Coping with Rapid Changes in IT: An Update

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Abstract:

Dealing with rapid changes in technology within and outside of their company is a constant challenge for IT managers. About two decades ago, a series of studies and in particular Benamati & Lederer (2001a) showed that a range of coping strategies to deal with such rapid changes exists. These coping strategies range from the use of external support by consultants or vendors, or IT education and training to keep up with the demands of new technologies, to simply enduring change and trying to weather technological trends in the belief that they may not have a substantial impact on the company's business. We argue that the current trend towards digital transformation further accelerates technological change in many companies. In this study, we therefore present a conceptual replication of the original series of studies on coping mechanisms and strategies to deal with the challenges of rapid technological change. Our findings indicate that the variety of coping strategies and mechanisms employed by IT managers has become more diverse. In particular, we find that today IT managers try to prepare their companies more proactively for technological change by providing the necessary resources and by creating an appropriate organizational environment, rather than by relying on external support by consultants or vendors, or even by simply ignoring technological developments altogether.

Keywords: Rapid Technological Change, Coping Mechanisms, Coping Strategies, IT Management, Chief Information Officer

1 Introduction

Information and communication technologies (ICT) help companies to survive in a competitive climate that demands constant innovation. Gartner, for example, recently projected that global IT spending will reach $3.76 trillion in 2019 and Gartner's research vice president John-David Lovelock added that: "IT is no longer just a platform that enables organizations to run their business on. It is becoming the engine that moves the business" (Gartner, 2019). The speed with which technology changes is a major challenge for businesses and individuals alike. In a recent survey of more than 7,000 employees, Gartner found that about 80% of individuals feel that their skills are not sufficient to deal with future or even the current challenges of digitalization in their job (Baker, 2019). Yet, simply slowing down no longer seems to be an option any longer and extreme measures are necessary in order to achieve organizational agility. This is highlighted by Seo and La Paz who summarize the importance of technological change, stating that "…[an information system] that suppresses an organization's ability to be agile cannot be tolerated as it may lead to the demise of the organization" (Seo & La Paz, 2008, p. 139).

IT managers have to face this conundrum and need to find ways to deal with rapid techno-logical change. They are not only responsible for ensuring the competitive survival of their organizations, but also need to consider the well-being of individuals who are affected by technology. In a series of studies conducted from the mid-1990s to the early 2000s, Benamati and Lederer therefore investigated the singular actions and groups of actions that IT managers use to handle rapid changes in the technological environment (Benamati & Lederer, 2001a; Benamati & Lederer, 2001b; Benamati & Lederer, 2001c; Benamati, Lederer, & Singh, 1997). In the context of this study, we refer to single actions to reactively or proactively handle rapid technological change as "coping mechanisms", whereas we refer to "coping strategies" when we discuss sets of coping mechanisms that have a common path of action.

Benamati and Lederer identified 34 coping mechanisms, which they grouped into five main coping strategies (1. Education and Training, 2. Endurance, 3. Internal Procedures, 4. Vendor Support, 5. Consultant Support). Yet, these studies were conducted almost two decades ago and technological change is going on relentlessly. The "digital transformation wave", in particular, which started about ten years ago and which has now reached a majority of companies in industrialized countries, has led to a rate and speed of technological change that is not comparable to that of the 1990s and early 2000s (Capgemini Consulting, 2011; Hess, Matt, Benlian, & Wiesböck, 2016; Sebastian et al., 2017; Singh & Hess, 2017). Against this background, the present study conceptually replicated the research by Benamati and Lederer with the goal of creating current insights about the usage of coping strategies and coping mechanisms to handle rapid IT change. Doing so, we want to answer the following research question:

> *Which strategies do IT managers use to cope with the rapid changes in IT today?*

2 Methodology

To investigate which coping mechanisms and coping strategies are used by IT managers today, we conducted a replication of the series of studies by Benamati and Lederer. While the original studies were conducted in the United States, our replication took place in Austria (Europe). In line with the classification for replication studies of Berthon, Pitt, Ewing, & Carr (2002), we therefore make an extension to the studies by Benamati and Lederer by applying their methodology almost two decades later, though in a slightly different context. In line with the procedures of Benamati et al. (1997), we first conducted interviews with 16 IT managers to identify currently and/or previously applied coping mechanisms. To generate a list of topics for our interviews, we reviewed the literature to check for further themes in addition to the coping strategies presented by Benamati and Lederer. The resulting list of coping mechanisms was then the basis for a quantitative survey of IT professionals in Austria.

Literature review. We conducted a literature search using the keywords derived from the published studies of Benamati and Lederer (please refer to Table B1 in Appendix B for a list of all keywords). The search was conducted in the Web of Science, by always combining one keyword from one of three keyword areas (i.e., "Change", "Technology" and "Coping"; exemplary query: Change AND Technology AND Coping). This resulted in a total of 201 hits, of which we initially selected 28 papers based on title and abstract. After reviewing the full text, 12 papers remained, which were then used for a forward and backward search (Webster & Watson, 2002). Through backward search, we identified two additional papers that are relevant to our research context and through forward search, we initially identified 626 papers, of which three were

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relevant for our research. The literature search process therefore resulted in 17 papers that handled coping with technological change.

While these papers reiterate the importance of the original five coping strategies by Benamati and Lederer, 16 out of 17 papers also highlight strategies that cannot be assigned to one of these original categories, which we tentatively called "Monitoring and Forecasting", "Networking and Cooperation" and "Strategic Orientation" (see Table 1). "Monitoring and Forecasting" is related to the IT manager trying to foresee future developments, which enables proactive measures to make use of technological innovations. This theme is, for example, covered by Vecchiato and Roveda (Vecchiato & Roveda, 2010), who discuss what drives change in organizations and which role strategic foresight plays in this context. They also highlight the link of these foresight activities to the overall business strategy, a theme that we called "Strategic Orientation" as it highlights the role of management in enabling an organizational environment that is embracing innovation. In the context of IS project success, the role of such an organizational environment is also highlighted by Pankratz and Basten (2018) who found that the attention and commitment of management to an innovative project is an important success factor. "Networking and Cooperation" deals with the exchange of information within the organization and between organizations. The importance of information exchange in the context of technological innovation is, for example, highlighted by Sköld and Karlsson (2012) who investigated the use of business groups to create an internal market for technology exchange.

Table 1. Additional Coping Strategies Identified through Initial Literature Review			
17 papers in the Literature Review	**Monitoring and Forecasting**	**Strategic Orientation**	**Networking and Cooperation**
Christensen (2002)		X	
Frishammar & Ake Horte (2005)	X		
Chow, Goodman, Rooney, & Wyble (2007)		X	
Lichtenthaler (2007)	X		
Newbold & Azua (2007)			X
Pan, Pan, & Devadoss (2008)		X	X
Smith, Busi, Ball, & van der Meer (2008)		X	
Spath, Pastewski, & Lang-Koetz (2010)	X		X
Vecchiato & Roveda (2010)	X	X	X
Hsu, Lin, Cheng, & Linden (2012)			X
Laine (2012)	X		X
Sköld & Karlsson (2012)		X	X
Weber, Harper, Konnola, & Carabias Barcelo (2012)	X		X
Zickert & Beck (2012)	X		
Burger, Staake, Fleisch, & Hierold (2013)		X	
Gupta & Gupta (2014)			
Pankratz & Basten (2018)	X		X

Structured interviews. The basis for each interview was the resulting list of coping strategies, which included areas either previously presented by Benamati and Lederer (i.e., Education and Training, Endurance, Internal Procedures, Vendor Support, Consultant Support) or identified through the additional review of the literature (i.e., Monitoring and Forecasting, Strategic Orientation Networking and Cooperation). Each interview was based on a structured guide, which first involved an introduction of the topic of ICT-related change and the acquisition of written consent to the audio capture of the interview. Next, the interview included a general part about the interviewees' experience with ICT-related change (e.g., the three most recent change projects in which they were involved, types of technologies that were implemented, problems related to ICT implementation, general approaches used to resolve ICT-related problems) before each of the eight coping strategies was discussed. Specifically, a description of each strategy was presented and it was then discussed whether this strategy was previously applied by the interviewee and in which way (to get an idea of the used descriptions please refer to Table A1 in Appendix A, which includes short forms of strategy descriptions for the original five strategies introduced by Benamati and Lederer). Before finishing the interview, the interviewee was also asked whether there are coping strategies that they have applied before, or would like to apply, that are different from the eight strategies that were presented.

