS literature are [33-38]. The IS literature which focuses on adoption, transfer and diffusion of IT includes factors related to technological, organizational and environmental attributes which are then tested quantitatively or qualitatively as explanatory factors for adoption – and often also non-adoption – of a given IT innovation. The studies used as inspiration in the WG 8.6 contributions are mainly focused on the organizational or inter-organizational context. [39-41] are all examples of WG 8.6 contributions inspired by IS studies.

Some of the studies included in WG 8.6 proceedings do not give IT itself any particular attention. Instead, transaction cost theory has been used to support their arguments [42-43]. These contributions are however the exception from the rule of a very technology centric lens in the WG 8.6.

Having this in mind it is surprising that very few apply the TAM model [44] or the TRA model in their study of adoption and diffusion of technological innovations among individuals given that these models are specifically designed to embrace uptake of IT innovations -contrary to Rogers' model which does not distinguish between uptake of mobile phones, hybrid seed, or contraceptives. Sandhu and Corbitt [45] applied the TAM model in their study of e-commerce adoption and Moore and Benbasat used the TRA model in their study of end-users adoption of IT in organizations.

#### **4 A Look Back to Look Forward**

As stated in the introduction, the objective of this paper is to outline which academic frameworks for transfer and diffusion of information technologies that have been applied in the studies presented in the proceedings of the past events in WG 8.6.

Our analysis of the use of frameworks, theories and models supporting the study of transfer and diffusion of technological innovations shows a varied picture of how contributors to the proceedings approach the phenomenon. Variation is found at the different conferences: when the WG 8.6 event was held in Copenhagen, Denmark in 2003 the proceedings mainly consisted of process oriented studies whereas the proceedings from the event in Sydney, Australia in 2001 were dominated by factor oriented studies. However, when analyzing the seven volumes of proceedings as a whole the share of contributions reporting process oriented studies and factor oriented studies is more or less even.

The factor oriented studies of the adoption and diffusion of innovations are mostly not based on Rogers' framework. Instead other explanatory factors than those Rogers lists in his framework are operationalized. Well-established factor oriented diffusion-frameworks such as the Bass-model [32] or TAM [44] are also only rarely applied in the search for variables explaining adoption and diffusion patterns. Instead, the contributions are inspired by IS adoption studies mainly focusing on attributes of the particular (technological) innovation under examination and attributes of more general (organizational) conditions, e.g. managerial support, organizational size, slack and structure.

With respect to the interpretative frameworks applied there seems to be a more consistent pattern compared to the factor oriented contributions. The frequency of studies applying ANT, SSM, and Walsham's interpretative framework is relatively high compared to the more scattered picture of the use of factor oriented frameworks.

Based on our analysis of the contributions it is observed that contributions falling into the category of factor oriented studies are often authored by "single event" contributors or newcomers to the working group. The long standing members of WG 8.6 are on the other hand more inclined to stick to the same theoretical foundation which they apply in different settings over time and write new accounts of their work for the different events over the years. For some reason the theoretical foundation applied by the long standing members often falls into the category of process oriented studies. Given that a number of the long standing members appear in most of the volumes of the proceedings a more consistent picture appears with respect to the process oriented frameworks, models and theories.

It can therefore be argued that even though there is a more or less even distribution of factor oriented studies and process oriented studies in the proceedings of the WG 8.6 events, the common theoretical denominator in WG 8.6 is rooted in the process oriented schools of theories for understanding the transfer, diffusion and adoption of information technologies.

The majority of the longstanding members of WG 8.6 provide process research oriented studies within an interpretative approach. Studies based on this approach are certainly also applicable and necessary in the future, and refinements of the existing frameworks and theories are needed to further improve our understanding of complex phenomena such as transfer, adoption and diffusion. This is true especially in light of the continuous stream of IT innovations and their potential adoption by new user groups and in geographical and cultural areas of what is traditionally called the 'Western World'.

However, while sustaining methodological and theoretical pluralism, future work of the WG 8.6 ultimately has to tackle the question whether particular approaches or theoretical models are more appropriate for particular aspects of the transfer adoption and diffusion of IT innovations. The apparent focus of the group on organizations and the organizational level as expressed by its established members should in the future – beyond their sporadic appearances – also allow for researchers who like to study transfer, adoption and diffusion of IT and IT related phenomena either on the individual, sectoral, societal, regional or global level and who favor different research approaches, independently of whether they are more factor or more process based to join the group on a more permanent basis.

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