We conducted interviews with 16 IT managers between December 2017 and March 2018. We recruited individuals (convenience sample based on contacts of the authors) for our interviews who are responsible for executive and/or managerial activities related to information technology and have a professional tenure of at least five years, so we can assume that they had to deal with changes in the technological environment of their respective companies before. Details on the main characteristics of our 16 interview partners,

including their professional tenure (average: 19 years, min.: 7 years, max.: 32 years), organizational tenure (average: 13 years, min.: 1 year, max.: 32 years) and gender (15 male, 1 female) can be found in Table C1 in Appendix C. For the sample size (N = 16) it has to be noted that the minimal requirement was a replication of the sample size reported by Benamati et al. (1997). In addition, the final question in our interview guide (i.e., "Are there any additional coping strategies that you have applied / would like to apply?") allowed use to assess whether further interviews were necessary. More specifically, based on the qualitative content analysis approach presented by Mayring & Fenzl (2014), coping mechanisms and groups of mechanisms were extracted from the interview transcripts (supported by qualitative data analysis program MAXQDA v. 12). This approach led to only three coping mechanisms being identified that could not be assigned to one of the existing coping strategies (i.e., "Accept error culture and learn from mistakes", "Increase the willingness of management to change", and "Improve the dominant image of IT in the company") with the most prominent of these mechanisms (i.e., "Accept error culture and learn from mistakes" in terms of mentions) being alluded to by only two interviewees. Hence, we can assume that the number of interview partners was sufficient for the purpose of this replication.

By analyzing the content of these interviews, we also found support for most of the 34 coping mechanisms presented by Benamati and Lederer, with 25 of them having been applied by at least one of our interviewees before. We also identified an additional 29 coping mechanisms that were added to the set of the original coping mechanisms, with most coping mechanisms being related to one of the eight strategies presented during the interviews (only three coping mechanisms were not related to an existing coping strategy). Of the original coping mechanisms, nine were removed as they had never been used by any of our interviewees before (see Table 3). Please note though that some of the new coping mechanisms can be regarded as a replacement for these mechanisms (e.g., instead of "Document the differences between new and previous IT", a new, more generic coping mechanism has been included that reads "Administration and documentation of IT projects and processes"). We therefore ended up with 54 coping mechanisms that are applied by IT managers today.

Table 2. Coping Mechanisms Excluded from the Survey	
Coping Mechanisms	Usage Mean and Rank in 2001
Inform IS professionals of the benefits of new IT	4.55 (2)
Pressure vendors of new IT to provide support	4.23 (6)
Purchase additional new IT	4.12 (11)
Consider only new IT successfully used by other organizations	4.00 (15)
Pressure IS professionals to use new IT	3.94 (16)
Work with IT vendors to improve future versions of IT	3.81 (18)
Engage a consultant to help in addressing problems	3.44 (25)
Engage the vendor to write required interfaces between IT	3.10 (30)
Document the differences between new and previous IT	2.63 (33)

Online Survey. For the survey, only individuals in IT management, and with at least five years of professional experience, were eligible for participation. The survey was online in July and August of 2018 and was originally distributed to a convenience sample of professional contacts of the authors and ICT-related interest groups (e.g., the IT cluster, an interest group for the IT sector in Upper Austria, which reaches most of the IT managers in Upper Austria through its newsletter, https://www.itcluster.at/en/) and then further distributed through snowballing (i.e., direct contacts were asked to forward the survey invitation to other IT managers or interest groups that they know). The survey was started 635 times of which 250 (39%) were completed. Eight completed surveys had to be removed as participants were not eligible to be part of our sample. The remaining 242 completed surveys were used for further analyses. In general, the sample size is comparable to the studies by Benamati and Lederer with 246 participants. It has to be noted though that a larger sample size should be the goal for future research, in particular to bolster the results of the conducted exploratory factor analysis (EFA) in terms of the item-to-subject ratio (see for example Costello & Osborne, 2005 for further details on the influence of sample sizes on the correctness of classifications created by an EFA).

Table 3. Industry Categories and Company Size Categories			
Industry	**Share**	**Company Size**	**Share**
1) Banking and insurance	7 (2.9%)	1) Very small companies (up to nine employees)	83 (34.3%)
2) Trade and crafts	15 (6.2%)		
3) Retail	25 (10.3%)	2) Small companies (10-49 employees)	51 (21.1%)
4) Manufacturing	31 (12.8%)		
5) Information and consulting	109 (45.0%)	3) Medium-sized companies (50-249 employees)	46 (19.0%)
6) Tourism and leisure	7 (2.9%)		
7) Transportation	9 (3.7%)	4) Large companies (250+ employees)	62 (25.6%)
8) Other (e.g., print office, law firm)	39 (16.1%)		

Of the 242 participants, 10% were women and 90% were men, ranging in age from 22 to 70 years (Ø 45 years). Nearly half of the participants (48.3 %) have a university degree (0% with no degree, 4.5% with compulsory education only, 9.5% with completed vocational training, 37.6% with a high school diploma). The survey participants have been employed in their respective companies for one to 51 years (Ø 14 years) and their professional experience in IT management ranges from five to 46 years (Ø 21 years). In Table 4, we additionally present an overview of the sample of our survey grouped by industries and company sizes, which were used as the basis for further analyses (i.e., mean comparisons).

3 Results

3.1 Coping Mechanisms

In Table 4, we summarize the survey results. Each of the identified 54 coping mechanisms is listed in the order of frequency with which they are used (from 1 = rarely to never used to 7 = frequently used). In addition, next to the average rating and rank of a coping mechanism in the current survey, we indicate in brackets the average use of the coping mechanism in the original study by Benamati and Lederer and its rank in this study (out of 34 mechanisms) (Benamati & Lederer, 2001a). Further, using an asterisk next to the coping mechanisms, we indicate whether this coping mechanism has been added and was therefore not part of the original list of coping mechanisms.

Table 4. Coping Mechanisms (Ordered by the Frequency with which they are Used by a Sample of N = 242 IT Managers)			
ID	**Coping Mechanisms**	**Mean**	**Rank**
1	Solve problems using exclusively internal resources	5.83 (4.18)	1 (9)
2	Use internal resources when IT projects affect the company's core competencies and value creation*	5.60 (-)	2 (-)
3	Read to keep informed about available new IT	5.40 (5.45)	3 (1)
4	Accept error culture and learn from mistakes*	5.25 (-)	4 (-)
5	Consider the actual added value of new IT (costs/benefits)*	5.10 (-)	5 (-)
6	Learn new IT informally without classes	4.98 (4.55)	6 (3)
7	Increase the willingness of management to change*	4.79 (-)	7 (-)
8	Administration and documentation of IT projects and processes*	4.75 (-)	8 (-)
9	Promotion of internal and cross-departmental communication and cooperation*	4.59 (-)	9 (-)
10	Consider the alignment of IT strategy and business strategy during decision-making*	4.57 (-)	10 (-)
11	Consider the company's global requirements and guidelines*	4.50 (-)	11 (-)
12	Motivate retention of staff who are knowledgeable in new IT	4.48 (3.57)	12 (22)
13	Improve the dominant image of IT in the company*	4.48 (-)	13 (-)
14	Use internal staff to write required interfaces between IT	4.45 (3.74)	14 (20)
15	Be involved in various networks with suppliers, consultants, partners, universities, and others*	4.38 (-)	15 (-)

16	Disseminate the strategic vision throughout the organisation*	4.36 (-)	16 (-)
17	Consider best practice examples and benchmarks as guidelines*	4.31 (-)	17 (-)
18	Discuss new trends among relevant interest groups including middle management*	4.27 (-)	18 (-)
19	Deliberately limit strategic planning forecasts to a few years*	4.26 (-)	19 (-)
20	Consider only new (upgradeable) IT compatible with existing IT	4.23 (4.18)	20 (8)
21	Use agile methods to implement IT projects step-by-step*	4.32 (-)	21 (-)
22	Use internal staff to rewrite applications	4.18 (3.90)	22 (17)
23	Monitor and investigate emerging drivers of change in the business environment to create strategic foresight*	4.09 (-)	23 (-)
24	Systematically plan and observe innovation processes and technological trends*	4.06 (-)	24 (-)
25	Targeted employee search for IT specialists and IT generalists*	4.05 (-)	25 (-)
26	Customize education on new IT	3.96 (3.45)	26 (24)
27	Use a well-defined IT implementation procedure	3.89 (4.09)	27 (13)
28	Use of subject matter experts (IT experts have different competence areas)*	3.81 (-)	28 (-)
29	Attend conferences to keep informed about available new IT	3.77 (4.15)	29 (10)
30	Use a set of formal processes to ensure alignment between IT and business strategy*	3.75 (-)	30 (-)
31	Educate IS professionals about new IT through classes	3.72 (4.19)	31 (7)
32	Learn about new IT through vendors	3.69 (4.46)	32 (4)
33	Restructure the IS organization	3.67 (3.41)	33 (26)
34	Have vendors customize new IT	3.65 (3.26)	34 (27)
35	Organize targeted meetings concerning new IT for joint exchange of information*	3.49 (-)	35 (-)
36	Engage a consultant to aid the implementation of new IT	3.46 (3.74)	36 (19)
37	Use objectives and key results; organizational units have their own goals*	3.44 (-)	37 (-)
38	Coordinate communication among multiple vendors	3.40 (3.18)	38 (28)
39	Act in a network of companies to profit from large-scale operations*	3.37 (-)	39 (-)
40	Delay acquisition of new IT	3.28 (4.11)	40 (12)
41	Use a well-defined IT acquisition procedure	3.10 (3.56)	41 (23)
42	Rely on IT vendors to provide solutions to problems	3.08 (4.26)	42 (5)
43	Partner with competitors and companies from other industries*	3.07 (-)	43 (-)
44	Engage a consultant to help plan for new IT	3.02 (3.66)	44 (21)
45	Delay IT projects (e.g., implementation)*	2.99 (-)	45 (-)
46	Engage a consultant who proposes strategic and methodological procedures*	2.97 (-)	46 (-)
47	Work around problems without fixing them	2.83 (4.06)	47 (14)
48	Engage a consultant to provide ongoing support for new IT	2.82 (3.13)	48 (29)
49	Maintain your own training staff for new IT	2.79 (2.77)	49 (32)
50	Obtain support from another company already using the new IT	2.74 (3.00)	50 (31)
51	Establish business groups as internal technology markets and innovation drivers*	2.71 (-)	51 (-)
52	Use of bimodal IT (two-speed approach: static/dynamic, slow/fast)*	2.50 (-)	52 (-)
53	Integrate IT provider in the company for a limited period of time*	2.26 (-)	53 (-)
54	Ignore problems	2.17 (2.54)	54 (34)
	* new coping mechanisms added in this study		

Next, we highlight the main changes in coping mechanism use, but we also highlight those mechanisms that are used consistently. In Table 5, we therefore list the top 3 most frequently used coping mechanisms in the original study and in our current study. As can be seen in this ranking, keeping up with new developments personally by reading up is still amongst the most frequently used coping mechanisms of IT managers. What has changed though is the more frequent use of internal resources to solve IT-related problems by IT managers today.

Table 5. Use of Coping Mechanisms in Previous Study and Current Study	
Usage	**Three most Used Coping Mechanisms in Initial Study Published in 2001**
5.45	Read to keep informed about available new IT
4.55	Inform IT professionals of the benefits of new IT
4.55	Learn new IT informally without classes
Usage	**Three most Used Coping Mechanisms in Current Study**
5.83	Solve problems using exclusively internal resources
5.60	Use of internal resources when IT projects affect the company's core competencies and value creation
5.40	Read to keep informed of available new IT
Change	**Five Coping Mechanisms with most Substantial Change in Use**
+1.65	Solve problems using exclusively internal resources
-1.23	Work around problems without fixing them
-1.18	Rely on IT vendors to provide solutions to problems
+0.91	Motivate retention of staff who are knowledgeable in new IT
-0.83	Delay acquisition of new IT

The more frequent use of internal resources is also reflected in the absolute change in the use of some coping mechanisms. We highlight this change in the lower half of Table 5, by listing the five coping mechanisms that were included in both studies which saw the most substantial change in use over time (scale: from 1 = rarely to never used to 7 = frequently used, "+" indicates an increase in use between 2001 study and current study, "-" indicates a decrease in use). We can see that while the use of internal resources and the retention of skilled IT employees has become much more important for IT managers, relying on external resources, namely IT vendors, has dropped significantly in importance. In addition, deciding not to keep up with technological changes, by working around problems or delaying IT acquisitions has become substantially less important as a coping mechanism for IT managers.

3.2   Coping Strategies

Like Benamati and Lederer, we also wanted to know whether some of the found 54 coping mechanisms are frequently used together and build a set of coping strategies. Further, as for coping mechanisms, we want to show whether this set of coping strategies has changed over time. We therefore used the data gathered through our survey study as a basis for an exploratory factor analysis (EFA) (Costello & Osborne, 2005) to identify common themes (i.e., coping strategies) amongst the coping mechanisms.

We used principal axis factoring for factor extraction and promax as the method for rotation. We calculated a total of five EFAs (using SPSS v. 25) before we achieved a result which did not include indicators with a loading below .400 and no substantial cross-loadings. The final EFA had a KMO of 0.851 and consisted of 39 indicators across 10 factors (the Kaiser-Meyer-Olkin criterion – KMO, indicates the potential for dimension reduction with a value of .851 being "meritorious" whereas values above .900 would be "marvelous", according to Kaiser & Rice, 1974). In the final model, 39 of the 54 mechanisms remained and were assigned to one of ten coping strategies (the results of the initial EFA and the final EFA are included in Appendix D). Please note that the labels for each coping strategy were created to reflect the included coping mechanisms, which, for example led to "Monitoring and Forecasting" being absent from this list as it is now part of the wider coping strategy "Strategic Orientation". This result (i.e., retaining 39 out of 54 mechanisms) is comparable in its extent to that of the studies by Benamati and Lederer, which resulted in five coping strategies based on 22 to 24 (depending on the publication that is used as basis) coping mechanisms out of 34. In Table 6, we present the result of this classification with the coping strategies being ordered by their mean usage (i.e., the mean of the means for the included coping mechanisms; such as for "Informal Learning": 5.19 = (4.98 + 5.40)/2).

The classification reveals five coping strategies in addition to those previously reported by Benamati and Lederer (i.e., known strategies: Education and Training, Endurance, Internal Procedures, Vendor Support, Consultant Support; new strategies: Informal Learning, Internal Resources, Strategic Orientation, IT Experts, Networking and Cooperation). Table 7 gives an overview of all ten strategies, which are ordered by the frequency of their mean usage.

Table 6. Coping Strategies and Coping Mechanisms	
Coping Strategies and Mechanisms	**Mean (Std.)**
I – Informal learning	*5.19 (1.54)*
I-01 (06) Learn new IT informally without classes	4.98 (1.80)
I-02 (03) Read to keep informed about available new IT	5.40 (1.69)
II – Internal resources	*4.75 (1.79)*
II-01 (14) Use internal staff to write required interfaces between IT	4.45 (2.20)
II-02 (22) Use internal staff to rewrite applications	4.18 (2.25)
II-03 (02) Use internal resources when IT projects affect the company's core competencies and value creation*	5.60 (1.73)
III – Strategic orientation	*4.31 (1.24)*
III-01 (10) Consider the alignment of IT strategy and business strategy during decision-making*	4.57 (1.80)
III-02 (16) Disseminate the strategic vision throughout the organization*	4.36 (1.84)
III-03 (23) Monitor and investigate emerging drivers of change in the business environment to create strategic foresight*	4.09 (1.72)
III-04 (19) Deliberately limit strategic planning forecasts to a few years*	4.26 (1.87)
III-05 (30) Use a set of formal processes to ensure alignment between IT and business strategy*	3.75 (1.82)
III-06 (13) Improve the dominant image of IT in the company*	4.48 (1.83)
III-07 (17) Consider best practice examples and benchmarks as guidelines*	4.31 (1.77)
III-08 (18) Discuss new trends among relevant interest groups including middle management*	4.27 (1.81)
III-09 (07) Increase the willingness of management to change*	4.79 (1.69)
III-10 (24) Systematically plan and observe innovation processes and technological trends*	4.06 (1.72)
III-11 (11) Consider the company's global requirements and guidelines*	4.50 (1.85)
IV – IT experts	*4.11 (1.88)*
IV-01 (25) Targeted employee search for IT specialists and IT generalists*	4.05 (2.32)
IV-02 (12) Motivate retention of staff who are knowledgeable in new IT	4.48 (2.12)
IV-03 (28) Use of subject matter experts (IT experts have different competence areas)*	3.81 (2.08)
V – Education and Training	*3.82 (1.67)*
V-01 (29) Attend conferences to keep informed about available new IT	3.77 (2.02)
V-02 (31) Educate IS professionals about new IT through classes	3.72 (1.84)
V-03 (26) Customize education on new IT	3.96 (1.97)
VI – Vendor support	*3.66 (1.55)*
VI-01 (34) Have vendors customize new IT	3.65 (1.94)
VI-02 (32) Learn about new IT through vendors	3.69 (1.86)
VI-03 (20) Consider only new (upgradeable) IT compatible with existing IT	4.23 (1.95)
VI-04 (42) Rely on IT vendors to provide solutions to problems	3.08 (1.80)
VII – Internal procedures	*3.50 (1.76)*
VII-01 (41) Use a well-defined IT acquisition procedure	3.10 (1.87)
VII-02 (27) Use a well-defined IT implementation procedure	3.89 (1.98)
VIII – Networking and cooperation	*3.49 (1.51)*
VIII-01 (39) Act in a network of companies to profit from large-scale operations*	3.37 (1.82)
VIII-02 (51) Establish business groups as internal technology markets and innovation drivers*	2.71 (1.76)
VIII-03 (15) Be involved in various networks with suppliers, consultants, partners, universities, and others*	4.39 (1.92)
IX – Consultant support	*3.07 (1.79)*
IX-01 (44) Engage a consultant to help plan for new IT	3.02 (2.00)
IX-02 (36) Engage a consultant to aid the implementation of new IT	3.46 (2.00)
IX-03 (48) Engage a consultant to provide ongoing support for new IT	2.82 (1.99)
IX-04 (46) Engage a consultant who proposes strategic and methodological procedures*	2.97 (1.96)
X – Endurance	*2.82 (1.32)*
X-01 (45) Delay IT projects (e.g., implementation)*	2.99 (1.58)
X-02 (47) Work around problems without fixing them	2.83 (1.71)
X-03 (40) Delay acquisition of new IT	3.28 (1.68)
X-04 (54) Ignore problems	2.17 (1.49)
* new coping mechanisms included in this study	

Table 7. Coping Strategies Identified and their Change in Usage		
	Mean Usage	
Coping Strategies	**Today (Change)**	**2001**
I – *Informal learning* (2 coping mechanisms) *	*5.19 (-)*	*-*
II – *Internal resources* (3 coping mechanisms) *	*4.75 (-)*	*-*
III – *Strategic orientation* (11 Coping mechanisms) *	*4.31 (-)*	*-*
IV – *IT experts* (3 coping mechanisms) *	*4.11 (-)*	*-*
V – *Education and training* (3 coping mechanisms)	*3.82 (-0.37)*	*4.29*
VI – *Vendor support* (4 coping mechanisms)	*3.66 (-0.01)*	*3.67*
VII – *Internal procedures* (2 coping mechanisms)	*3.50 (-0.21)*	*3.71*
VIII – *Networking and cooperation* (3 coping mechanisms) *	*3.49 (-)*	*-*
IX – *Consultant support* (4 coping mechanisms)	*3.07 (-0.43)*	*3.50*
X – *Endurance* (4 coping mechanisms)	*2.82 (-0.93)*	*3.75*
* = highlights newly identified coping strategies		

For those coping strategies that were part of the earlier studies, we also highlight how their use has changed. As indicated in Table 7, four out of five of our new coping strategies are more commonly used than all five of the originally presented coping strategies, with the exception of the new strategy "Networking and Cooperation". In addition, we found that each of the coping strategies of the original study has lost in frequency of use. It has to be noted though that the results in this context are not completely comparable as some of the coping mechanisms included in the original study are now part of separate, new coping strategies (e.g., "Reading to keep informed about new IT" was part of "Education and Training", but is now part of the separate strategy "Informal Learning").

Informal learning. The most frequently used coping strategy involves reading up on technological trends and acquiring necessary skills informally, without any formal procedures implemented by an organization.

Internal resources. This strategy involves using internal staff to implement technological changes, such as writing new applications. The importance of this strategy was highlighted during our interviews particularly by an interviewee who stated that: "We actually do everything internally. Every employee is specialized to some degree in certain areas and we try to make sure that those employees are our experts. They are assigned specific projects due to their knowledge and experience" (Source: Interview XIV. Industry: Information and Consulting, 18 years in company, 18 years in IT). From this comment, we can infer a strong connection with other coping strategies such as the cultivation of an own team of IT experts (strategy 4).

Strategic orientation. This strategy involves the alignment of IT with the overall business goals, monitoring and forecasting related to IT and strategic management fostering a culture of change in the organization. During our interviews, particularly achieving a culture that is accepting failure has been highlighted as challenging, with an interviewee stating that: "That's something we're working on now that's insanely hard. That's the whole issue of error culture. [...] I was at a lecture in London, where exactly the topic "fail often, fail fast" was dealt with. And there they said, they really screwed up a project, completely. And there were no heads to roll. No, they were even rewarded for it, because they at least made a decision, even if the decision was wrong. People now prefer that to not making a decision at all" (Source: Interview XIII. Industry: Retail, 28 years in company, 28 years in IT).

IT experts. Using this strategy, IT managers attempt to build an internal pool of IT experts who can then be used to resolve IT-related problems and create the necessary technological changes. In the original studies, this strategy was not included, but a related coping mechanism (i.e., mechanism ID 12 "Motivate retention of staff who are knowledgeable in new IT") was included.

Education and training. This strategy has already been part of the original series of studies and involves the education of IS professionals through more formal means such as structured classes or conferences on new technological trends.

Vendor support. This coping strategy implies that the vendor(s) of IT are more strongly involved in the technological change activities of an organization. The identified coping mechanisms for this strategy portray different levels of involvement from simply providing information on new IT (mechanism ID 32) to relying on a vendor to provide the solutions to IT-related problems (mechanism ID 42).

Internal procedures. Using well-defined, formalized approaches to handle technological change, particularly regarding the acquisition and implementation of IT, is the focus of the "Internal Procedures" coping strategy.

Networking and cooperation. The last one of our newly identified classes of coping strategies involves the idea of exchanging knowledge internally (e.g., through business groups, mechanism ID 51) or externally with other companies or related organizations that could provide insights into new technologies (e.g., universities, mechanism ID 15).

Consultant support. Like Vendor Support, this coping strategy entails the use of external resources, in this case consultants and consulting firms to aid in the planning process for new IT or even its implementation and ongoing technical support. This coping strategy saw a decline in use (i.e., 3.07 now as compared to 3.50 in the previous studies). A potential reason for this decline was given by one of our interviewees who mentioned that when using consultant support something decisive is missing: "I've found that the biggest problem with consulting firms is that they still only understand 90 % of the business and it's the crucial 10 % that make the difference" (Source: Interview V, 18.01.2018. Industry: Law firm, 4 years in company, 20 years in IT).

Endurance. As in the original series of studies, the strategy to endure technological change by either only adopting technological trends if it is absolutely necessary (e.g., if they become pivotal to the organization because of outside pressure) or by even ignoring them completely is the least used strategy amongst the surveyed IT managers. One of our interview partners also explains why this strategy may be an option in some cases but is not a general alternative to other strategies: "So the ignore strategy, the typical bird's-eye view does not exist with us. Wait and see, we have already dealt with this, but we do not yet see the great added value, that is clear. Nor do we have the objective of simply introducing technology just because it is there, or because anyone believes that it will do any good." (Source: Interview VI. Industry: Retail, 30 years in company, 24 years in IT). Hence, in combination with strategic foresight (*Strategic Orientation* strategy) this approach can have merit, if it is applied to technological areas that are ambiguous and potentially entail a certain risk when invested in too early.

4   Discussion

Our study shows that there have been significant changes in the variety and application of coping mechanisms and coping strategies to handle rapid technological change since the series of studies by Benamati and Lederer about two decades ago. In particular, strategies that focus on increasing the preparedness for technological change (e.g., Informal learning: 5.19, internal resources: 4.75, strategic orientation: 4.31) have become more important than relying on external support (i.e., Vendor support: 3.66, consultant support: 3.07), which indicates that **IT managers today try to cope with technological change more actively**. This is also showcased by the significantly less frequent use of the *endurance* strategy (now: 2.82; originally: 3.75), which promotes waiting and perhaps even ignoring technological change.

We also tested whether these coping strategies are used to a different degree depending on industry and company size. We used the Kruskal-Wallis test (McDonald, 2014) as an alternative to an analysis of variance (ANOVA), as our data was not normally distributed. For the comparison of specific groups, we also applied the Dunn-Bonferroni post-hoc test.

In Table 8, we highlight the mean usage of each coping strategy based on the industry of the companies that our respondents work for and we highlight the strategies that are most frequently used (light grey coloring) and least frequently used (dark grey coloring). In line with this picture, which shows some variations in the use of certain coping strategies, we find statistically significant differences for four coping strategies: Informal learning (strategy 1; χ^2 (7) = 21.999. p = 0.003), internal resources (strategy 2; χ^2 (7) = 28.834. p < 0.001), networking and cooperation (strategy 8; χ^2 (7) = 19.909. p = 0.006), and consultant support (strategy 9; χ^2 (7) = 19.392. p = 0.007). In particular, for informal learning we find that companies in the area of information and consulting use this strategy far more frequently than transportation companies (p = 0.020) and for internal resources, we find that companies in information and consulting use this strategy significantly more often than companies in trade and crafts (p = 0.003) or retailing (p = 0.037).

Based on company size, we find a largely similar pattern in the use of coping strategies, as seen in Table 9 (light grey coloring indicates strategies that are most used and dark grey coloring indicates strategies that are least used). Still, there are statistically significant differences for two coping strategies: IT experts (strategy 4; χ^2 (3) = 8.861. p = 0.031), and consultant support (strategy 9; χ^2 (3) = 9.555. p = 0.023). In

particular, we can see that these strategies are highly resource-dependent and therefore more often applied by larger companies.

	1ᵃ	2ᵃ	3	4	5	6	7	8ᵃ	9ᵃ	10
Table 8. Differences in Coping Strategy Usage based on Industry										
A	4.43	4.52	4.90*	4.67*	4.24	4.14	3.86*	4.90*	2.64	2.75
B	4.33	3.31	4.18	3.31	2.91	3.93	3.40	2.76	3.83	2.28
C	4.86	4.00	4.16	3.60	3.15	3.58	3.30	3.19	3.20	2.87
D	4.95	4.24	4.01	3.87	3.74	4.31*	3.19	2.97	4.27*	3.27*
E	5.51*	5.23	4.46	4.45	4.18*	3.53	3.55	3.79	2.71	2.72
F	5.00	5.00	4.23	4.10	3.52	3.43	3.14	3.10	2.32	3.00
G	3.67	5.52*	4.46	3.59	3.78	3.44	3.78	3.15	3.47	3.00
H	5.55	4.65	4.18	4.03	3.61	3.49	3.69	3.42	2.85	2.88

Rows = company sizes; columns = coping strategies
Industries: A = banking and insurance; B = trade and crafts; C = retail; D = manufacturing; E = information and consulting; F = tourism and leisure; G = transportation; H = other
Coping Strategies: 1 = informal learning; 2 = internal resources; 3 = strategic orientation; 4 = IT experts; 5 = education and training; 6 = vendor support; 7 = internal procedures; 8 = networking and cooperation; 9 = consultant support; 10 = endurance
a = indicates statistically significant differences based on p < 0.05.
* = indicates the industries that use a specific strategy most frequently.

	1	2	3	4ᵃ	5	6	7	8	9ᵃ	10
Table 9. Differences in Coping Strategy Usage based on Company Size										
I	5.34*	4.65	4.35	3.73	3.75	3.41	3.34	3.29	2.74	2.50
J	5.27	5.00*	4.20	4.20	3.95*	3.56	3.33	3.48	3.01	2.85
K	5.12	4.51	4.36*	4.05	3.60	3.80	3.41	3.72*	3.19	3.16*
L	4.97	4.83	4.32	4.59*	3.95*	3.99*	3.90*	3.58	3.46*	2.96

Rows = company sizes; columns = coping strategies
Company sizes: I = very small companies (up to nine employees); J = small companies (10-49 employees); K = medium-sized companies (50-249 employees); L = large companies (250+ employees)
Coping strategies: 1 = informal learning; 2 = internal resources; 3 = strategic orientation; 4 = IT experts; 5 = education and training; 6 = vendor support; 7 = internal procedures; 8 = networking and cooperation; 9 = consultant support; 10 = endurance
a = indicates statistically significant differences based on p < 0.05.
* = indicates the group of companies (by size) that uses a strategy most frequently.

Next to highlighting currently applied coping mechanisms and coping strategies, we further investigated whether there are patterns of combined use or mutually exclusive use of coping strategies. For this purpose, we had a look at the correlations of coping strategies (interpretation of clusters was further supported by a dendrogram based on a hierarchical cluster analysis, which is included in Appendix E). We used Spearman correlations (McDonald, 2014), which do not require normally distributed data, to investigate the relationships between our coping strategies. In Table 10, we present the correlation coefficients and indicate their level of significance. We found **four main patterns of correlations amongst the ten coping strategies**.

We call the first group **"Building expertise"** as it combines strategies 1 and 2 (Informal learning, internal resources) and therefore revolves around the idea of building own, internal resources to be prepared for technological changes now and in the future. The second, larger group of strategies evolves around the idea of embracing change and building an organizational environment that is open for innovation. We therefore call this group **"Innovating and embracing technological change"**, as it combines strategies 3, 4, 5, 7, and 8 (Strategic orientation, IT experts, education and training, internal procedures, networking and cooperation). The third group includes the two strategies that are related to the use of external resources (i.e., 6 – vendor support and 9 – consultant support), which we accordingly call "**External support**". Importantly, the two strategies in this group are not only positively related to each other, but also negatively related to the use of internal resources (strategy 2), which highlights the opposing approaches of these strategies. Finally, the only strategy that stands alone is **"Endurance"** (strategy 10), which is further indicated by its negative relationship with strategy 3 (strategic orientation).

In general, combining coping strategies to deal with the many potential facets of technological change seems to be a good choice, which was also mentioned by one of our interviewees: "I believe that someone who omits one of the strategies also makes a mistake, so to speak, because time is so fast-moving and the changes are so rapid that you simply have to have a strategy at hand for emerging new topics" (Source: Interview XII. Industry: Information and consulting, 1 year in company, 25 years in IT).

Table 10. Spearman Correlations for Coping Strategies									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1									
2	.272**								
3	.171**	.143*							
4	.198**	.272**	.420**						
5	.137*	.127*	.497**	.536**					
6	.007	-.246**	.189**	.206**	.269**				
7	.077	.041	.472**	.345**	.375**	.187**			
8	.116	.071	.459**	.394**	.421**	.207**	.334**		
9	-.113	-.289**	.139*	.119	.225**	.478**	.201**	.189**	
10	.020	.030	-.287**	-.076	-.125	.145*	-.225**	-.117	.058

* = Correlation is significant the 0.05 level (2-tailed).
** = Correlation is significant at the 0.01 level (2-tailed).
1 = Informal learning; 2 = internal resources; 3 = strategic orientation; 4 = IT experts; 5 = education and training; 6 = vendor support; 7 = internal procedures; 8 = networking and cooperation; 9 = consultant support; 10 = endurance

5   Limitations and Areas for Future Research

Our study has its limitations, which also provide potential for future research. First, the sample size is a limiting factor as we did not reach the recommended item-to-subject ratio of at least 10 for our EFA (Costello & Osborne, 2005), but instead only achieved a ratio of 4.48 (242 participants in our online survey and 54 coping mechanisms). Extending the sample size by creating another replication of this study is therefore called for in order to again check the validity of the classification that was the basis for the creation of our ten coping strategies.

Second, for the gender distribution in both our interviews (1 out of 16 interviewees was a woman) and our online survey (10% of participants were women), it has to be noted that, while they do not represent the general population of Austria, they are representative of the IT sector in Austria and the European Union. For example, in a recent report on women in the digital age, the European Commission highlighted that the share of women amongst the population working in digital jobs with ICT-related studies has dropped from 13.9% in 2011 to 11.8% in 2015 (European Commission, 2018; see Figure 11 in the report). These numbers are not reported for Austria specifically, though it is also highlighted which share of individuals by gender graduated in ICT-related fields in 2015 (see Figure 2 in the same report by the European Commission), which shows that Austria is slightly below average (a mean of 1.2% of all graduated women in the EU studied ICT-related fields, compared to 1.0% in Austria). Having only 10% or less female participants in the context of an empirical study involving IT managers is therefore not unexpected. Nonetheless, as there are differences between male and female managers in terms of their leadership behavior (e.g., in the context of project management, Neuhauser, 2007), it should be investigated whether these differences also extend to the area of coping with ICT-related change.

Third, our study was conducted in a different country than the original studies by Benamati and Lederer (i.e., Austria vs the USA). Based on recent findings by Fang, Benamati, & Lederer (2017), who compared coping behaviors in the US and China (e.g., they find that the coping strategies vendor support, education and training, and internal procedures are more extensively used in China), it can be expected that country-specific differences exist, though they may not be as substantial in our study due to economic and ICT-related commonalities of the US and Austria (please refer to Appendix F for a brief economic and ICT-related comparison of the countries). Further studies are needed though to further explore whether additional coping mechanisms and strategies are employed in different countries and the extent to which they are used, for example as a result of cultural differences.

Fourth and finally, we focused solely on the ICT-related coping behaviors employed by IT managers in our study. Although this approach is comparable to the one taken in the studies by Benamati and Lederer, it should be clear that other stakeholders are also involved in this coping process, with IT users being another major group that has received extensive research attention (see for example the studies by Beaudry & Pinsonneault, 2005; Beaudry & Pinsonneault, 2010; D'Arcy, Herath, & Shoss, 2014; Liang & Xue, 2010). Rather than focusing on one side (e.g., IT managers) or another side (e.g., IT users), we call for additional research that combines these perspectives to create more holistic insights into the mutual effects of applied coping mechanisms and strategies (e.g., How does the portfolio of coping strategies chosen by IT managers influence the coping mechanisms employed by IT users and *vice versa*?).

6   Conclusion

In summary, our study provides IT managers with an overview of current approaches to handling rapid technological innovation. In addition, by identifying coping mechanisms and coping strategies, we provide a means to self-assess the applied coping mechanisms portfolio and benchmark with IT managers from companies of equal size or industry. As we have shown that the portfolio of potential coping mechanisms can change substantially over time, we argue that a regular update to this investigation is needed. It will be rewarding to see what insights future research will reveal.

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Appendix A: Original Coping Mechanisms and Coping Strategies

In their series of studies, Benamati and Lederer presented a list of 34 potential coping mechanisms, which were then assigned to five coping strategies based on the results of an EFA (see Table A1). Please note that in Benamati & Lederer (2001b), which is used as the basis for Table A1, and Benamati & Lederer (2001a), slightly different EFAs are reported in terms of the number of coping mechanisms which are included in the resulting coping strategies.

Table A1. Original Coping Mechanisms and Strategies based on Benamati & Lederer (2001b)	
Coping Strategies	**Coping Mechanisms**
1. Education & training "Stay informed of new IT as it becomes available and instruct or provide guidance in the use of new IT."	• Inform IS professionals of the benefits of new IT • Educate IS professionals about new IT through classes • Attend conferences to stay informed about available new IT • Read to keep informed about available new IT • Customize education on new IT • Pressure IS professionals to use new IT
2. Endurance "Ignore or work around problems, and learn new IT without formal education."	• Work around problems without fixing them • Ignore problems • Learn new IT informally without classes
3. Internal procedures Develop processes to aid in the evaluation, acquisition, and implementation of new IT."	• Use a well-defined IT implementation procedure • Consider only new IT compatible with existing IT • Use a well-defined IT acquisition procedure • Consider only new IT successfully used by other organizations • Document the differences between new and previous IT
4. Vendor support "Rely on IT suppliers for problem determination and resolution, customization to, interfaces with, and functional enhancement to new IT."	• Have vendors customize new IT • Rely on IT vendors to provide solutions to problems • Pressure vendors of new IT to provide support • Work with IT vendors to improve future versions of IT • Engage the vendor to provide required interfaces between IT • Coordinate communication among multiple vendors
5. Consultant support "Engage external IS professionals to help plan for, implement, problem solve, or provide ongoing support for new IT."	• Engage a consultant to help in addressing problems • Engage a consultant to aid the implementation of new IT • Engage a consultant to provide ongoing support for new IT • Engage a consultant to help plan for new IT
Coping mechanisms **not assigned to a strategy:**	• Delay acquisition of new IT • Solve problems using exclusively internal resources • Learn about new IT through vendors • Restructure the IS organization • Motivate retention of staff who are knowledgeable in new IT • Purchase additional new IT • Maintain your own training staff for new IT • Use internal staff to write required interfaces between IT • Use internal staff to rewrite applications • Obtain support from another company already using new IT

Appendix B: Keywords Used for Literature Search

Table B1 lists the keyword areas and specific keywords that were used for the literature search. For each query, one term from each keyword area was selected and combined (e.g., Development AND Information AND Handling).

Table B1. Keywords Used for the Literature Search	
Area	**Keywords**
Change	Change
	Development
	Innovation
	Transformation
Technology	Technology
	Information
	Information technology
	Information and communication technology
Coping	Coping
	Handling
	Dealing
	Managing

Appendix C: Characteristics of Interview Partners

The main characteristics of our 16 interview partners are presented in Table C1 below.

Table C1. Characteristics of Interview Partners				
ID	**Gender**	**Industry**	**Organizational Tenure (in Years)**	**Professional Tenure (in Years)**
1	Male	Other (accounting firm)	18	18
2	Male	Retail	34	32
3	Male	Information and consulting	2	7
4	Male	Information and consulting	12	14
5	Male	Other (law firm)	4	20
6	Male	Retail	30	24
7	Male	Information and consulting	11	17
8	Male	Manufacturing	2	8
9	Male	Information and consulting	6	13
10	Male	Transportation	10	23
11	Female	Other (print office)	30	30
12	Male	Information and consulting	1	25
13	Male	Retail	28	28
14	Male	Information and consulting	18	18
15	Male	Manufacturing	6	15
16	Male	Information and consulting	2	17

Appendix D: Exploratory Factor Analyses (EFAs)

In Table D1, the pattern matrix for the initial EFA is presented, which converged after 14 iterations and reached a KMO of .864. Including all 54 coping mechanisms, this EFA resulted in 12 factors with an Eigenvalue greater than 1, that explained a cumulative 56.66% of variance of the item variance. The column "ID" lists all 54 coping mechanisms based on their mean usage rank (see also Table 4 in the main body of the paper). This initial result still included items with substantial cross-loadings and items with no substantial loadings on any specific factor. Hence, additional EFAs were calculated, which involved the removal of items, until a clean solution was achieved (i.e., no substantial cross-loadings and loadings close to or above .500 on one specific factor). The result of this process was a final EFA that is reported in Table D2.

	Table D1. Factors and Item Loadings in Initial EFA											
	Factors and Loadings (Pattern Matrix)											
ID	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	.071	-.087	.239	-.054	-.022	-.101	.345	-.111	-.089	.224	-.001	-.098
2	.139	.058	.077	-.039	.018	-.111	.536	-.017	-.022	.252	-.005	-.106
3	-.099	-.033	-.080	.030	-.013	.041	-.027	.119	.226	.734	-.032	-.060
4	.554	.059	.084	-.050	-.185	-.182	-.043	-.004	-.029	.262	-.024	.314
5	.470	.014	.055	.069	.145	-.003	-.005	-.140	-.198	.321	.021	.082
6	-.070	-.018	.012	-.014	.197	.074	-.024	-.068	.125	.777	.037	.037
7	.596	.002	-.150	.109	-.127	-.023	.036	-.014	.086	.116	-.084	.420
8	-.007	-.005	.381	.060	-.145	.000	-.036	.031	.121	.176	.280	-.185
9	.414	.010	.210	-.053	-.012	.229	-.042	.042	-.116	.146	-.083	-.012
10	.767	-.064	.178	.046	.010	-.063	-.004	-.081	.058	-.105	.007	-.060
11	.504	-.025	.087	.001	.013	-.025	-.002	-.003	.268	-.012	-.153	-.172
12	-.031	-.076	.716	-.010	-.063	-.019	.006	.208	.030	.096	.054	.099
13	.685	.064	-.214	-.035	-.018	-.030	.071	.060	.144	-.008	-.097	.177
14	-.030	-.041	.097	.070	.007	.048	.970	-.062	-.007	-.087	-.059	.066
15	.017	.039	-.043	.097	-.174	.579	.047	.058	-.148	.150	-.094	-.098
16	.715	-.075	.102	-.025	-.001	.055	-.071	-.039	.089	-.164	.062	-.043
17	.628	.048	-.101	.040	.037	.094	.072	-.070	-.008	.062	.155	.038
18	.576	.007	-.064	.025	-.079	.126	.124	.194	-.295	-.095	.100	.040
19	.715	-.078	.032	-.003	.083	-.005	.018	-.111	-.011	-.031	.229	.188
20	-.064	.011	.088	.797	-.121	.012	-.001	-.021	-.049	.055	-.050	-.147
21	.035	-.032	.402	.012	.010	.025	.057	-.072	.108	.184	.409	.102
22	.010	.010	-.056	-.099	.084	.007	.850	.036	.027	-.107	.004	-.008
23	.739	-.004	-.158	-.020	.028	-.069	-.070	.185	-.078	.019	.268	-.115
24	.561	.014	-.162	-.031	-.068	-.010	-.016	.249	-.015	-.003	.272	-.052
25	-.059	.015	.844	.055	-.062	-.024	.040	.110	-.164	-.126	.199	-.049
26	.064	.032	.202	-.019	.041	-.013	-.016	.662	.043	.124	-.021	-.027
27	.086	-.050	-.020	.021	-.123	.025	.042	.052	.722	.157	.078	-.004
28	-.149	.063	.653	.051	-.011	.050	.097	.137	.037	-.014	.046	.102
29	-.040	.003	.288	-.153	.143	.006	-.099	.753	-.018	.029	-.001	.063
30	.651	.004	.033	-.038	.074	.039	-.008	-.048	.282	-.268	.037	-.136
31	.013	-.055	.083	.174	.034	-.126	.051	.754	.114	-.101	-.107	-.014
32	.033	-.103	-.027	.784	.002	-.013	-.060	.112	-.040	.058	.060	.149
33	.250	.069	.047	.022	.008	.026	-.005	-.112	.323	.122	.355	.059
34	.017	.022	.036	.871	.001	-.037	.064	-.062	-.003	-.100	-.005	.053
35	.123	.017	.232	-.078	-.057	.360	.039	.171	-.018	-.186	.056	.168
36	.137	.872	.017	.064	-.033	-.073	-.031	-.039	-.174	-.078	.050	.020
37	.214	.085	.426	-.042	.090	.054	-.066	-.094	.067	-.093	.540	.035
38	.037	.106	-.172	.435	.062	.122	.051	.035	.097	.132	.006	-.270
39	-.013	-.035	.038	.028	-.032	.886	-.088	-.107	-.096	.082	.040	-.007
40	.140	-.016	-.043	-.011	.844	.111	-.034	.030	-.137	.188	-.243	-.038
41	-.010	.038	-.057	-.051	-.053	-.014	-.028	.074	.776	.157	.100	.080
42	.062	.064	.107	.524	.170	-.038	-.183	-.073	-.012	-.005	.003	.135
43	.105	-.086	-.100	.079	-.020	.396	.078	.181	.155	-.037	.086	.227
44	-.040	.930	-.044	-.029	-.029	-.032	.018	-.042	.067	.015	-.007	.042
45	.026	.052	-.044	-.082	.856	-.021	.045	.149	-.044	.085	-.046	.056
46	.032	.839	.023	-.067	.013	.005	-.047	.038	.025	.037	.020	.039
47	-.031	-.036	-.015	.039	.736	-.087	.056	.014	-.045	.054	.207	-.053
48	-.184	.843	.006	.026	-.011	.082	.066	-.018	.069	-.013	.033	.071
49	.032	.094	.055	.035	.045	-.039	.203	.080	.072	.076	.107	-.134
50	.036	.142	.092	.037	.039	.146	-.020	.032	.052	-.023	.083	.359
51	-.014	.036	-.042	-.109	.096	.786	.022	-.097	.160	.029	.080	.139
52	.097	-.045	.157	.025	.039	.308	-.012	-.038	.051	-.088	.336	.030
53	-.031	.245	.146	.256	.148	-.028	-.020	.137	.080	-.149	-.163	.064
54	-.171	-.056	-.099	.087	.648	-.034	.049	.003	.036	-.038	.129	-.019

The final EFA (pattern matrix in Table D2) resulted in ten factors with a cumulative 60.88% in explained variance and a KMO of .851 (convergence after eight iterations). In this final EFA, 39 out of 54 coping mechanisms remained, which are again listed based on their mean usage rank in the left-most column (see Table 4 in the main body of the paper for the coping mechanisms that belong to each ID). The ten resulting factors, which then constitute our coping strategies, are ranked based on their mean usage (see row "Usage"). In line with Benamati & Lederer (2001a) and Benamati & Lederer (2001b), for each factor, we also report the Eigenvalue with 1.000 being the cutoff (i.e., factors with an Eigenvalue <1.000 were excluded), we report the contribution to the explained variance of each factor (see row "% of var.") and we report the Cronbach's Alpha value (see row "α") with values >.700 indicating sufficient construct reliability (Cronbach & Meehl, 1955). In addition, we highlighted the coping mechanisms that belong to each coping strategy by adding grey background color to their respective loadings (coping mechanisms are ordered based on the extent of their loadings).

Table D2. Factors and item loadings in final EFA										
	Coping Strategies and Loadings (Pattern Matrix)									
ID	I	II	III	IV	V	VI	VII	VIII	IX	X
Eigenvalue	1.116	1.644	9.173	1.720	1.428	1.877	1.226	1.291	4.957	2.975
% of var.	1.948	3.370	22.457	3.426	2.695	3.778	2.222	2.391	11.940	6.656
α	.717	.826	.892	.830	.824	.839	.804	.757	.923	.834
Usage	5.19	4.75	4.31	4.11	3.82	3.66	3.50	3.49	3.07	2.82
6	.821	-.025	.051	.098	-.158	-.020	.014	.015	.000	.147
3	.700	-.036	.004	.079	.014	.003	.092	.015	-.037	-.083
14	-.048	.975	-.024	.132	-.116	.096	.005	.014	-.028	-.006
22	-.081	.848	.034	.026	-.033	-.099	.030	-.014	.019	.081
2	.222	.485	.161	.141	-.010	-.069	-.038	-.116	-.001	-.009
10	-.055	-.014	.752	.287	-.102	.039	-.062	-.064	-.062	-.008
16	-.106	-.076	.735	.198	-.056	-.034	-.047	.029	-.048	-.014
23	.000	-.017	.697	-.185	.261	-.064	.008	.014	-.042	.070
19	.064	.052	.687	-.067	-.034	.022	.012	.007	-.045	.120
30	-.206	-.057	.654	.204	-.101	-.071	.168	.049	.022	.072
13	.049	-.002	.651	-.116	.000	.000	.059	-.078	.110	-.065
17	.117	.094	.643	-.098	-.055	.021	.004	.093	.062	.055
18	-.013	.136	.571	-.081	.218	.012	-.253	.097	.027	-.065
7	.160	-.008	.538	-.153	-.022	.180	.023	-.085	.070	-.160
24	-.011	.049	.533	-.214	.314	-.051	.093	.067	-.007	-.013
11	-.003	-.042	.484	.268	-.086	.019	.149	-.052	-.043	-.054
25	-.014	.108	-.050	.702	.215	-.004	-.113	.051	.028	.018
12	.180	.034	-.027	.667	.241	.000	.020	-.024	-.040	-.057
28	.073	.107	-.147	.602	.180	.047	.038	.067	.097	.007
29	-.014	-.115	-.017	.300	.729	-.109	.004	-.022	.029	.112
31	-.171	-.021	-.005	.169	.694	.195	.109	-.087	-.048	-.004
26	.021	-.048	.073	.253	.670	-.006	.040	.011	.015	.011
34	-.082	.079	.006	-.015	-.052	.879	.054	.000	.034	.041
32	.063	-.047	.049	-.113	.141	.783	-.005	.008	-.065	.031
20	-.018	.021	-.038	.132	.004	.713	-.034	.017	.007	-.088
42	.043	-.182	.057	.071	-.072	.537	-.017	-.012	.108	.189
41	.053	-.017	.003	-.069	.096	-.016	.858	.006	.031	-.011
27	.050	.062	.157	.034	.029	.048	.656	.042	-.046	-.103
39	.023	-.089	.025	.075	-.052	.036	-.076	.844	-.050	-.020
51	-.010	.008	.022	-.004	-.074	-.079	.185	.758	.061	.124
15	.019	.066	.012	.049	.089	.107	-.086	.494	-.012	-.200
44	-.001	.014	-.020	.012	-.044	-.018	.052	-.033	.928	-.030
36	-.028	-.024	.129	-.004	-.006	.056	-.129	-.047	.860	-.012
48	-.026	.063	-.136	.012	-.008	.049	.068	.078	.831	.002
46	.019	-.063	.056	.063	.060	-.063	.010	.001	.828	.011
45	.017	.003	.033	.013	.120	-.048	-.036	-.023	.063	.829
47	-.002	.112	-.005	-.053	.059	.027	.030	-.022	-.038	.794
40	.108	-.079	.104	.095	-.047	.037	-.138	.046	-.030	.708
54	-.040	.054	-.132	-.101	-.008	.091	.072	.002	-.033	.689

Appendix E: Patterns of Coping Strategies (Dendrogram)

To further support our interpretation of the patterns of correlations between coping strategies we ran a hierarchical cluster analysis in SPSS (v. 25), with the result being illustrated by the dendrogram shown in Figure E1 below. As can be seen, the distance between clusters (x-axis) would allow for multiple combinations of the coping strategies (y-axis). Alternatives to our four patterns would have been, for example, a classification with three patterns that combines consultant support, vendor support, and endurance, or a classification with five patterns that separates internal resources from informal learning. Based on the significance and extent of the correlations between these strategies, we chose a four-pattern solution though.
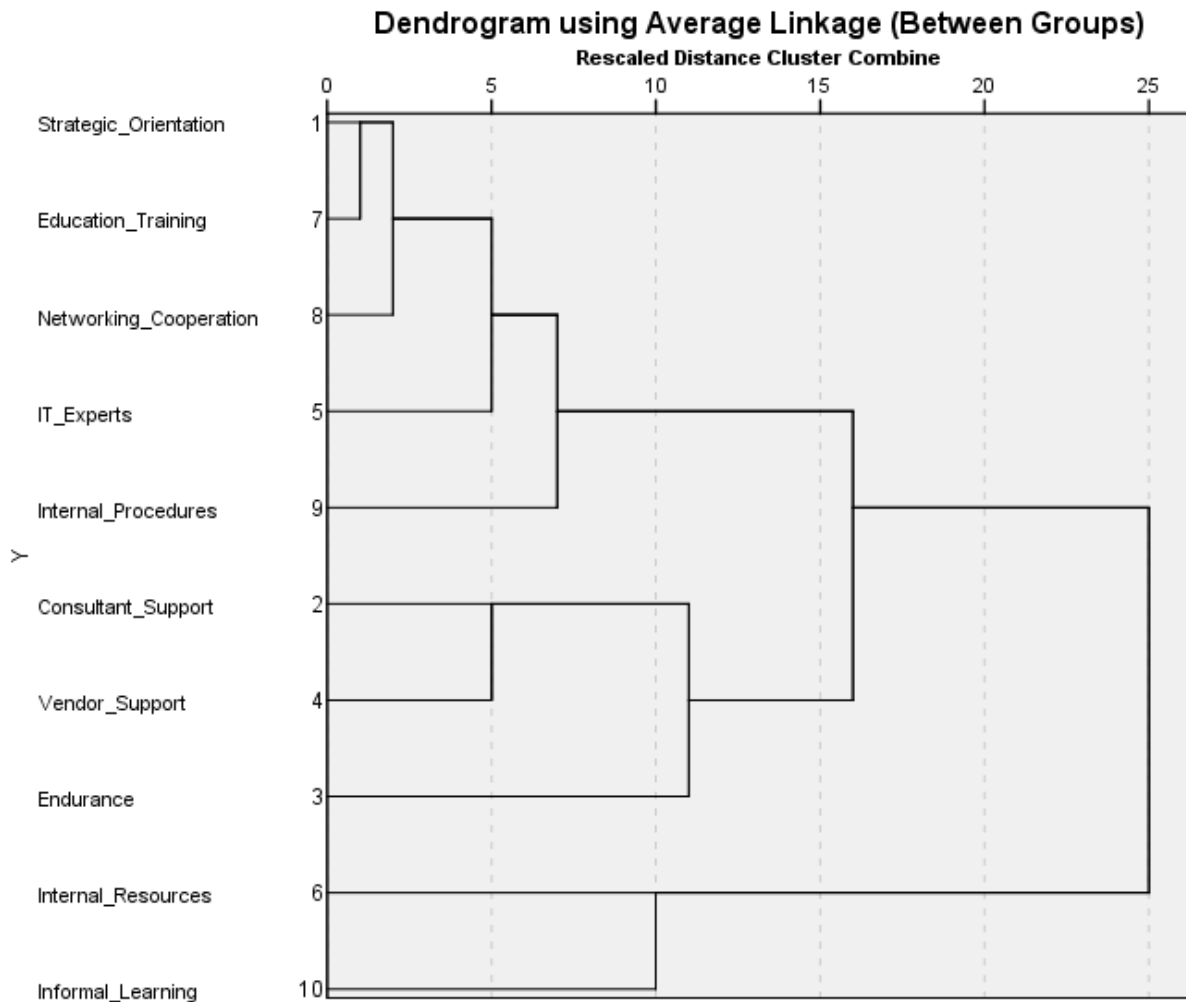
Figure 1. Dendrogram of Coping Strategies

Appendix F: Comparison of Austria and USA

To further indicate that our results can be compared to the results of Benamati and Lederer despite the fact that data collection took place in a different country, we briefly outline the economic and ICT-related commonalities and differences between Austria and the United States. Austria is a small country compared to the United States (population of 8.8 million vs. 328 million, 2018); however, the GDP per capita is similar (according to 2017 data, the US is ranked 8th while Austria is ranked 15th, out of 192 countries worldwide; ~59,000 US$ vs. ~47,000 US$) (International Monetary Fund, 2018). Moreover, regarding the use of ICT for business, the two countries are even more similar. This circumstance can be checked by referring to the

latest edition of the Global Information Technology Report by the World Economic Forum, which also includes the "Networked Readiness Index", which assesses a country's "… preparedness to reap the benefits of emerging technologies and capitalize on the opportunities presented by the digital transformation and beyond" (Baller, Dutta, & Lanvin, 2016). Here, the United States achieves a value of 5.8 (out of 7), while Austria is rated with a 5.4 (out of 7). The highest value in this ranking is awarded to Singapore and Finland (6.0 out of 7), with only 28 out of 139 countries achieving a value higher than 5.0.

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